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FPSC - COMMISSION CLERK

FLORIDA PUBLIC SERVICE COMMISSION

EXHIBIT INDEX

FOR THE HEARING DATED 10/07/2025 IN DOCKET 20250029

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FPSC EXH NO. 95
ADMITTED

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for Rate Increase by Peoples Gas System, Inc.	DOCKET NO. 20250029-GU FILED: May 5, 2025

PEOPLES GAS SYSTEM, INC.'S RESPONSE TO OFFICE OF PUBLIC COUNSEL'S SECOND REQUEST FOR PRODUCTION OF DOCUMENTS (NOS. 42-46)

Pursuant to Rule 106.206, Florida Administrative Code, and Florida Rule of Civil Procedure 1.350, Peoples Gas System, Inc. ("Peoples" or the "company"), hereby responds to the Office of Public Counsel's ("OPC") Second Request for Production of Documents (Nos. 42-46), served April 4, 2025 ("OPC's Second POD").

General Objections

1. Peoples objects to each Request for Production in OPC's Second POD ("Request") to the extent that it seeks information that is duplicative, not relevant to the subject matter of this docket, and is not reasonably calculated to lead to the discovery of admissible evidence.

2. Peoples objects to each Request to the extent it is vague, ambiguous, overly broad, imprecise, or utilizes terms that are subject to multiple interpretations but are not properly defined or explained for purposes of such Requests. Peoples will seek clarification from OPC if a request is not clear, but Peoples will produce documents subject to, and without waiving, this objection.

3. Peoples objects to each Request to the extent it requires Peoples to produce information that is already in the public record before the Florida Public Service Commission ("FPSC" or the "Commission"), or the OPC, or other public agency and/or available to OPC through normal procedures or is readily accessible through legal search engines.

4. Peoples objects to each Request to the extent that it calls for data or information protected by the attorney-client privilege, the work product doctrine, the accountant-client

E18865

privilege, the trade secret privilege, or any other applicable privilege or protection afforded by law. Peoples will describe the nature of the privileged material, if any, in a privilege log that will accompany its responses.

5. Peoples objects to producing paper copies on the grounds that doing so would be unduly burdensome. Peoples intends to enter an agreement with OPC, governing discovery production and responses, and will serve its responses to the Requests and related responsive documents to OPC in electronic form via a SharePoint site to which OPC and its consultants have remote access.

6. Peoples objects to each Request to the extent it requires the company to provide information that it believes is "proprietary confidential business information" as described in Section 366.093, Florida Statutes. Peoples will provide such confidential information to OPC in a designated confidential portion of the SharePoint site described above and subject to a Motion for Temporary Protective Order, Notice of Intent to Request Confidential Classification, and/or Request for Confidential Classification, as appropriate.

7. Peoples objects to each Request to the extent it requests Peoples to prepare information in a particular format or create data or information that it otherwise does not possess as unduly burdensome and purports to expand Peoples' obligations under applicable law.

8. Subject to Section 366.093(1), Florida Statutes, Peoples objects to any definition or Request that requests documents from persons or entities who are not parties to this proceeding, that seek information from affiliates unrelated to transactions or cost allocations involving Peoples, or that are not otherwise subject to discovery under applicable rules.

9. Peoples objects to any Request requiring the company to provide additional information beyond that obtained through a reasonable and diligent search.

FPSC EXH NO. 95
ADMITTED

General Response

Subject to and without waiving its general objections, which are incorporated by reference in each of its specific responses, Peoples will produce documents responsive to the Requests to the non-Commission staff parties by posting electronic versions of documents on the Peoples Discovery SharePoint site established for this docket (the "SharePoint") and as specified in its specific responses. Peoples will serve documents responsive to the Requests to the Commission staff by hand delivering a USB containing electronic versions of responsive documents to the Commission Clerk's office, and for Staff's purposes, the term "USB" should be substituted for "SharePoint" in the specific responses shown below.

The company's specific responses will identify Requests that call for documents that contain (a) information for which the company asserts a legal privilege and/or (b) "proprietary confidential business information" as defined in Section 366.093, Florida Statutes.

Documents responsive to a Request that contains information for which the company asserts a legal privilege will be identified in the privilege log attached as Exhibit A.

Documents responsive to a Request that contains information the company asserts to be "proprietary confidential business information" will be produced in the Confidential portion of the SharePoint subject to a request for confidential classification, motion for temporary protective order and/or a non-disclosure agreement.

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FPSC EXH NO. 95
ADMITTED

Specific Responses

43. **Forecasting Process.** Please provide all documents identified in Citizens' Second Set of Interrogatories, Interrogatory No. 101.

Response:

The documents in this folder contain proprietary business information. Peoples' confidential electronic documents responsive to this request will be served by posting on the SharePoint or via USB in the folder entitled "CONF_POD_2_43."

The current year long-term forecasting process is ongoing at the time of this response and the resulting long-term forecast has not been submitted to Emera.

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FPSC EXH NO. 95
ADMITTED

46. Contractor/Employee Studies. Please provide all documents identified in Citizens' Second Set of Interrogatories, Interrogatory No. 110.

Response:

The documents responsive to this request contain proprietary confidential business information. Peoples confidential electronic documents responsive to this request will be served by posting on the Confidential Section of the SharePoint or via USB in the folder entitled "CONF_POD_2_46."

E18869

ADMITTED

Measurement Analyst Insourcing Analysis

	Labor	Benefits	Total Cost
Contractor Equivalent Measurement Analyst	[redacted]		
		Annual Delta	66,950

FPSC EXH NO. 96
ADMITTED

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for Rate Increase by Peoples Gas System, Inc.	DOCKET NO. 20250029-GU FILED: May 5, 2025

PEOPLES GAS SYSTEM, INC.'S RESPONSE TO OFFICE OF PUBLIC COUNSEL'S THIRD REQUEST FOR PRODUCTION OF DOCUMENTS (NOS. 47-52)

Pursuant to Rule 106.206, Florida Administrative Code, and Florida Rule of Civil Procedure 1.350, Peoples Gas System, Inc. ("Peoples" or the "company"), hereby responds to the Office of Public Counsel's ("OPC") Third Request for Production of Documents (Nos. 47-52), served April 4, 2025 ("OPC's Third POD").

General Objections

1. Peoples objects to each Request for Production in OPC's Third POD ("Request") to the extent that it seeks information that is duplicative, not relevant to the subject matter of this docket, and is not reasonably calculated to lead to the discovery of admissible evidence.

2. Peoples objects to each Request to the extent it is vague, ambiguous, overly broad, imprecise, or utilizes terms that are subject to multiple interpretations but are not properly defined or explained for purposes of such Requests. Peoples will seek clarification from OPC if a request is not clear, but Peoples will produce documents subject to, and without waiving, this objection.

3. Peoples objects to each Request to the extent it requires Peoples to produce information that is already in the public record before the Florida Public Service Commission ("FPSC" or the "Commission"), or the OPC, or other public agency and/or available to OPC through normal procedures or is readily accessible through legal search engines.

4. Peoples objects to each Request to the extent that it calls for data or information protected by the attorney-client privilege, the work product doctrine, the accountant-client

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privilege, the trade secret privilege, or any other applicable privilege or protection afforded by law. Peoples will describe the nature of the privileged material, if any, in a privilege log that will accompany its responses.

5. Peoples objects to producing paper copies on the grounds that doing so would be unduly burdensome. Peoples intends to enter an agreement with OPC, governing discovery production and responses, and will serve its responses to the Requests and related responsive documents to OPC in electronic form via a SharePoint site to which OPC and its consultants have remote access.

6. Peoples objects to each Request to the extent it requires the company to provide information that it believes is "proprietary confidential business information" as described in Section 366.093, Florida Statutes. Peoples will provide such confidential information to OPC in a designated confidential portion of the SharePoint site described above and subject to a Motion for Temporary Protective Order, Notice of Intent to Request Confidential Classification, and/or Request for Confidential Classification, as appropriate.

7. Peoples objects to each Request to the extent it requests Peoples to prepare information in a particular format or create data or information that it otherwise does not possess as unduly burdensome and purports to expand Peoples' obligations under applicable law.

8. Subject to Section 366.093(1), Florida Statutes, Peoples objects to any definition or Request that requests documents from persons or entities who are not parties to this proceeding, that seek information from affiliates unrelated to transactions or cost allocations involving Peoples, or that are not otherwise subject to discovery under applicable rules.

9. Peoples objects to any Request requiring the company to provide additional information beyond that obtained through a reasonable and diligent search.

FPSC EXH NO. 96
ADMITTED

General Response

Subject to and without waiving its general objections, which are incorporated by reference in each of its specific responses, Peoples will produce documents responsive to the Requests to the non-Commission staff parties by posting electronic versions of documents on the Peoples Discovery SharePoint site established for this docket (the "SharePoint") and as specified in its specific responses. Peoples will serve documents responsive to the Requests to the Commission staff by hand delivering a USB containing electronic versions of responsive documents to the Commission Clerk's office, and for Staff's purposes, the term "USB" should be substituted for "SharePoint" in the specific responses shown below.

The company's specific responses will identify Requests that call for documents that contain (a) information for which the company asserts a legal privilege and/or (b) "proprietary confidential business information" as defined in Section 366.093, Florida Statutes.

Documents responsive to a Request that contains information for which the company asserts a legal privilege will be identified in the privilege log attached as Exhibit A.

Documents responsive to a Request that contains information the company asserts to be "proprietary confidential business information" will be produced in the Confidential portion of the SharePoint subject to a request for confidential classification, motion for temporary protective order and/or a non-disclosure agreement.

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FPSC EXH NO. 96
ADMITTED

Specific Responses

47. Please provide all exhibits, schedules, and workpapers utilized and/or filed by Mr. D'Ascendis in this case, to the extent these material were not included in the filing.

Response:

Peoples' non-confidential electronic documents responsive to this request were served by posting on the SharePoint or via USB in the referenced folder entitled "POD_1_7" at bates stamp 865 - 1874.

48. Please provide all source documents relied upon and/or cited by Mr. D'Ascendis in this case.

Response:

Peoples' non-confidential electronic documents responsive to this request were served by posting on the SharePoint or via USB in the referenced folder entitled "POD_1_7" at bates stamp 865 - 1874.

E18874

FPSC EXH NO. 97
ADMITTED

BEFORE THE FLORIDA PUBLIC SERVICE COMMISSION

In re: Petition for rate increase by Peoples Gas System, Inc	DOCKET NO.: 20250029-GU FILED: July 14, 2025

OFFICE OF PUBLIC COUNSEL'S OBJECTIONS AND RESPONSE TO PEOPLES GAS SYSTEM, INC.'S FIRST REQUEST FOR PRODUCTION OF DOCUMENTS (NOS. 1 - 7)

The Citizens of the State of Florida, by and through the Office of Public Counsel, ("Citizens" or "OPC"), by the requirements set forth in Commission Order PSC-2025-0123-PCO-GU, Rule 28-106.206, Florida Administrative Code, and Rule 1.350, Florida Rules of Civil Procedure, submit the following objections and response to the First Request for Production of Documents (Nos. 1-7) propounded by PGS on June 23, 2025.

GENERAL OBJECTIONS

A. By making these general objections at this time, Citizens do not waive or relinquish its right to assert additional general and/or specific objections to PGS's discovery.

B. With respect to the "Definitions" and "Instructions" in the requests, Citizens object to any definitions or instructions that are inconsistent with Citizens' discovery obligations under applicable rules and/or the order establishing procedure. If some question arises as to Citizens' discovery obligations, Citizens will comply with applicable rules and/or order and not with the definitions or instructions herein that are inconsistent with those rules.

C. Citizens object to each and every request to the extent it is vague, ambiguous, overly broad, imprecise, or utilizes terms that are subject to multiple interpretations but are not properly defined or explained for purposes of such discovery requests.

D. Citizens object to each and every request to the extent it is unduly burdensome and outweighs its likely benefit, considering the needs of the case, amount in controversy, parties' resources, the importance of the issues at stake in the action, and the importance of the discovery in resolving the issues.

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E. Citizens object to each and every request to the extent it would require Citizens and/or its consultants to perform a new study or analysis, or to do work that has not been done for Citizens.

F. Citizens object to each and every request to the extent it requires information prepared in anticipation of litigation or hearing, for data or information protected by the attorney-client privilege, the work product privilege, the accountant-client privilege, the trade secret privilege, or any other applicable privilege or protection afforded by law.

G. Citizens object to each and every request to the extent requires disclosure of the Public Counsel's deliberative process and internal reviews to determine what if any issues to litigate or protest in any case. The Public Counsel's decision-making and grant of discretion to take any position he deems in the public interest is not subject to review or an issue in this case. Thus, any such request is not relevant nor can it be reasonably calculated to lead to the discovery of admissible evidence.

H. Citizens reserve the right to supplement any of its responses if Citizens cannot locate the answers immediately; if supplementation is necessary due to their magnitude and the work required to aggregate them; or if Citizens later discover additional responsive information in the course of this proceeding.

I. By making these responses herein, Citizens do not concede that any request is relevant to this action or is reasonably calculated to lead to the discovery of admissible evidence. Citizens expressly reserve the right to object to further discovery into the subject matter of any of these requests, to the introduction of evidence of any response or portion thereof, and to supplement its responses should further investigation disclose responsive information.

J. In responding to these discovery request, Citizens have made a reasonable inquiry of those persons likely to possess information responsive thereto and has conducted a reasonable search of those records in Citizens' possession, custody, or control where the requested information would likely be maintained in the ordinary course of business. To the extent that the requests ask Citizens to go to greater lengths, Citizens object because such requests are overly broad, unduly burdensome, and unreasonable.

K. Citizens object to providing responsive documents to the extent that such documents are in the public record, including documents filed by Citizens in any matter before the Florida

Public Service Commission and available to PGS, or can be obtained from another source or in another manner that is more convenient, less burdensome, or less expensive.

L. In responding to these Requests, Citizens do not waive the foregoing objections, or the specific objections that are set forth in the responses to particular requests.

M. Any responses provided by Citizens are provided subject to, and without waiver of, the foregoing objection.

DOCUMENT REQUESTS

Request No. 1:

1. With respect to each witness who will file testimony on behalf of OPC, please produce the following in the following format, in EXCEL or EXCEL compatible format with all formulae intact and unlocked:

   a. Copies of all testimonies and exhibits submitted by the witness in utility regulatory proceedings in Florida and in all other regulatory jurisdictions from January 1, 2022 to date.

   b. Copies of all workpapers, calculations, spreadsheets, computer models, computer programs and other materials prepared by, for or on behalf of the witness, or otherwise relied upon by the witness, that support the witness's testimony in this proceeding and all of such documents that support the conclusions or recommendations contained in such testimony.

   c. Copies of any published articles, treaties, or other documents referenced in the testimony of any of OPC's witnesses who filed testimony as of the date of production specified above, except any documents produced by Peoples to OPC in response to a discovery request from OPC.

OPC RESPONSE:

OPC Witness Lane Kollen:

1. a. Refer to Mr. Kollen's Exhibit LK-1 for a list of his expert testimonies. Mr. Kollen's testimonies are available on the respective regulatory body's website by docket in the electronic document files.

b. See attached electronic files prepared by or on behalf of Mr. Kollen:

OPC RESP-PGS POD1-b 000001 - *O&MCapExCustomers,Employ,Graphs*

OPC RESP-PGS POD1-b 000002 - *OPCPropertyTaxRecommendationSupportFile2026*

OPC RESP-PGS POD1-b 000003 - *OPCPropertyTaxRecommendationSupportFile2027*

OPC RESP-PGS POD1-b 000004 - OPCRevenueRequirementRecommendationforPGS

c. Mr. Kollen has no responsive documents that were not provided by PGS to OPC and/or other parties in this proceeding in the Company's filing, in response to discovery, and/or through depositions of PGS witnesses, or that were not previously provided by Mr. Kollen to the parties in the form of exhibits or in footnotes with links to the documents or other information.

<u>OPC Witness David Garret:</u>

a. Refer to Mr. Garrett's Exhibit DJG-1 for a list of his expert testimonies. Mr. Kollen's testimonies are available on the respective regulatory body's website by docket in the electronic document files.

b. See attached electronic files prepared by Mr. Garrett:

OPC RESP-PGS POD1-b 000005- PGSGarrettWorkpapers-000005

c. See the following file:
OPC RESP-PGS POD1-c-0000006-Garrett'sArticles,Treaties,etc

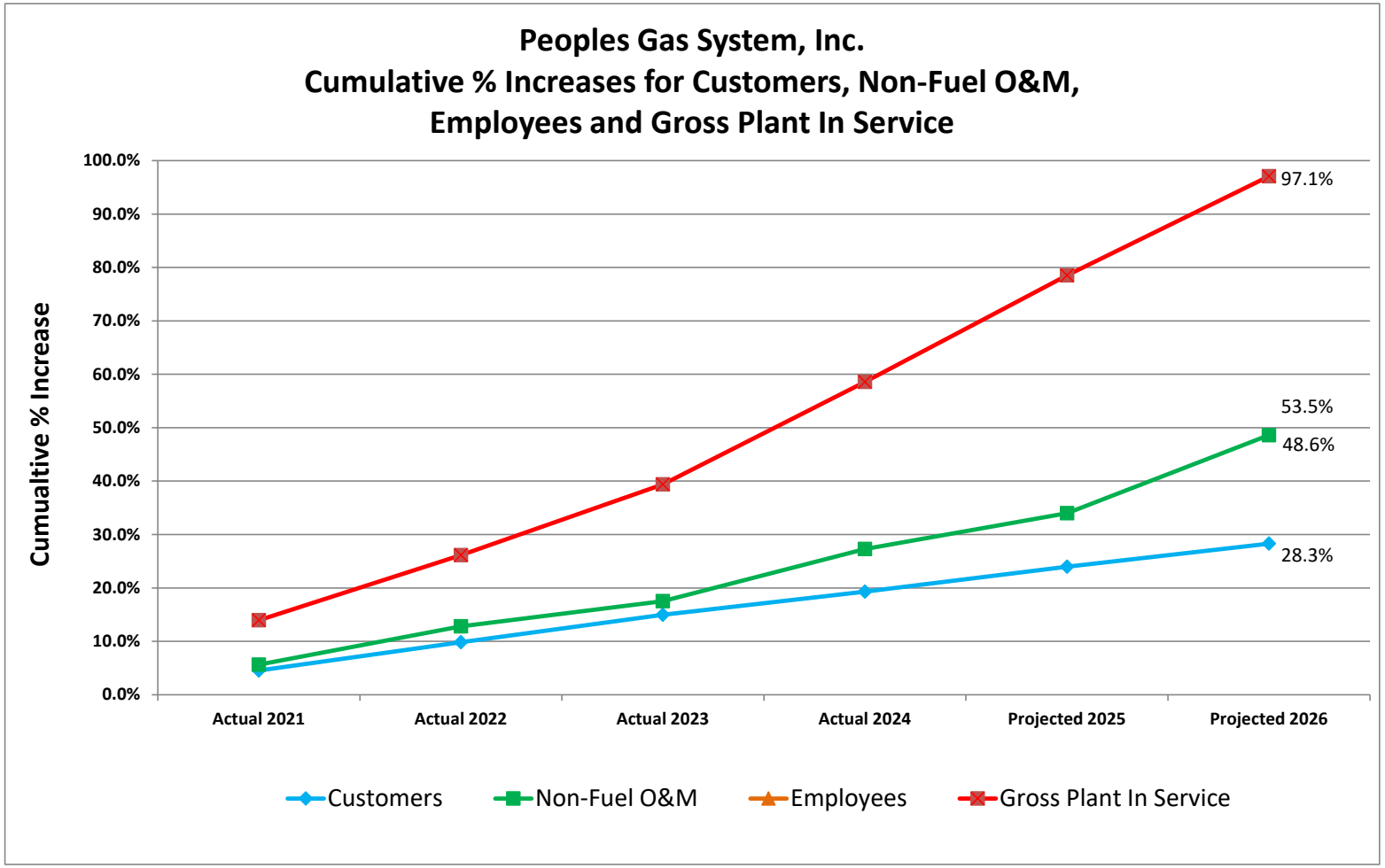
FPSC EXH NO. 97

ADMITTED

O&M Expense

Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits

	Customers	Non Fuel O&M	Employees	Gr PIS
Actual 2021	4.5%	5.6%	62400.0%	14.0%
Actual 2022	9.9%	12.8%	70800.0%	26.1%
Actual 2023	15.0%	17.5%	76400.0%	39.4%
Actual 2024	19.3%	27.3%	81200.0%	58.6%
Projected 2025	24.0%	34.0%	86800.0%	78.5%
Projected 2026	28.3%	48.6%	95600.0%	97.1%

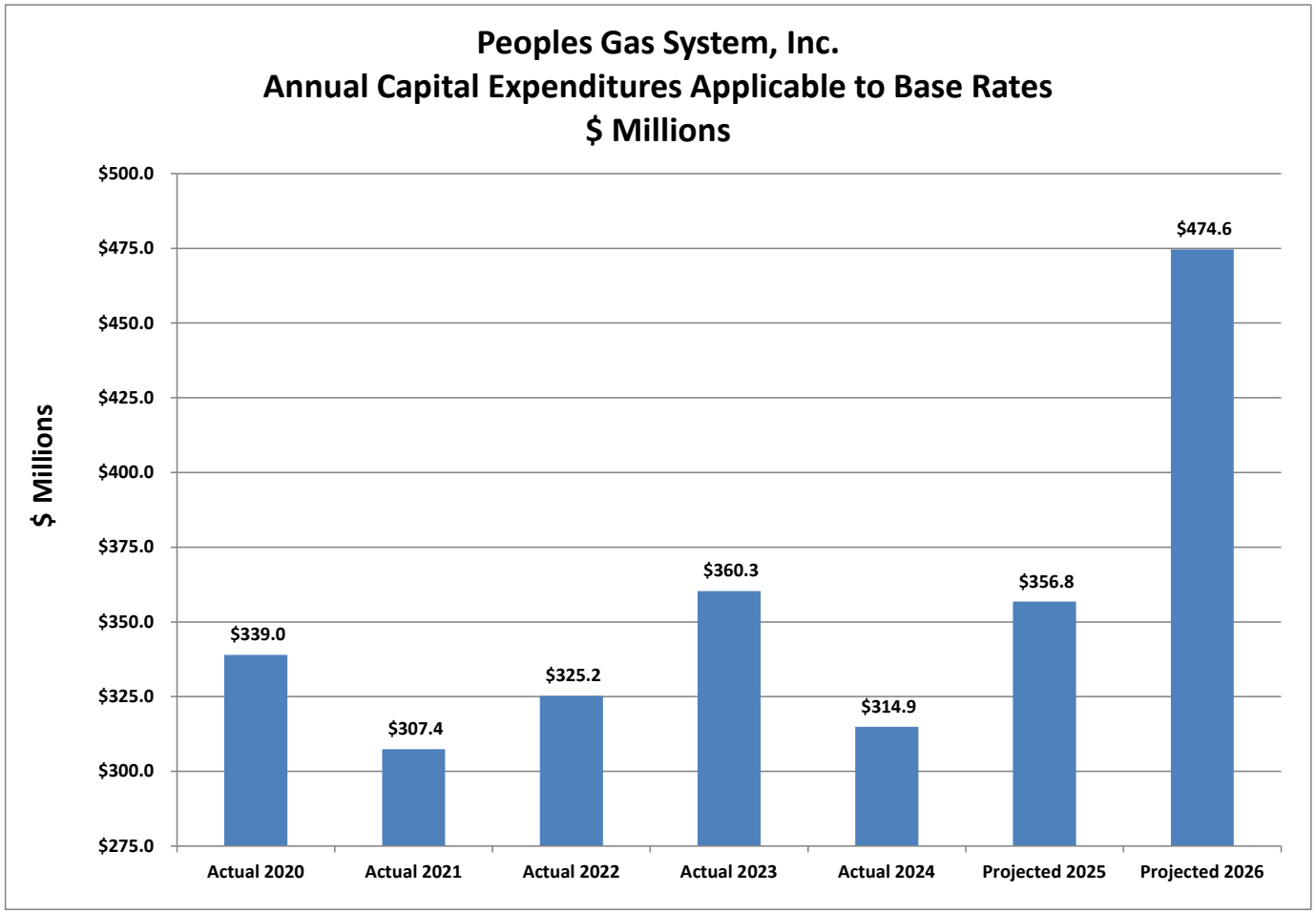


FPSC EXH NO. 97

ADMITTED

O&M Expense
Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits
Sources: ROG 1-81, Nichols Exhibit No. AN-1

Actual 2020	$	339.0
Actual 2021	$	307.4
Actual 2022	$	325.2
Actual 2023	$	360.3
Actual 2024	$	314.9
Projected 2025	$	356.8
Projected 2026	$	474.6



FPSC EXH NO. 97

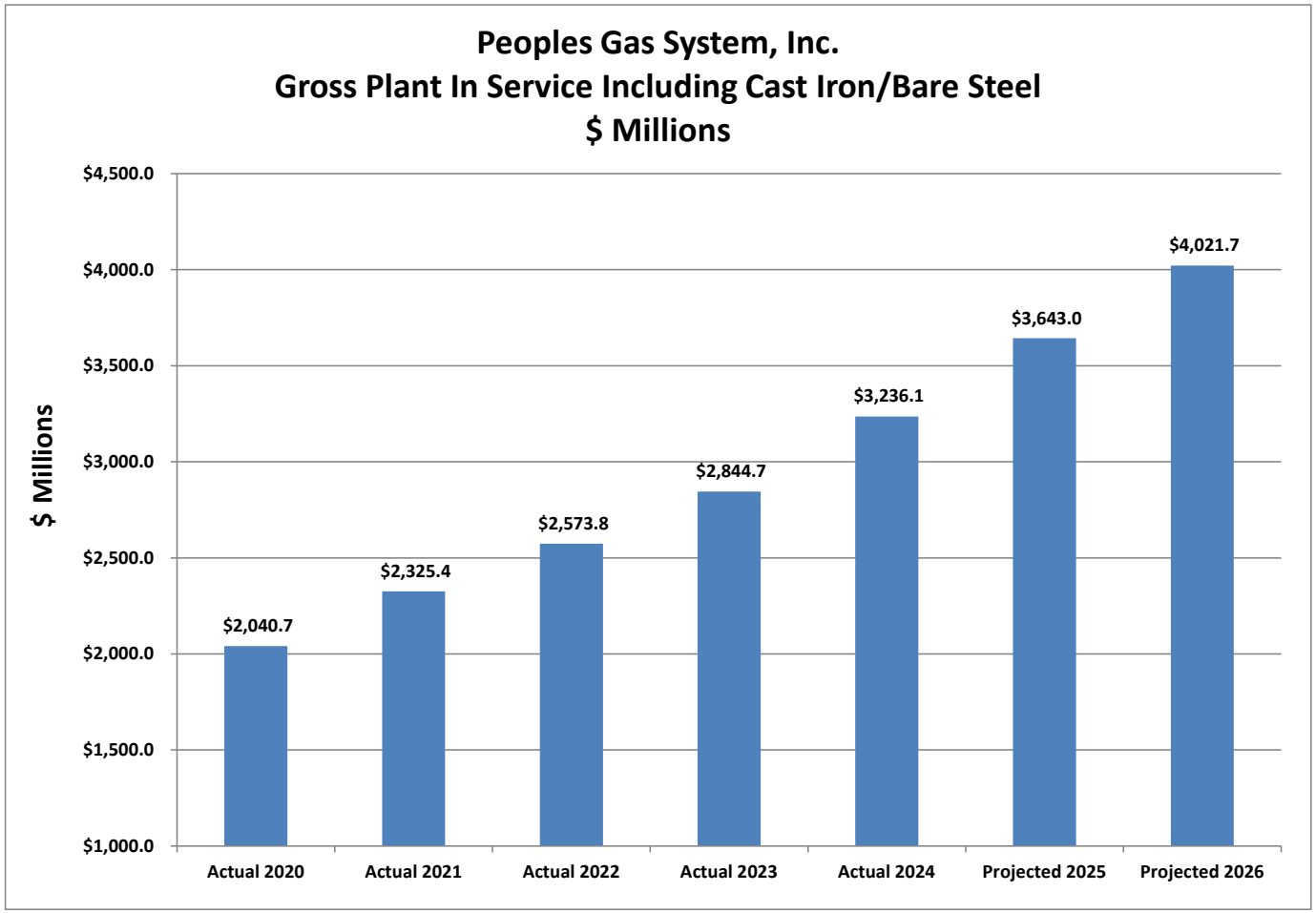
ADMITTED

O&M Expense

Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits

Sources: Annual Surveillance Reports and Schedule G-1

		Incr %	Cum Incr
Actual 2020	$ 2,040.7		
Actual 2021	$ 2,325.4	14.0%	14.0%
Actual 2022	$ 2,573.8	10.7%	26.1%
Actual 2023	$ 2,844.7	10.5%	39.4%
Actual 2024	$ 3,236.1	13.8%	58.6%
Projected 2025	$ 3,643.0	12.6%	78.5%
Projected 2026	$ 4,021.7	10.4%	97.1%

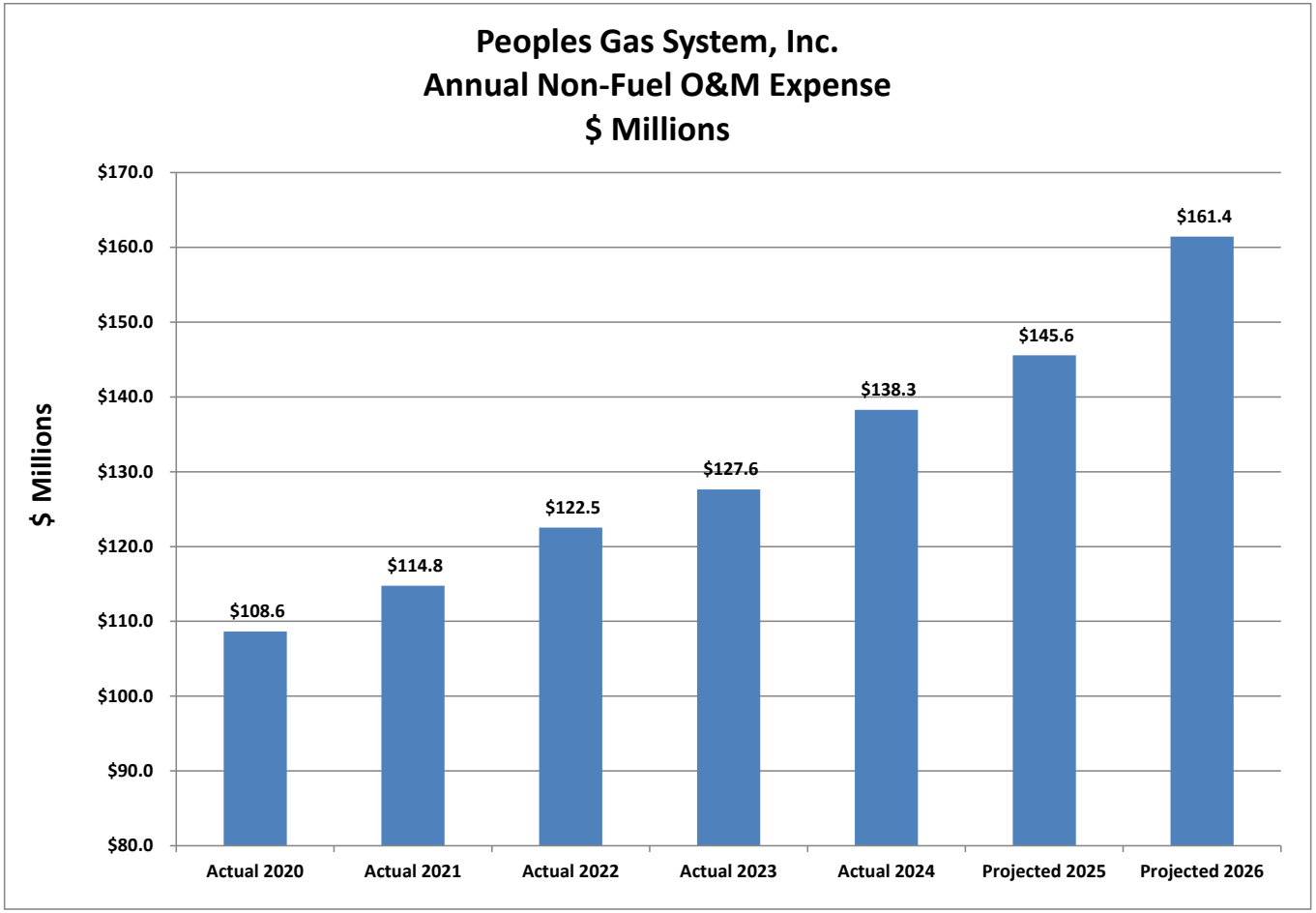


FPSC EXH NO. 97

ADMITTED

O&M Expense
Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits
Sources: ROG 1-58, ROG 1-63, and ROG 4-133

		Incr %	Cum Incr
Actual 2020	$ 108.6		
Actual 2021	$ 114.8	5.6%	5.6%
Actual 2022	$ 122.5	6.8%	12.8%
Actual 2023	$ 127.6	4.2%	17.5%
Actual 2024	$ 138.3	8.3%	27.3%
Projected 2025	$ 145.6	5.3%	34.0%
Projected 2026	$ 161.4	10.9%	48.6%

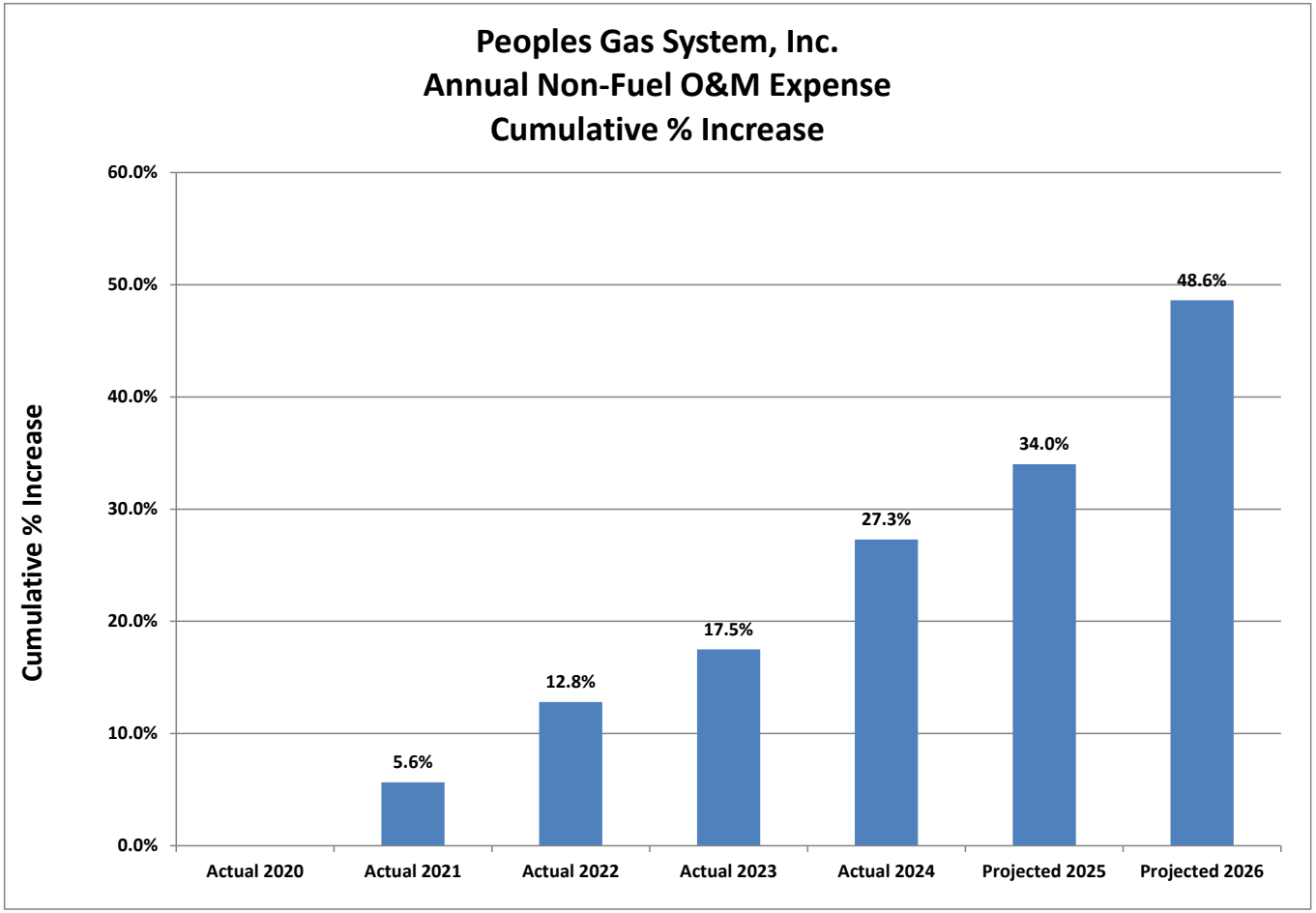


FPSC EXH NO. 97

ADMITTED

O&M Expense
Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits
Sources: ROG 1-58, ROG 1-63, and ROG 4-133

			Incr %	Cum Incr
Actual 2020		$ 108.6		
Actual 2021	5.6%	$ 114.8	5.6%	5.6%
Actual 2022	12.8%	$ 122.5	6.8%	12.8%
Actual 2023	17.5%	$ 127.6	4.2%	17.5%
Actual 2024	27.3%	$ 138.3	8.3%	27.3%
Projected 2025	34.0%	$ 145.6	5.3%	34.0%
Projected 2026	48.6%	$ 161.4	10.9%	48.6%



FPSC EXH NO. 97

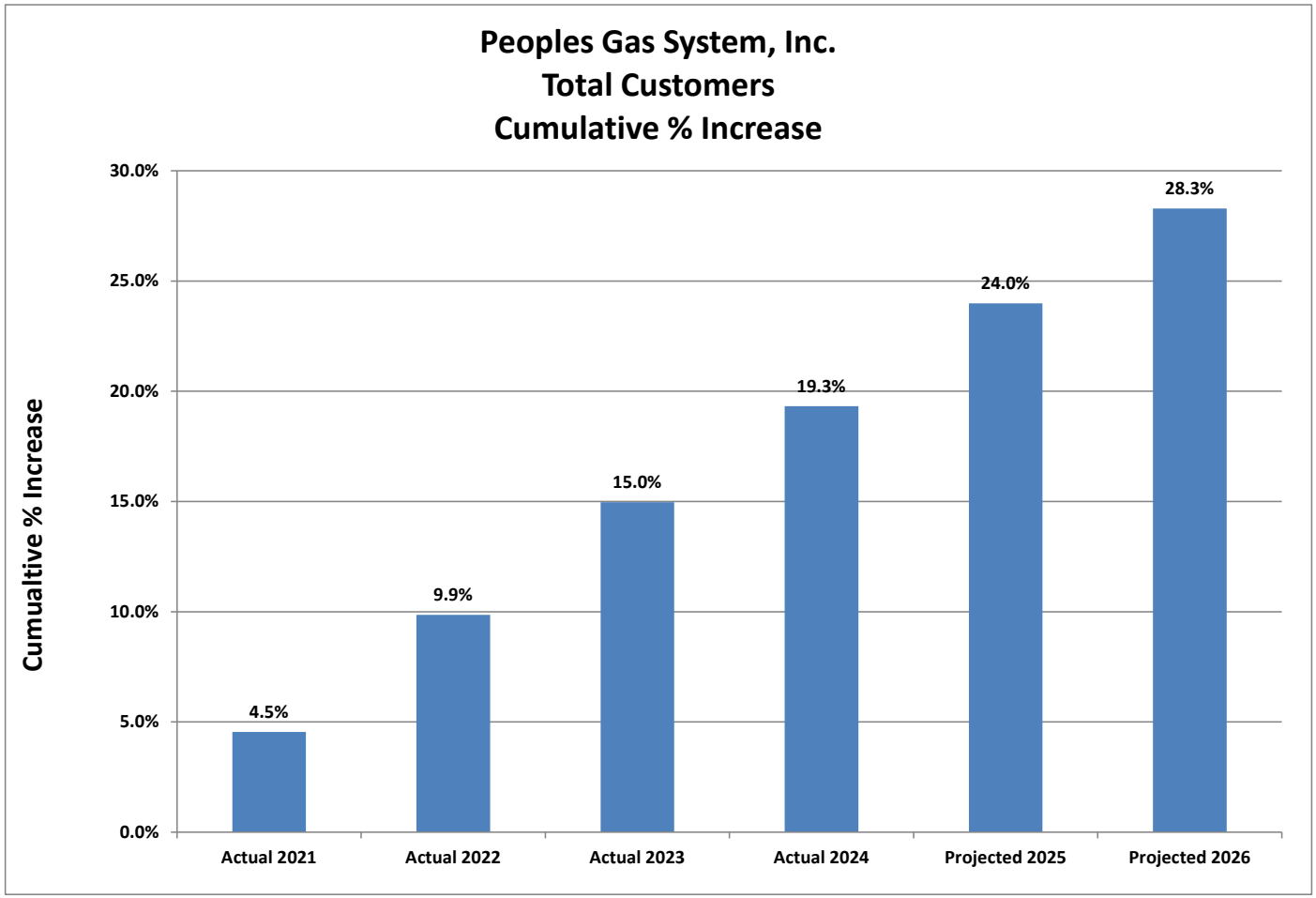
ADMITTED

O&M Expense

Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits

Sources: ROG 1-6 and ROG 1-4

	Cum Growth %	Total Cust	Incr	Incr %	Cum Incr %
Actual 2021		425,990			
Actual 2021	4.5%	445,336	19,346	4.5%	4.5%
Actual 2022	9.9%	467,975	22,639	5.1%	9.9%
Actual 2023	15.0%	489,751	21,776	4.7%	15.0%
Actual 2024	19.3%	508,289	18,538	3.8%	19.3%
Projected 2025	24.0%	528,159	19,870	3.9%	24.0%
Projected 2026	28.3%	546,510	18,351	3.5%	28.3%



FPSC EXH NO. 97

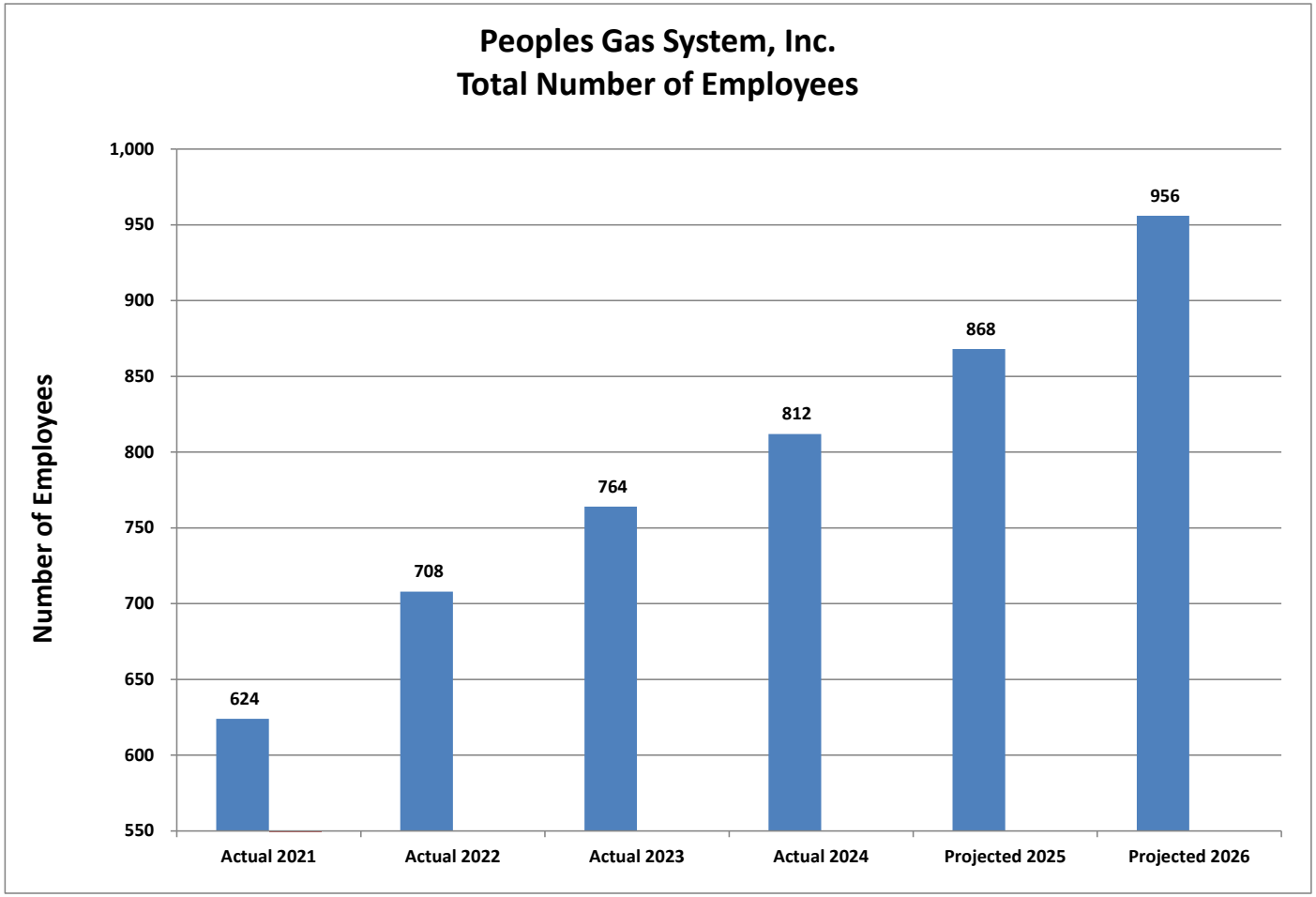
ADMITTED

O&M Expense

Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits

Sources: ROG 1-6 and ROG 1-7 from 2023 Case for Actual 2020

	Total Empl	Total Empl	Incr	Incr %	Cum Incr %
Actual 2020	623	623			
Actual 2021	624	624	1	0.2%	0.2%
Actual 2022	708	708	84	13.5%	13.6%
Actual 2023	764	764	56	7.9%	22.6%
Actual 2024	812	812	48	6.3%	30.3%
Projected 2025	868	868	56	6.9%	39.3%
Projected 2026	956	956	88	10.1%	53.5%



FPSC EXH NO. 97

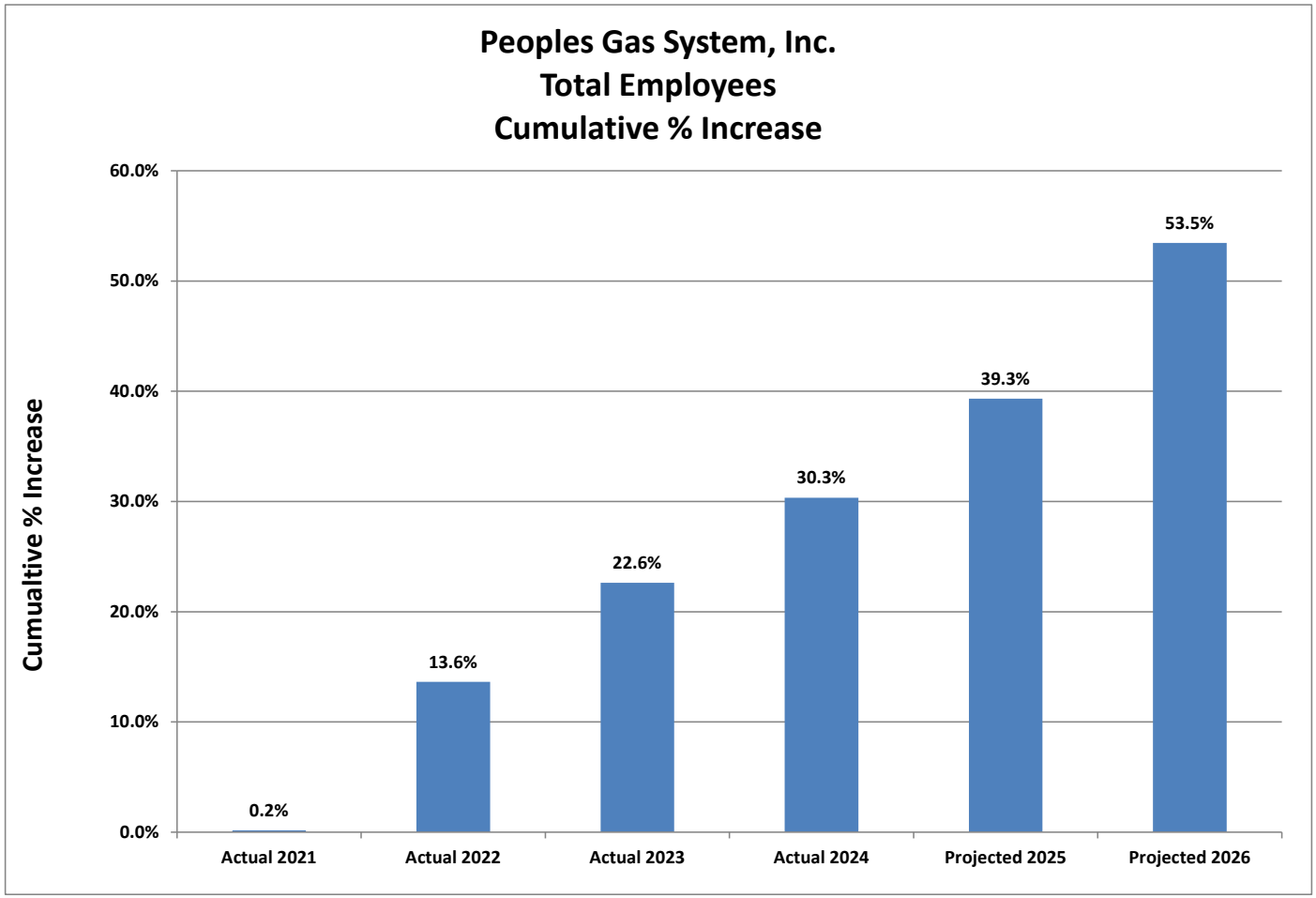
ADMITTED

O&M Expense

Excludes Cost of Gas, Conservation Clause Expense, and Regulatory Debits

Sources: ROG 1-6 and ROG 1-7 from 2023 Case for Actual 2020

	Cum Growth %	Total Empl	Incr	Incr %	Cum Incr %
Actual 2020		623			
Actual 2021	0.2%	624	1	0.2%	0.2%
Actual 2022	13.6%	708	84	13.5%	13.6%
Actual 2023	22.6%	764	56	7.9%	22.6%
Actual 2024	30.3%	812	48	6.3%	30.3%
Projected 2025	39.3%	868	56	6.9%	39.3%
Projected 2026	53.5%	956	88	10.1%	53.5%



Peoples Gas System 2026 Property Tax Budget Appraisal
Income Approach to Value - As Filed by PGS
Determine 2026 Net Operating Income to Capitalize

Year	NOI As Booked	Weight	Weighted NOI	
2023 Actual	$118,841,878	1	$19,806,980	
2024 Forecast	$169,027,750	2	$56,342,583	
2025 Forecast	$172,037,106	3	$86,018,553	
			Weighted Average	**Use**
			$162,168,116	**$162,200,000**

6

Peoples Gas System 2026 Property Tax Budget Appraisal
Income Approach to Value - As Adjusted by OPC
Determine 2026 Net Operating Income to Capitalize

Year	NOI As Booked	Weight	Weighted NOI	
2023 Actual	$118,841,878	1	$19,806,980	
2024 Actual	$168,827,176	2	$56,275,725	
2025 Forecast	$157,385,906	3	$78,692,953	
			Weighted Average	**Use**
			$154,775,658	**$154,800,000**

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2027 Property Tax Budget Appraisal
Income Approach to Value - As Filed by PGS
Determine 2027 Net Operating Income to Capitalize

Year	NOI As Booked	Weight	Weighted NOI	
2024 Actual	$168,827,176	1	$28,137,863	
2025 Forecast	$157,385,906	2	$52,461,969	
2026 Forecast	$223,651,232	3	$111,825,616	
			Weighted Average	**Use**
			$192,425,448	**$200,000,000**

6

Peoples Gas System 2027 Property Tax Budget Appraisal
Income Approach to Value - As Adjusted by OPC
Determine 2027 Net Operating Income to Capitalize

Year	NOI As Booked	Weight	Weighted NOI	
2024 Actual	$168,827,176	1	$28,137,863	
2025 Forecast	$157,385,906	2	$52,461,969	
2026 Forecast	$184,873,821	3	$92,436,911	
			Weighted Average	**Use**
			$173,036,742	**$173,100,000**

See Rev Requirement File For 2026 Forecast Amount After OPC Ajustments

FPSC EXH NO. 97

ADMITTED

E18889

ACCOUNT ID	ACCOUNT DESCRIPTION	ACTUALS 2020 JAN	ACTUALS 2020 FEB	ACTUALS 2020 MAR	ACTUALS 2020 APR	ACTUALS 2020 MAY	ACTUALS 2020 JUN	ACTUALS 2020 JUL	ACTUALS 2020 AUG	ACTUALS 2020 SEP	ACTUALS 2020 OCT	ACTUALS 2020 NOV	ACTUALS 2020 DEC	DEC Sum
RS1_NB	Residential - 1	99,107	99,054	99,162	99,066	98,969	98,991	98,811	98,787	98,734	98,615	98,466	98,565	
RS2_NB	Residential - 2	171,118	171,105	171,392	171,309	171,545	171,859	175,384	175,505	175,769	175,842	175,957	176,328	
RS3_NB	Residential - 3	96,211	97,134	98,443	99,603	101,015	102,427	103,737	105,010	106,242	107,466	108,949	110,012	
RSG_NB	Residential Stand by Generator	903	899	900	901	913	924	926	933	949	961	980	979	
RG1_NB	Residential-General Service 1	1,403	1,400	1,400	1,399	1,401	1,399	1,399	1,400	1,398	1,404	1,397	1,398	
RG2_NB	Residential-General Service 2	36	38	35	35	36	37	40	39	39	41	41	40	
RG3_NB	Residential-General Service 3	30	28	29	28	27	27	28	28	28	28	28	28	
RT1_NB	Residential TRANSP General Service 1	408	408	408	408	408	408	407	408	408	408	408	408	
RT2_NB	Residential TRANSP General Service 2	258	257	260	260	257	258	257	260	259	256	255	258	
RT3_NB	Residential TRANSP General Service 3	46	46	46	46	46	46	46	47	47	47	47	47	
RHP_NB	Residential Gas Heat Pump	-	-	-	-	1	1	1	1	1	-	-	-	
RTP_NB	Residential TRANSP Gas Heat Pump	-	-	-	-	-	-	-	-	-	1	1	1	
CSG_NB	Commercial Standby Generator	952	957	952	956	960	967	969	975	977	976	978	977	
SGS_NB	Small General Service	7,078	7,042	7,037	7,017	7,031	7,016	7,014	7,034	7,054	7,042	7,013	7,016	
GS1_NB	Gen. Service - 1	3,391	3,422	3,454	3,496	3,537	3,589	3,649	3,679	3,730	3,778	3,794	3,787	
GS2_NB	Gen. Service - 2	646	642	643	664	672	712	749	776	799	798	806	820	
GS3_NB	Gen. Service - 3	53	54	55	52	51	49	51	50	51	57	57	59	
GS4_NB	Gen. Service - 4	8	6	6	7	8	5	6	6	6	8	8	7	
GS5_NB	Gen. Service - 5	2	2	4	4	4	4	3	3	3	3	3	4	
NVT_NB	Natural Gas Vehicle Sales-TRANSP	4	4	4	4	4	4	4	4	4	4	5	5	
CTG_NB	Commercial TRANSP Standby Generator	158	157	161	162	162	162	164	164	166	167	165	165	
SGT_NB	Small General Service TRANSP	4,386	4,362	4,347	4,335	4,316	4,299	4,280	4,264	4,233	4,217	4,204	4,194	
GT1_NB	Gen. Service - 1 TRANSP	12,894	12,915	12,956	12,952	12,931	12,931	12,902	12,918	12,899	12,861	12,895	12,957	
GT2_NB	Gen. Service - 2 TRANSP	6,897	6,919	6,923	6,911	6,882	6,871	6,841	6,814	6,816	6,794	6,803	6,803	
GT3_NB	Gen. Service - 3 TRANSP	736	740	739	739	744	742	743	744	744	738	739	737	
GT4_NB	Gen. Service - 4 TRANSP	169	169	168	169	168	171	171	172	173	171	175	171	
GT5_NB	Gen. Service -5 TRANSP	149	150	150	150	150	150	152	151	153	149	155	150	
CHP_NB	Commercial Gas Heat Pump	1	1	1	1	1	1	1	1	1	1	2	2	
SIT_NB	Small Interruptible Service	24	23	24	23	26	24	24	24	24	24	24	24	
ITS_NB	Interruptible Large Volume 1	13	13	13	13	13	13	13	13	13	13	13	13	
CTS_NB	Contract Transportation Service (flex)	19	19	20	20	20	20	20	19	20	21	20	20	
WHL_NB	Wholesale	5	5	5	5	5	5	5	5	5	5	5	5	
WHT_NB	Wholesale TRANSP	6	6	6	6	6	6	6	6	6	6	6	6	
MBS_NB	Mutually Beneficial	1	-	1	1	1	1	1	1	-	-	-	-	
CTP_NB	Commercial TRANSP Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-	
IL1_NB	Interruptible Large Volume 1	-	-	-	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	9	6	6	5	3	10	9	5	4	3	1	4	425,990

ACCOUNT ID	ACCOUNT DESCRIPTION	ACTUALS 2021 JAN	ACTUALS 2021 FEB	ACTUALS 2021 MAR	ACTUALS 2021 APR	ACTUALS 2021 MAY	ACTUALS 2021 JUN	ACTUALS 2021 JUL	ACTUALS 2021 AUG	ACTUALS 2021 SEP	ACTUALS 2021 OCT	ACTUALS 2021 NOV	ACTUALS 2021 DEC
RS1_NB	Residential - 1	98,687	98,898	98,958	98,928	98,848	98,862	104,439	104,338	104,272	104,159	104,144	104,228
RS2_NB	Residential - 2	176,698	177,116	177,358	177,386	177,431	177,638	178,077	178,258	178,325	178,525	178,661	178,941
RS3_NB	Residential - 3	111,191	112,594	114,171	115,332	116,627	118,212	112,303	113,626	114,729	116,583	117,976	119,531
RSG_NB	Residential Stand by Generator	985	994	998	1,002	1,014	1,015	1,023	1,021	1,037	1,027	1,023	1,029
RG1_NB	Residential-General Service 1	1,404	1,403	1,398	1,394	1,394	1,392	2,106	2,106	2,111	2,109	2,103	2,104
RG2_NB	Residential-General Service 2	41	39	38	38	38	37	38	38	39	38	41	41
RG3_NB	Residential-General Service 3	28	1	1	1	1	1	1	81	86	43	18	14
RT1_NB	Residential TRANSP General Service 1	407	406	408	408	408	409	406	405	405	406	405	406
RT2_NB	Residential TRANSP General Service 2	256	258	259	259	259	259	258	258	257	258	255	255

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RT3_NB	Residential TRANSP General Service 3	47	47	47	47	47	47	50	50	50	50	50	50	
RHP_NB	Residential Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-	
RTP_NB	Residential TRANSP Gas Heat Pump	1	1	1	1	1	1	5	2	2	2	2	2	
NGV_NB	Natural Gas Vehicle Sales	1	-	-	-	-	-	-	-	-	-	-	-	
CSG_NB	Commercial Standby Generator	976	972	973	974	972	971	974	971	971	967	967	966	
SGS_NB	Small General Service	7,018	7,016	7,009	7,004	6,980	6,974	7,397	7,386	7,385	7,344	7,416	7,432	
GS1_NB	Gen. Service - 1	3,874	3,890	3,869	3,851	3,903	3,902	3,666	3,688	3,684	3,684	3,719	3,745	
GS2_NB	Gen. Service - 2	851	840	830	841	823	838	761	752	746	743	757	764	
GS3_NB	Gen. Service - 3	58	63	63	61	57	56	45	46	49	49	51	53	
GS4_NB	Gen. Service - 4	6	3	3	4	4	5	2	2	2	2	2	3	
GS5_NB	Gen. Service - 5	7	7	6	6	4	4	4	5	5	6	3	3	
NVT_NB	Natural Gas Vehicle Sales-TRANSP	3	-	-	-	-	-	-	-	-	-	-	-	
CTG_NB	Commercial TRANSP Standby Generator	167	168	165	166	166	167	166	166	166	168	167	167	
SGT_NB	Small General Service TRANSP	4,187	4,179	4,175	4,162	4,158	4,137	5,070	5,054	5,042	5,031	4,950	4,931	
GT1_NB	Gen. Service - 1 TRANSP	12,955	12,991	13,073	13,155	13,145	13,255	13,166	13,230	13,285	13,369	13,426	13,480	
GT2_NB	Gen. Service - 2 TRANSP	6,809	6,808	6,854	6,856	6,886	6,871	6,055	6,078	6,105	6,133	6,132	6,156	
GT3_NB	Gen. Service - 3 TRANSP	736	734	738	744	745	745	656	645	643	648	644	642	
GT4_NB	Gen. Service - 4 TRANSP	176	175	176	178	177	177	150	148	151	150	149	149	
GT5_NB	Gen. Service -5 TRANSP	151	152	145	158	153	153	175	173	170	174	170	174	
CHP_NB	Commercial Gas Heat Pump	1	1	1	1	1	1	1	1	1	1	1	1	
SIT_NB	Small Interruptible Service	24	24	24	24	24	24	24	24	25	25	25	25	
ITS_NB	Interruptible Large Volume 1	13	13	13	13	13	13	13	13	13	13	13	13	
CTS_NB	Contract Transportation Service (flex)	22	18	18	20	18	16	20	18	18	18	18	18	
WHL_NB	Wholesale	5	5	5	5	5	5	5	5	5	5	5	5	
WHT_NB	Wholesale TRANSP	6	6	6	6	6	6	6	6	6	6	6	6	
MBS_NB	Mutually Beneficial	-	4	1	-	-	-	-	-	1	-	-	-	
CTP_NB	Commercial TRANSP Gas Heat Pump	1	1	1	1	1	1	1	1	1	1	1	1	
IL1_NB	Interruptible Large Volume 1	-	-	-	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	2	3	2	3	5	2	1	3	2	5	1	1	445,336

	ACCOUNT DESCRIPTION	ACTUALS 2022 JAN	ACTUALS 2022 FEB	ACTUALS 2022 MAR	ACTUALS 2022 APR	ACTUALS 2022 MAY	ACTUALS 2022 JUN	ACTUALS 2022 JUL	ACTUALS 2022 AUG	ACTUALS 2022 SEP	ACTUALS 2022 OCT	ACTUALS 2022 NOV	ACTUALS 2022 DEC
RS1_NB	Residential - 1	104,316	104,373	104,571	104,420	104,235	103,953	114,928	114,794	114,591	114,530	114,479	114,631
RS2_NB	Residential - 2	179,255	179,555	179,726	179,853	179,965	179,934	185,347	185,520	185,505	185,589	185,660	186,018
RS3_NB	Residential - 3	121,212	122,720	124,435	125,825	127,610	129,208	114,024	116,103	117,795	119,631	121,505	123,578
RSG_NB	Residential Stand by Generator	1,037	1,043	1,047	1,049	1,049	1,050	1,050	1,059	1,063	1,064	1,074	1,082
RG1_NB	Residential-General Service 1	2,101	2,104	2,104	2,102	2,100	2,098	2,478	2,472	2,468	2,468	2,470	2,473
RG2_NB	Residential-General Service 2	41	42	42	41	41	41	52	52	52	52	53	51
RG3_NB	Residential-General Service 3	15	7	6	6	3	3	2	3	2	3	2	2
RT1_NB	Residential TRANSP General Service 1	406	404	405	406	406	407	406	407	407	403	403	402
RT2_NB	Residential TRANSP General Service 2	252	251	251	250	249	250	252	253	253	251	254	250
RT3_NB	Residential TRANSP General Service 3	50	50	50	50	50	50	51	50	51	51	51	51
RHP_NB	Residential Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-
RTP_NB	Residential TRANSP Gas Heat Pump	2	2	2	2	2	2	2	2	2	2	2	2
CSG_NB	Commercial Standby Generator	962	963	968	969	967	968	963	968	967	960	966	964
SGS_NB	Small General Service	7,459	7,418	7,407	7,409	7,382	7,410	7,478	7,474	7,479	7,476	7,487	7,475
GS1_NB	Gen. Service - 1	3,760	3,814	3,825	3,901	3,904	3,908	3,767	3,772	3,796	3,830	3,876	3,851
GS2_NB	Gen. Service - 2	782	783	810	802	806	836	843	830	844	848	862	850
GS3_NB	Gen. Service - 3	52	54	54	54	49	51	46	44	43	40	43	42
GS4_NB	Gen. Service - 4	3	4	3	3	3	3	3	3	4	5	5	5
GS5_NB	Gen. Service - 5	4	6	5	3	6	13	4	6	4	4	4	4

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NVT_NB	Natural Gas Vehicle Sales-TRANSP	-	-	-	-	-	-	-	-	-	-	-	-	
CTG_NB	Commercial TRANSP Standby Generator	167	167	168	167	169	169	170	168	167	170	170	171	
SGT_NB	Small General Service TRANSP	4,896	4,923	4,922	4,887	4,903	4,844	4,933	4,904	4,878	4,868	4,866	4,874	
GT1_NB	Gen. Service - 1 TRANSP	13,535	13,512	13,561	13,574	13,639	13,687	13,331	13,381	13,378	13,377	13,415	13,478	
GT2_NB	Gen. Service - 2 TRANSP	6,172	6,176	6,171	6,186	6,217	6,219	6,535	6,562	6,566	6,557	6,572	6,603	
GT3_NB	Gen. Service - 3 TRANSP	642	643	643	643	649	647	708	710	709	716	713	716	
GT4_NB	Gen. Service - 4 TRANSP	149	149	150	147	151	149	136	136	136	135	135	133	
GT5_NB	Gen. Service -5 TRANSP	175	176	175	177	177	180	190	193	193	189	197	199	
CHP_NB	Commercial Gas Heat Pump	1	1	1	1	1	1	1	1	1	1	1	1	
SIT_NB	Small Interruptible Service	26	26	26	26	28	27	29	27	27	26	26	26	
ITS_NB	Interruptible Large Volume 1	17	14	13	15	14	13	15	14	14	14	14	14	
CTS_NB	Contract Transportation Service (flex)	17	15	13	16	14	14	14	14	14	14	15	13	
WHL_NB	Wholesale	5	5	5	5	5	5	5	5	5	5	5	5	
WHT_NB	Wholesale TRANSP	6	6	6	6	6	6	6	6	6	6	6	6	
MBS_NB	Mutually Beneficial	-	-	-	-	-	1	2	2	2	-	-	-	
CTP_NB	Commercial TRANSP Gas Heat Pump	1	1	1	1	1	1	1	1	1	1	1	1	
IL1_NB	Interruptible Large Volume 1	-	-	-	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	5	8	5	2	4	6	7	4	4	2	2	4	467,975

	ACCOUNT DESCRIPTION	ACTUALS 2023 JAN	ACTUALS 2023 FEB	ACTUALS 2023 MAR	ACTUALS 2023 APR	ACTUALS 2023 MAY	ACTUALS 2023 JUN	ACTUALS 2023 JUL	ACTUALS 2023 AUG	ACTUALS 2023 SEP	ACTUALS 2023 OCT	ACTUALS 2023 NOV	ACTUALS 2023 DEC
RS1_NB	Residential - 1	114,878	114,916	114,823	114,596	114,582	114,378	131,906	131,798	131,656	131,619	131,532	131,654
RS2_NB	Residential - 2	186,467	186,930	187,659	188,210	189,062	190,003	195,758	196,795	197,564	198,666	199,700	201,274
RS3_NB	Residential - 3	125,009	126,479	127,822	128,769	129,901	131,049	109,086	109,642	110,280	110,920	111,460	112,344
RSG_NB	Residential Stand by Generator	1,080	1,108	1,100	1,104	1,119	1,124	1,144	1,158	1,167	1,191	1,202	1,221
RG1_NB	Residential-General Service 1	2,477	2,473	2,475	2,475	2,472	2,476	2,200	2,204	2,201	2,202	2,205	2,215
RG2_NB	Residential-General Service 2	50	51	51	52	52	53	40	41	41	41	39	44
RG3_NB	Residential-General Service 3	1	1	2	45	96	15	56	-	-	-	-	-
RT1_NB	Residential TRANSP General Service 1	400	400	399	397	397	397	412	411	407	406	406	406
RT2_NB	Residential TRANSP General Service 2	251	251	251	251	251	249	240	240	240	237	242	240
RT3_NB	Residential TRANSP General Service 3	51	51	51	51	51	51	45	45	45	45	45	45
RHP_NB	Residential Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-
RTP_NB	Residential TRANSP Gas Heat Pump	2	2	2	2	2	2	2	2	2	2	2	2
CSG_NB	Commercial Standby Generator	966	961	961	962	963	963	968	964	965	959	962	961
SGS_NB	Small General Service	7,501	7,482	7,494	7,477	7,477	7,473	7,707	7,699	7,686	7,694	7,696	7,708
GS1_NB	Gen. Service - 1	3,899	3,954	3,940	3,945	3,958	3,999	3,802	3,844	3,892	3,837	3,872	3,928
GS2_NB	Gen. Service - 2	855	890	878	871	868	884	833	845	863	859	844	839
GS3_NB	Gen. Service - 3	45	45	44	43	42	44	43	45	47	45	42	43
GS4_NB	Gen. Service - 4	6	4	2	4	3	3	2	1	1	2	2	3
GS5_NB	Gen. Service - 5	3	3	3	3	3	3	3	3	2	2	1	1
NVT_NB	Natural Gas Vehicle Sales-TRANSP	-	-	-	-	-	-	-	-	-	-	-	-
CTG_NB	Commercial TRANSP Standby Generator	173	173	174	175	176	177	175	175	175	177	178	180
SGT_NB	Small General Service TRANSP	4,865	4,842	4,848	4,833	4,829	4,818	5,479	5,459	5,448	5,444	5,428	5,405
GT1_NB	Gen. Service - 1 TRANSP	13,488	13,495	13,565	13,613	13,656	13,686	13,322	13,334	13,332	13,455	13,518	13,535
GT2_NB	Gen. Service - 2 TRANSP	6,618	6,621	6,639	6,670	6,679	6,695	6,491	6,489	6,478	6,534	6,567	6,581
GT3_NB	Gen. Service - 3 TRANSP	717	713	719	721	728	723	708	725	717	727	721	727
GT4_NB	Gen. Service - 4 TRANSP	134	133	135	136	136	133	137	161	165	164	164	163
GT5_NB	Gen. Service -5 TRANSP	196	185	201	192	198	192	192	172	157	160	162	163
CHP_NB	Commercial Gas Heat Pump	1	1	1	-	-	-	-	-	-	-	-	-
SIT_NB	Small Interruptible Service	27	26	28	26	28	28	26	27	27	27	27	27
ITS_NB	Interruptible Large Volume 1	14	13	15	14	14	14	14	14	14	14	14	14

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CTS_NB	Contract Transportation Service (flex)	14	14	14	11	13	15	15	14	13	14	14	14	
WHL_NB	Wholesale	5	5	5	5	5	5	5	5	5	5	5	5	
WHT_NB	Wholesale TRANSP	6	6	6	6	6	6	6	6	6	6	6	5	
MBS_NB	Mutually Beneficial	-	-	-	-	-	-	1	-	-	-	-	-	
CTP_NB	Commercial TRANSP Gas Heat Pump	1	1	1	2	2	2	2	2	2	3	3	3	
IL1_NB	Interruptible Large Volume 1	-	-	-	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	1	2	3	2	3	2	3	2	2	1	1	1	489,751

	ACCOUNT DESCRIPTION	ACTUALS 2024 JAN	ACTUALS 2024 FEB	ACTUALS 2024 MAR	ACTUALS 2024 APR	ACTUALS 2024 MAY	ACTUALS 2024 JUN	ACTUALS 2024 JUL	ACTUALS 2024 AUG	ACTUALS 2024 SEP	ACTUALS 2024 OCT	ACTUALS 2024 NOV	ACTUALS 2024 DEC	
RS1_NB	Residential - 1	131,854	131,713	131,661	131,626	131,382	131,113	140,307	139,988	139,847	139,818	139,601	139,621	
RS2_NB	Residential - 2	202,683	203,435	204,849	206,201	207,079	207,856	212,041	212,647	214,078	215,319	216,246	217,353	
RS3_NB	Residential - 3	113,157	113,524	114,039	114,663	115,042	115,414	103,592	103,862	104,477	105,033	105,510	106,011	
RSG_NB	Residential Stand by Generator	1,224	1,221	1,222	1,233	1,243	1,253	1,256	1,278	1,288	1,302	1,313	1,322	
RG1_NB	Residential-General Service 1	2,208	2,208	2,206	2,213	2,214	2,207	2,216	2,212	2,217	2,219	2,211	2,219	
RG2_NB	Residential-General Service 2	45	45	95	130	132	130	129	122	113	98	87	83	
RG3_NB	Residential-General Service 3	-	1	2	-	-	-	2	2	2	2	2	2	
RT1_NB	Residential TRANSP General Service 1	405	405	405	404	403	403	382	381	379	378	376	374	
RT2_NB	Residential TRANSP General Service 2	240	240	240	240	240	241	256	256	256	256	255	255	
RT3_NB	Residential TRANSP General Service 3	45	45	45	45	45	45	46	46	46	46	46	46	
RHP_NB	Residential Gas Heat Pump	-	-	-	-	-	1	-	-	-	-	1	1	
RTP_NB	Residential TRANSP Gas Heat Pump	2	2	2	2	2	2	2	2	2	2	2	3	
CSG_NB	Commercial Standby Generator	967	962	967	965	967	970	973	977	980	980	985	989	
SGS_NB	Small General Service	7,765	7,754	7,722	7,726	7,704	7,686	7,783	7,783	7,779	7,807	7,804	7,797	
GS1_NB	Gen. Service - 1	3,949	4,042	4,011	4,053	4,081	4,077	3,978	3,984	4,040	4,062	4,156	4,132	
GS2_NB	Gen. Service - 2	825	867	860	842	835	836	872	873	865	864	881	899	
GS3_NB	Gen. Service - 3	43	49	46	47	46	47	54	49	50	51	49	48	
GS4_NB	Gen. Service - 4	2	2	2	2	2	4	3	5	4	4	5	3	
GS5_NB	Gen. Service - 5	1	2	2	4	3	2	1	1	1	1	2	1	
NVT_NB	Natural Gas Vehicle Sales-TRANSP	-	-	-	-	-	-	-	-	-	-	-	-	
CTG_NB	Commercial TRANSP Standby Generator	180	179	176	185	184	184	186	189	190	190	190	190	
SGT_NB	Small General Service TRANSP	5,380	5,338	5,335	5,315	5,307	5,277	5,465	5,419	5,380	5,346	5,318	5,309	
GT1_NB	Gen. Service - 1 TRANSP	13,592	13,570	13,649	13,687	13,732	13,740	13,613	13,639	13,663	13,662	13,672	13,739	
GT2_NB	Gen. Service - 2 TRANSP	6,616	6,609	6,628	6,695	6,705	6,701	6,695	6,700	6,746	6,747	6,753	6,762	
GT3_NB	Gen. Service - 3 TRANSP	728	728	732	729	738	734	728	733	727	729	730	731	
GT4_NB	Gen. Service - 4 TRANSP	162	161	161	161	161	161	160	163	148	144	146	146	
GT5_NB	Gen. Service -5 TRANSP	166	164	167	164	166	163	167	164	179	179	182	182	
CHP_NB	Commercial Gas Heat Pump	-	-	-	-	-	-	-	-	-	1	-	-	
SIT_NB	Small Interruptible Service	27	27	27	27	26	27	28	28	28	28	28	28	
ITS_NB	Interruptible Large Volume 1	14	14	14	14	13	16	12	12	12	12	12	12	
CTS_NB	Contract Transportation Service (flex)	14	16	12	13	12	13	15	11	14	12	14	14	
WHL_NB	Wholesale	5	5	5	5	5	5	5	5	5	5	5	5	
WHT_NB	Wholesale TRANSP	6	5	5	5	5	5	5	5	5	5	5	5	
MBS_NB	Mutually Beneficial	1	-	1	-	-	-	-	1	-	2	-	1	
CTP_NB	Commercial TRANSP Gas Heat Pump	3	3	3	3	3	3	3	3	3	2	3	3	
IL1_NB	Interruptible Large Volume 1	-	-	-	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	3	2	3	3	5	3	2	3	1	4	5	3	508,289

	ACCOUNT DESCRIPTION	ACTUALS 2025 JAN	ACTUALS 2025 FEB	ACTUALS 2025 MAR	BUDGET 2025 APR	BUDGET 2025 MAY	BUDGET 2025 JUN	BUDGET 2025 JUL	BUDGET 2025 AUG	BUDGET 2025 SEP	BUDGET 2025 OCT	BUDGET 2025 NOV	BUDGET 2025 DEC

RESTRICTED – INTERNAL USE ONLY

FPSC EXH NO. 97

ADMITTED

E18893

RS1_NB	Residential - 1	139,627	139,457	139,383	141,667	141,890	142,107	143,751	143,892	144,229	144,581	144,954	145,301	
RS2_NB	Residential - 2	218,342	219,216	220,016	219,075	219,651	220,210	222,424	222,778	223,235	223,694	224,126	224,544	
RS3_NB	Residential - 3	106,590	107,068	107,525	109,236	109,944	110,672	108,246	109,239	109,952	110,647	111,347	112,094	
RSG_NB	Residential Stand by Generator	1,339	1,353	1,365	1,316	1,320	1,323	1,326	1,337	1,341	1,347	1,352	1,354	
RG1_NB	Residential-General Service 1	2,217	2,215	2,213	2,238	2,239	2,244	2,321	2,330	2,332	2,333	2,333	2,333	
RG2_NB	Residential-General Service 2	76	70	69	98	98	98	98	99	99	99	100	100	
RG3_NB	Residential-General Service 3	10	11	9	3	3	3	3	3	3	3	3	3	
RT1_NB	Residential TRANSP General Service 1	373	373	372	388	391	392	393	396	397	399	403	404	
RT2_NB	Residential TRANSP General Service 2	257	256	255	250	249	251	251	252	252	250	250	252	
RT3_NB	Residential TRANSP General Service 3	46	46	46	45	45	45	45	45	45	45	45	44	
RHP_NB	Residential Gas Heat Pump	1	1	1	-	-	-	-	-	-	-	-	-	
RTP_NB	Residential TRANSP Gas Heat Pump	3	3	3	2	2	2	2	2	2	2	2	2	
CSG_NB	Commercial Standby Generator	989	988	985	966	968	970	972	968	969	965	966	966	
SGS_NB	Small General Service	7,825	7,820	7,812	7,879	7,888	7,896	7,906	7,918	7,929	7,940	7,949	7,960	
GS1_NB	Gen. Service - 1	4,176	4,203	4,323	4,113	4,121	4,124	4,075	4,082	4,099	4,115	4,113	4,134	
GS2_NB	Gen. Service - 2	901	918	960	865	867	867	856	858	860	856	855	862	
GS3_NB	Gen. Service - 3	47	46	44	48	46	46	46	46	46	47	45	46	
GS4_NB	Gen. Service - 4	4	3	4	3	3	3	3	3	3	3	3	3	
GS5_NB	Gen. Service - 5	1	1	3	1	1	1	1	1	1	1	1	1	
NVT_NB	Natural Gas Vehicle Sales-TRANSP	-	-	-	-	-	-	-	-	-	-	-	-	
CTG_NB	Commercial TRANSP Standby Generator	190	191	192	192	191	191	189	189	190	189	188	189	
SGT_NB	Small General Service TRANSP	5,271	5,262	5,231	5,460	5,462	5,470	5,530	5,529	5,535	5,536	5,543	5,545	
GT1_NB	Gen. Service - 1 TRANSP	13,733	13,742	13,676	13,742	13,762	13,778	13,880	13,894	13,905	13,923	13,954	13,962	
GT2_NB	Gen. Service - 2 TRANSP	6,764	6,756	6,738	6,848	6,863	6,884	6,830	6,853	6,865	6,879	6,892	6,899	
GT3_NB	Gen. Service - 3 TRANSP	732	734	734	739	741	742	743	743	744	744	746	748	
GT4_NB	Gen. Service - 4 TRANSP	146	147	147	141	142	142	142	142	142	142	142	142	
GT5_NB	Gen. Service -5 TRANSP	185	182	182	187	187	187	187	187	187	187	187	187	
CHP_NB	Commercial Gas Heat Pump	3	3	3	5	5	5	5	5	5	6	6	6	
SIT_NB	Small Interruptible Service	28	28	28	28	28	28	28	28	28	28	28	28	
ITS_NB	Interruptible Large Volume 1	12	10	10	12	12	12	12	12	12	12	12	12	
CTS_NB	Contract Transportation Service (flex)	16	14	17	-	-	-	-	-	-	-	-	-	
WHL_NB	Wholesale	5	5	5	9	9	9	9	9	9	9	9	9	
WHT_NB	Wholesale TRANSP	5	5	5	4	4	4	4	4	4	4	4	4	
MBS_NB	Mutually Beneficial	2	2	-	-	-	-	-	-	-	-	-	-	
CTP_NB	Commercial TRANSP Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-	
IL1_NB	Interruptible Large Volume 1	1	1	1	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	4	4	4	4	4	4	4	4	4	4	4	4	
	Special Contracts	-	-	-	20	20	20	20	20	20	20	20	21	528,159

	ACCOUNT DESCRIPTION	BUDGET 2026 JAN	BUDGET 2026 FEB	BUDGET 2026 MAR	BUDGET 2026 APR	BUDGET 2026 MAY	BUDGET 2026 JUN	BUDGET 2026 JUL	BUDGET 2026 AUG	BUDGET 2026 SEP	BUDGET 2026 OCT	BUDGET 2026 NOV	BUDGET 2026 DEC
RS1_NB	Residential - 1	145,554	145,784	146,027	146,252	146,463	146,658	148,356	148,481	148,808	149,156	149,524	149,867
RS2_NB	Residential - 2	225,072	225,658	226,165	226,710	227,251	227,780	230,121	230,421	230,833	231,255	231,643	232,014
RS3_NB	Residential - 3	112,782	113,423	114,142	114,838	115,551	116,286	113,632	114,654	115,374	116,071	116,776	117,531
RSG_NB	Residential Stand by Generator	1,355	1,358	1,359	1,361	1,366	1,371	1,373	1,381	1,388	1,393	1,399	1,401
RG1_NB	Residential-General Service 1	2,332	2,337	2,336	2,337	2,335	2,339	2,421	2,430	2,429	2,429	2,429	2,427
RG2_NB	Residential-General Service 2	101	101	101	101	101	102	102	103	104	104	105	105
RG3_NB	Residential-General Service 3	3	3	3	3	3	3	3	3	3	3	3	3
RT1_NB	Residential TRANSP General Service 1	406	407	408	410	411	413	414	416	419	420	422	423
RT2_NB	Residential TRANSP General Service 2	251	251	252	252	253	253	254	255	256	255	255	256
RT3_NB	Residential TRANSP General Service 3	43	47	45	44	44	45	44	45	44	44	44	44
RHP_NB	Residential Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-

E18893

FPSC EXH NO. 97

ADMITTED

E18894

RTP_NB	Residential TRANSP Gas Heat Pump	2	2	2	2	2	2	2	2	2	2	2	2	
CSG_NB	Commercial Standby Generator	969	963	968	966	968	970	972	968	969	965	966	966	
SGS_NB	Small General Service	7,968	7,980	7,990	8,001	8,010	8,020	8,030	8,040	8,052	8,059	8,071	8,083	
GS1_NB	Gen. Service - 1	4,142	4,152	4,157	4,172	4,179	4,181	4,131	4,139	4,157	4,173	4,175	4,192	
GS2_NB	Gen. Service - 2	865	869	868	865	868	870	859	861	865	863	864	870	
GS3_NB	Gen. Service - 3	46	47	46	47	46	45	46	45	46	45	44	46	
GS4_NB	Gen. Service - 4	3	3	3	3	3	3	3	3	3	3	3	3	
GS5_NB	Gen. Service - 5	1	1	1	1	1	1	1	1	1	1	1	1	
NVT_NB	Natural Gas Vehicle Sales-TRANSP	-	-	-	-	-	-	-	-	-	-	-	-	
CTG_NB	Commercial TRANSP Standby Generator	186	186	183	192	191	191	189	189	190	189	188	189	
SGT_NB	Small General Service TRANSP	5,548	5,548	5,556	5,561	5,561	5,568	5,633	5,631	5,633	5,636	5,645	5,648	
GT1_NB	Gen. Service - 1 TRANSP	13,974	13,991	14,012	14,020	14,044	14,064	14,158	14,175	14,183	14,203	14,226	14,231	
GT2_NB	Gen. Service - 2 TRANSP	6,923	6,936	6,952	6,973	6,987	7,006	6,951	6,972	6,985	6,999	7,011	7,023	
GT3_NB	Gen. Service - 3 TRANSP	748	748	750	752	752	752	755	757	760	760	760	761	
GT4_NB	Gen. Service - 4 TRANSP	145	145	145	145	145	146	146	146	146	146	146	146	
GT5_NB	Gen. Service -5 TRANSP	189	189	189	191	191	191	192	192	192	192	192	192	
CHP_NB	Commercial Gas Heat Pump	5	5	5	5	5	5	5	5	5	6	6	6	
SIT_NB	Small Interruptible Service	28	28	28	28	28	28	28	28	28	28	28	28	
ITS_NB	Interruptible Large Volume 1	12	12	12	12	12	12	11	11	11	11	11	11	
CTS_NB	Contract Transportation Service (flex)	-	-	-	-	-	-	-	-	-	-	-	-	
WHL_NB	Wholesale	9	9	9	9	9	9	9	9	9	9	9	9	
WHT_NB	Wholesale TRANSP	4	4	4	4	4	4	4	4	4	4	4	4	
MBS_NB	Mutually Beneficial	-	-	-	-	-	-	-	-	-	-	-	-	
CTP_NB	Commercial TRANSP Gas Heat Pump	-	-	-	-	-	-	-	-	-	-	-	-	
IL1_NB	Interruptible Large Volume 1	-	-	-	-	-	-	-	-	-	-	-	-	
IL2_NB	Interruptible Large Volume 2	-	-	-	-	-	-	-	-	-	-	-	-	
OSS_NB	CUSTOMERS-OSS	4	4	4	4	4	4	4	4	4	4	4	4	
	Special Contracts	21	21	22	22	22	23	23	24	24	24	24	24	546,510

	ACCOUNT DESCRIPTION	BUDGET 2027 JAN	BUDGET 2027 FEB	BUDGET 2027 MAR	BUDGET 2027 APR	BUDGET 2027 MAY	BUDGET 2027 JUN	BUDGET 2027 JUL	BUDGET 2027 AUG	BUDGET 2027 SEP	BUDGET 2027 OCT	BUDGET 2027 NOV	BUDGET 2027 DEC
RS1_NB	Residential - 1	151,090	151,369	151,646	151,901	152,153	152,387	154,172	154,328	154,699	155,095	155,519	155,899
RS2_NB	Residential - 2	232,393	233,017	233,563	234,148	234,727	235,294	237,851	238,175	238,620	239,046	239,452	239,855
RS3_NB	Residential - 3	118,758	119,420	120,176	120,905	121,651	122,419	119,564	120,641	121,397	122,146	122,891	123,682
RSG_NB	Residential Stand by Generator	1,397	1,401	1,402	1,405	1,409	1,413	1,417	1,427	1,433	1,438	1,443	1,444
RG1_NB	Residential-General Service 1	2,426	2,430	2,430	2,430	2,427	2,431	2,519	2,525	2,524	2,524	2,522	2,521
RG2_NB	Residential-General Service 2	126	126	128	129	129	129	129	131	131	132	132	133
RG3_NB	Residential-General Service 3	3	3	3	3	3	3	3	3	3	3	3	3
RT1_NB	Residential TRANSP General Service 1	429	429	431	433	435	437	437	440	441	444	446	449
RT2_NB	Residential TRANSP General Service 2	257	257	257	259	259	259	259	261	260	259	259	261
RT3_NB	Residential TRANSP General Service 3	43	46	44	44	44	44	44	44	44	44	44	43
RHP_NB	Residential Gas Heat Pump												
RTP_NB	Residential TRANSP Gas Heat Pump												
CSG_NB	Commercial Standby Generator												
SGS_NB	Small General Service	8,076	8,086	8,096	8,106	8,115	8,124	8,136	8,146	8,159	8,167	8,179	8,189
GS1_NB	Gen. Service - 1	4,189	4,199	4,203	4,217	4,228	4,230	4,178	4,189	4,207	4,223	4,223	4,242
GS2_NB	Gen. Service - 2	866	875	874	869	873	876	866	870	872	870	871	877
GS3_NB	Gen. Service - 3	46	47	47	48	47	46	47	46	48	47	46	48
GS4_NB	Gen. Service - 4												
GS5_NB	Gen. Service - 5												
NVT_NB	Natural Gas Vehicle Sales-TRANSP												
CTG_NB	Commercial TRANSP Standby Generator												
SGT_NB	Small General Service TRANSP	5,685	5,685	5,692	5,697	5,698	5,706	5,772	5,770	5,774	5,775	5,783	5,784

E18894

FPSC EXH NO. 97

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GT1_NB	Gen. Service - 1 TRANSP	14,240	14,259	14,279	14,292	14,310	14,326	14,419	14,435	14,442	14,460	14,487	14,493
GT2_NB	Gen. Service - 2 TRANSP	7,049	7,059	7,077	7,095	7,111	7,130	7,075	7,097	7,108	7,126	7,138	7,149
GT3_NB	Gen. Service - 3 TRANSP	760	760	761	763	763	765	767	768	769	769	770	771
GT4_NB	Gen. Service - 4 TRANSP												
GT5_NB	Gen. Service -5 TRANSP												
CHP_NB	Commercial Gas Heat Pump												
SIT_NB	Small Interruptible Service												
ITS_NB	Interruptible Large Volume 1												
CTS_NB	Contract Transportation Service (flex)												
WHL_NB	Wholesale												
WHT_NB	Wholesale TRANSP												
MBS_NB	Mutually Beneficial												
CTP_NB	Commercial TRANSP Gas Heat Pump												
IL1_NB	Interruptible Large Volume 1												
IL2_NB	Interruptible Large Volume 2												
OSS_NB	CUSTOMERS-OSS												
	Special Contracts												

RESTRICTED – INTERNAL USE ONLY

E18895

FPSC EXH NO. 97

ADMITTED

Ok

PGS LTF 2023
i.Global To Map

Timeline Flags and Helpers

Period		**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Section		Actual	Actual	Bugdet	Bugdet	Forecast	Forecast	Forecast	Forecast
Start date		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
End date		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
x **Global Inputs**									
lightly review inputs annually to ensure no changes YoY									
Payroll Tax Inflation Rate	%								
TPI / Subsidiary Earnings	%								
Property Tax									
Real Estate Tax	$000s	425	-						
Real Estate Growth Rate	%			#DIV/0!					
Tax Rate	%			1.56%					
Cap Rate	%			8.78%					
Income Approach Weighting - 80/20 except Hillsborough (conservative assumption)	%			80.0%					
Weighted Net Income									
Year 1	%			16.7%					
Year 2	%			33.3%					
Year 3	%			50.0%					
% TTPP	%			89.7%					
x **END**									

FPSC EXH NO. 97

ADMITTED

RE: Working Group - Property Tax

Kelley, Amanda M.
To Gurgel, Brady G.
Cc Fanger, Daniel
Retention Policy Default 1 yr retention (1 year)

Internal

Start your reply all with: Thank you! Perfect, thank you! Got it, thanks! Feedback

Account 154 values are now $3,507,441 for 2024 $3,595,127 for 2025 $3,677.815 for 2026

12/31/25 forecast	3,595,127

	12/2023 actuals
Dade	621,572.44
Hillsborough	295,924.22
Pinellas	235,754.87
Orange	202,709.78
Lake	85,574.13
Duval	448,306.49
Polk	326,917.59
Volusia	59,608.87
Highlands	23,664.65
Sarasota	1,155,009.88
Palm Beach	196,096.58
Bay	228,034.94
Marion	544,182.50
Lee	620,543.98
Total	**5,043,900.92**

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Cost Approach to Value
January 1, 2026F

Property Accounts		Balance 12/31/2025F
Utility Plant in Service (101, 104, 106, 18679)	$	3,834,139,000
Acquisition Adjustment (114)		-
Property Held for Future Use (105)		1,940,000
Construction Work in Progress (107)		28,668,000
Total Utility Plant	$	3,864,747,000
Less Depreciation & Amortization (108, 115)		(1,018,754,000)
Net Utility Plant	$	2,845,993,000
Materials & Supplies Inventory		3,595,127
Non-Utility RNG (121,122)		10,925,000
Total Property @ Cost	$	2,860,513,127
Less Obsolescence	$	-
Cost Indicator of Value (All Property)	**$**	**2,860,513,127**

Schedule 1

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Summary of Property
January 1, 2026F

	Original Cost	Depreciation & Amortization	Net Book Value	% of Total
Property Accounts (101,104,105,106,114, 18679)	$ 3,836,079,000	$ (1,018,754,000)	$ 2,817,325,000	
Constuction Work in Progress (107)	28,668,000	-	28,668,000	
Total Utility Plant	$ 3,864,747,000	$ (1,018,754,000)	$ 2,845,993,000	
Fuel (151)	-	-	-	
Non Utility RNG (121)	11,939,000	(1,014,000)	10,925,000	
Materials & Supples (154)	3,595,127	-	3,595,127	
All Property Cost Approach To Value	$ 3,880,281,127	$ (1,019,768,000)	**$ 2,860,513,127**	100.00%
Less Separately Assessed & Exempt Property:				
Construction Work in Progress	$ 28,668,000	$ -	$ 28,668,000	
Gas Plant Acquistion Adjustment	-	-	$ -	
Fuel Inventory	-	-	$ -	
Non Utility RNG (121)	11,939,000	(1,014,000)	$ 10,925,000	
Materials & Supplies Inventory	3,595,127	-	$ 3,595,127	
Software	138,245,000	(45,693,000)	$ 92,552,000	
Vehicles	51,181,000	(22,026,000)	$ 29,155,000	
Franchise & Consents and Organizational Costs	13,000	(0)	$ 13,000	
Real Estate - Land & Structures, Easements	134,585,000	(6,870,000)	$ 127,715,000	
Real Estate - PHFFU Land (105)	1,940,000	-	$ 1,940,000	
Total Exempt & Separately Assessed	$ 370,166,127	$ (75,603,000)	$ 294,563,127	10.30%
Property in Unit Valuation at Cost	$ 3,510,115,000	$ (944,165,000)	$ 2,565,950,000	89.70%
Non-Utility RNG (121)	$ 11,939,000	$ (1,014,000)	$ 10,925,000	
Materials & Supplies Inventory	3,595,127	-	3,595,127	
Total Taxable TPP Cost Approach to Value	$ 3,525,649,127	$ (945,179,000)	**$ 2,580,470,127**	

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Capitalization Rate

Capital	Balance	Ratio	Cost	Weighted Average Cost
Long-Term Debt	$ 1,023,341,196	43.06%	5.65%	2.43%
Common Equity	1,353,136,935	56.94%	11.15%	6.35%
Total	$ 2,376,478,131	100.00%		**8.78%**

Beginning 2024 11.15% is the new high point in the range of allowed ROE following rate case resolution Nov 2023

2025F YE from Amanda

207	5,575,333.00
211	1,216,474,836.00
216	131,086,766.00
Total	**1,353,136,935.00**

2025
207 5,575,333
211 1,216,474,836
216 132,086,766

RE: 2025 PGS Property Tax Budget

Kelley, Amanda M.
To Gurgel, Brady G.
2:41 P

Retention Policy Default 1 yr retention (1 year) Expires 8/16/2025

Internal

You replied to this message on 8/15/2024 3:26 PM.

2025 PGS LTD Schedule Updt needed.xlsx
20 KB

Start your reply all with: Thank you! Got it, thanks! Received, thank you. (

2024 Equity Forecast
207 5,575,333
211 1,098,474,836
216 131,291,659

Net Income
2024F 116,720,000
2025F 116,630,000

Debt is attached.

Amanda

FPSC EXH NO. 97

ADMITTED

Peoples Gas System 2026 Property Tax Return Budget Appraisal

Long Term Debt

Long Term Notes		(1) Principle Balance - Forecast 12/31/2024	(2) Months Outstanding	(3) Budget Balance 12/31/2025	(4) Principle 12-Months 2025 Average	(5) Interest Expense	Interest Rate
5.42% Due in 2028		$ 350,000,000	12	$ 350,000,000	350,000,000	18,970,000	5.42%
5.63% Due in 2033		$ 350,000,000	12	$ 350,000,000	350,000,000	19,705,000	5.63%
5.94% Due in 2053		$ 225,000,000	12	$ 225,000,000	225,000,000	13,365,000	5.94%
5.20 % New Loan		-	7	100,000,000	$ 58,333,333	$ 3,033,333	5.20%
	Subtotal	$ 925,000,000		$ 1,025,000,000	$ 983,333,333	$ 55,073,333	
Amortization of Debt Expense		$ (1,992,576)		$ (1,658,804)	$ (1,825,690)	$ 333,772	
	Total	$ 923,007,424		$ 1,023,341,196	$ 981,507,643	$ 55,407,106	

Weighted Cost of Debt (5) / (4) **5.65%**

Updated with LTD sch received from Amanda Kelley 8/615/24 bg

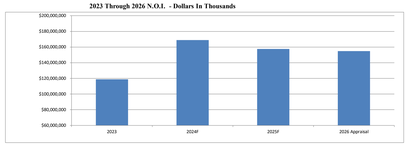
FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Income Approach to Value
Determine 2026 Net Operating Income to Capitalize

	(1)	(2)	(3) (1) x (2)
	NOI		Weighted
Year	An Booked	Weight	NOI
2023Act	$ 118,841,878	1	$ 19,806,980
2024Act	$ 168,827,176	2	$ 56,275,725
2025F	$ 157,385,906	3	$ 78,692,953
	Mean Average		**Weighted Average**
2026 Appraisal NOI	**$ 148,351,654**		**$ 154,775,658**

	As Filed NOI	
2023	$ 118,841,878	
2024F	$ 169,027,750	Used Actual Instead
2025F	$ 172,037,106	Used 2025 Forecast in MFRs
	Use	**Use**
	$ 154,800,000	**$ 162,200,000**

2023 Through 2026 N.O.I. - Dollars In Thousands



2026 Appraisal NOI	$	**154,800,000**
Capitalization Rate		**8.78%**
Income Approach Indicator of Value (All Property)	$	**1,763,193,940**

	2023	$ 118,841,878
2024F		$ 168,827,176
2025F		$ 157,385,906
	2026 Appraisal	$ 154,800,000

$	2,610,248
$	1,305,123.98
$	156,080,782.38

4

2013 Actual	2014 Actual	2015 Actual	2016 Actual	2017 Actual	2018 Actual	2019 Actual	2020 Actual	2021 Actual	2022 Actual	2023 Actual	2024F	2025F
34,729,226.00	35,834,101.87	35,265,270	34,859,000	43,000,000	47,700,000	54,029,133	53,915,389	77,282,929	82,237,618	78,534,752	116,720,000	116,630,000
11,965,023.00	12,237,167.66	13,468,366	13,347,422	14,113,428	14,891,315	15,895,709	15,614,689	19,957,823	21,425,081	40,307,126	52,307,750	55,407,106
46,694,249.00	**48,071,269.51**	**48,733,636**	**48,206,422**	**57,113,428**	**62,591,315**	**69,924,842**	**67,530,058**	**97,220,750**	**103,662,699**	**118,841,878**	**169,027,750**	**172,037,106**

2024F 2025F NI from Amanda below

RE: 2025 PGS Property Tax Budget

Kelley, Amanda M.
To: Gurgel, Brady G.
2:41 P
Retention Policy: Default 1 yr retention (1 year) Expires 8/16/2025
Internal
You replied to this message on 8/15/2024 3:26 PM.
2025 PGS LTD Schedule Updt needed.xlsx
20 KB
Start your reply all with: Thank you! Got it, thanks! Received, thank you. (

2024 Equity Forecast
207 6,575,333
211 1,098,474,836
216 131,291,659

Net Income
2024F 116,720,000
2025F 116,630,000

Debt is attached.

Amanda

	(1) Principle Balance - Forecast 12/31/2023	(2) Months Outstanding	(3) Budget Balance 12/31/2024	(4) Principle 12-Months 2024 Average	(5) Interest Expense	Interest Rate
	$ 350,000,000	12	$ 350,000,000	350,000,000	18,970,000	5.42%
	$ 350,000,000	12	$ 350,000,000	350,000,000	19,705,000	5.63%
	$ 225,000,000	12	$ 225,000,000	225,000,000	13,365,000	5.94%
	(97,500)		-	-	$ -	
Subtotal	$ 924,902,500		$ 925,000,000	$ 925,000,000	$ 52,040,000	
	$ (2,223,013)		$ (1,955,263)	$ (2,089,138)	$ 267,750	
Total	$ 922,679,487		$ 923,044,737	$ 922,910,862	$ ~~52,307,750~~	

Weighted Cost of Debt (5) / (4) **5.67%**

2024 forecast interest on LTD
52307750

2025 int on LTD forecast

	(1) Principle Balance - Forecast 12/31/2024	(2) Months Outstanding	(3) Budget Balance 12/31/2025	(4) Principle 12-Months 2025 Average	Interest Expense	Interest Rate
	$ 350,000,000	12	$ 350,000,000	350,000,000	18,970,000	5.42%
	$ 350,000,000	12	$ 350,000,000	350,000,000	19,705,000	5.63%
	$ 225,000,000	12	$ 225,000,000	225,000,000	13,365,000	5.94%
	-	7	100,000,000	$ 58,333,333	$ 3,033,333	5.20%
Subtotal	$ 925,000,000		$ 1,025,000,000	$ 983,333,333	$ 55,073,333	
	$ (1,992,576)		$ (1,658,804)	$ (1,825,690)	$ 333,772	
Total	$ 923,007,424		$ 1,023,341,196	$ 981,507,643	$ ~~55,407,106~~	

Weighted Cost of Debt (5) / (4) **5.65%**

Total 2023 Int on LTD

Intercompany	38,419,373.00
7500110	1,879,222.00
7500130	8,331.00
	40,307,126.00

TECO
PEOPLES GAS
An EMERA COMPANY

☐ Reference Cycle ☐ YTD Reporting ☑ EBITDA - Effective Tax Rate

Report Type:	**INC STMT**
Scenario:	**ACT_BUDGET**
Cost Center:	**P_CORP**
Cost Type:	**2024 YTD NI**
ADDITIONAL DETAIL:	**Y**

Peoples Gas

INCOME STATEMENT REPORT

CALENDARMONTH			YTDPERIOD BUDGET
___GROUP	ACCOUNT ID	ACCOUNT DESCRIPTION	DISAFTOTAL
5001	INC_BEF_TAX	Income before taxes	116,720,000
5001	NETINC_AFTAX	Net income / loss(regong	103,649,92
5001	Sub_BS_AFTA	Sub F (loss) on sale of assets	105,996.00
5001	Sub_BS_AFTA_TOTAL	Sub F (loss) on sale of assets	105,996.00
5001	NETINCOME_CHANGE_A	NETINCOME CHANGE A	11,566,243.00
5001	NETINCOME_EXPENSE	Network Expense	10,263,183.92
5001	P_OTHER	Network Income - long-term debt	1,303,060.00
5001	P_OTHER	Network Income - other	2,735,819.92
5001	ALLOWANCE_BRONCHTRACT	Allowance for borrowed funds used during constructio	(755,898.92)
5001	DEF_IT_EXP_A_A	Deferred income tax expense - A_A_A_A	1,491,718.92
5001	TOTAL_IT_EXP	Income tax expense	13,027,283.92
5001	DEF_IT_EXP	Deferred income tax expense	16,430,476.92

RE: 2023 Interest on LTD

Kelley, Amanda M.
To: Gurgel, Brady G.
Retention Policy: Default 1 yr retention (1 year)
Internal
Start your reply all with: Okay, thank you! Will do. Ok, will do. Thanks! Feedback

Exclude the 7500190- there is an offset in AFUDC

RE: 2023 Interest on LTD

Kelley, Amanda M.
To: Gurgel, Brady G.
Retention Policy: Default 1 yr retention (1 year)
Internal
Start your reply all with: Okay, thank you! Will do. Ok, will do. Thanks! Feedback

FROM: Kelley, Amanda M. <kelleyam@peoplesenergy.com>
Sent: Monday, 22 January, 2024 11:06 AM
To: Gurgel, Brady G. <BGGUR001@tecoenergy.com>
Subject: RE: 2023 Interest on LTD

There is $20,261,807 in account 7500700 (include 7500110 & 7500130)

I am asking about 7500190 since my impression that was based on Short term rates.

Peoples Gas System 2026 Property Tax Budget Appraisal
January 1, 2026F
Dollars in Thousands

Line No.			
	Cost Approach Calculation		
1	Utility Plant (Accounts 101 & 106)	$	3,834,139
2	Construction Work in Progress (Account 107)		28,668
3	Total Utility Plant	$	3,862,807
4	Less: Accumulated Depreciation & Amortization (Accounts 108 & 111)		(1,018,754)
5	Net Utility Plant	$	2,844,053
6	Materials & Supplies Inventory (Account 154) Appraise @ Situs		3,595
7	Real Estate - PHFFU (Account 105)		1,940
8	RNG Non-Utility Property (Account 121)		10,925
9	Net Book Value of All Operating Property	$	2,860,513
10	Obsolescense Percentage - See Cost Approach to Value Page		0.00%
11	Obsolescense (line 10 x line 9)	$	-
12	**Cost Approach Indicator of Value - All Operating Property**	**$**	**2,860,513**
13			
14	*Income Approach Calculation*		
15	Appraisal Net Operating Income - December 31, 2024	$	154,800
16	Capitalization Rate		8.78%
17	**Income Approach Indicator of Value - All Operating Property (Line 15 / Line 16)**	**$**	**1,763,194**
18			
19	*Calculate Value of Taxable Tangible Personal Property in Unit*		
20	Cost Approach Indicator of Value - All Operating Property (Line 12)	$	2,860,513
21	Cost Approach Indicator of Value - TTPP Excl. M&S Inventory	$	2,565,950
22	Income Approach Indicator of Value - All Operating Property (Line 17)	$	1,763,194
23	Percent of All Property Value Attributable to TTPP (Line 21 / Line 20)		89.70%
24	Income Approach Indicator of Value - TTPP (Line 22 x Line 23)	$	1,581,628
25			
26	Reconcile Cost & Income Approach		
27	Income		80%
28	Cost		20%
29			
30	Reconciled Indicator of Unit Value [(Line 24 x Line 27) + (Line 21 x Line 28)]	$	1,778,492
	Add: RNG Non Utility Property	$	10,925
31	Add: Materials & Supples Inventory		3,595
32	**Estimate of Fair Market Value - Taxable Tangible Personal Property**	**$**	**1,793,012**

Dollars in Thousands

	Allocation Factor	Original Cost	Valuation 100% Cost	Valuation 100% Income	Reconciled Value
Wakulla					
Estimate of FMV - Unit Apprasisal	**0.01%**	**$ 186**	**$ 164**	**$ 101**	**$ 113**
M&S Inventory/Non Utility	**NA**	**-**	**-**	**-**	**-**
Wakulla Total		**$ 186**	**$ 164**	**$ 101**	**$ 113**
Unit Appraisal	99.99%	$ 2,914,760	$ 2,565,786	$ 1,581,527	$ 1,778,379
M&S Inventory/Non Utility		16,155	16,155	16,155	16,155
Total All Other Counties		$ 2,930,915	$ 2,581,942	$ 1,597,682	$ 1,794,534
Estimate of FMV - Unit Apprasisal	100.00%	$ 2,914,945	$ 2,565,950	$ 1,581,628	$ 1,778,492
M&S Inventory/Non Utility		16,155	16,155	16,155	16,155
Total All Counties		$ 2,931,101	$ 2,582,105	$ 1,597,783	$ 1,794,648

updt county and these 2 fields and make copy for each county

$ 113,325.34

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Reconciliation of Fair Market Value
January 1, 2026

Approach	Indicated Value	Weight	Weighted Value	% TTPP	TTPP	
Income Approach	$ 1,763,193,940	80%	$ 1,410,555,152	89.7%	$ 1,265,302,354	0.506676378 FMV Factor
Cost Approach	$ 2,860,513,127	20%	$ 572,102,625	89.7%	$ 513,190,000	
Estimate of Fair Market Value (All Property)		**100%**	**$ 1,982,657,777**			

Estimate of FMV - TTPP Unit Apprasisal	$ 1,778,492,354
Material & Supplies Inventory	3,595,127
RNG Non Utility NBV	10,925,000
Total System Estimate of FMV	**$ 1,793,012,481**

Peoples Gas System 2024 Property Tax Appraisal
TPP by County/District
THIS TAB IS N/A TO 2026 BUDGET APPRAISAL-ACTUAL 2024 VALUES BELOW ARE USED TO DERIVE ALLOCATION FACTORS UTILIZED IN 2026 BUDGET PROJECTION HOWEVER

County/District	Asset Type	Original Cost
Baker County	Gas Distribution Lines & Equip	25,394
Baker County	Main Gas Lines	2,598,492
Macclenny	Gas Distribution Lines & Equip	60,024
	FL-G 376-Mains - Situs	2,488,711
	FL-G 378-Meas & Regulating Equip	109,781
	FL-G 380-Services - Allocated	56,367
	FL-G 381-Meters & Regs - Allocated	8,449
	FL-G 382-Meter & Installs - Alloc	12,632
	FL-G 383-House Regulators	5,359
	FL-G 385-Ind Meas & Reg Stat Equip	1,417
	FL-G 387-Other Equipment	1,194
	Grand Total	**2,683,911**

County/District	Asset Type	Original Cost
Bay County	Gas Distribution Lines & Equip	10,258,535
Bay County	Material and Supplies Inv (154)	228,035
Bay County	Main Gas Lines	67,991,081
Callaway	Gas Distribution Lines & Equip	2,726,546
Lynn Haven	Gas Distribution Lines & Equip	3,079,637
Panama City	Gas Distribution Lines & Equip	10,211,330
Panama City Beach	Gas Distribution Lines & Equip	7,987,043
Parker	Gas Distribution Lines & Equip	407,849
Springfield	Gas Distribution Lines & Equip	130,285
	FL-154-Materials & Supplies	228,035
	FL-G 376-Mains - Situs	67,027,488
	FL-G 378-Meas & Regulating Equip	470,775
	FL-G 380-Services - Allocated	22,965,166
	FL-G 381-Meters & Regs - Allocated	3,442,439
	FL-G 382-Meter & Installs - Alloc	5,146,513
	FL-G 383-House Regulators	2,183,236
	FL-G 385-Ind Meas & Reg Stat Equip	577,271
	FL-G 387-Other Equipment	486,601
	FL-G 391-Office Furn & Equip	102,847
	FL-G 394-Tools, Shop & Garage Equip	246,528
	FL-G 396-Power Operated Equipment	117,510
	FL-G 397-Communication Equipment	18,417
	FL-G 398-Miscellaneous Equipment	7,515
	Grand Total	**103,020,341**

County/District	Asset Type	Original Cost
Bradford County	Main Gas Lines	1,687,918
Bradford County	Gas Distribution Lines & Equip	9,234
	FL-G 376-Mains - Situs	1,687,918
	FL-G 380-Services - Allocated	6,094
	FL-G 381-Meters & Regs - Allocated	913
	FL-G 382-Meter & Installs - Alloc	1,366
	FL-G 383-House Regulators	579
	FL-G 385-Ind Meas & Reg Stat Equip	153
	FL-G 387-Other Equipment	129
	Grand Total	**1,697,152**

County/District	Asset Type	Original Cost
Brevard County	Main Gas Lines	2,947,608

County/District	Asset Type	Original Cost
Broward County	Main Gas Lines	81,035,606

Broward County	Gas Distribution Lines & Equip	4,405,848
Coconut Creek	Gas Distribution Lines & Equip	192,936
Cooper City	Gas Distribution Lines & Equip	80,630
Coral Springs	Gas Distribution Lines & Equip	668,077
Dania	Gas Distribution Lines & Equip	1,056,828
Davie	Gas Distribution Lines & Equip	760,225
Deerfield Beach	Gas Distribution Lines & Equip	486,659
Ft. Lauderdale	Gas Distribution Lines & Equip	21,649,131
Hallendale	Gas Distribution Lines & Equip	1,874,645
Hollywood	Gas Distribution Lines & Equip	20,598,062
Lauderdale Lakes	Gas Distribution Lines & Equip	97,908
Lauderdale-by-the-Sea	Gas Distribution Lines & Equip	918,605
Lauderhill	Gas Distribution Lines & Equip	408,909
Lighthouse Point	Gas Distribution Lines & Equip	77,750
Margate	Gas Distribution Lines & Equip	1,722,024
North Lauderdale	Gas Distribution Lines & Equip	17,278
Oakland Park	Gas Distribution Lines & Equip	2,836,445
Parkland	Gas Distribution Lines & Equip	10,939,751
Pembroke Pines	Gas Distribution Lines & Equip	14,418,356
Plantation	Gas Distribution Lines & Equip	3,677,300
Pompano Beach	Gas Distribution Lines & Equip	11,175,881
Tamarac	Gas Distribution Lines & Equip	51,833
Weston	Gas Distribution Lines & Equip	190,056

FL-G 376-Mains - Situs	80,583,974
FL-G 378-Meas & Regulating Equip	390,055
FL-G 380-Services - Allocated	64,871,099
FL-G 381-Meters & Regs - Allocated	9,724,065
FL-G 382-Meter & Installs - Alloc	14,537,668
FL-G 383-House Regulators	6,167,120
FL-G 385-Ind Meas & Reg Stat Equip	1,630,651
FL-G 387-Other Equipment	1,374,533
FL-G 391-Office Furn & Equip	24,482
FL-G 394-Tools, Shop & Garage Equip	1,319
FL-G 397-Communication Equipment	34,486
FL-G 398-Miscellaneous Equipment	1,290
Grand Total	**179,340,742**

County/District	Asset Type	Original Cost
Charlotte County	Main Gas Lines	22,133,068
Charlotte County	Gas Distribution Lines & Equip	3,539,095
Babcock Ranch	Gas Distribution Lines & Equip	2,307,637
Punta Gorda	Gas Distribution Lines & Equip	871,294

FL-G 376-Mains - Situs	21,820,541
FL-G 378-Meas & Regulating Equip	312,528
FL-G 380-Services - Allocated	4,433,194
FL-G 381-Meters & Regs - Allocated	664,528
FL-G 382-Meter & Installs - Alloc	993,482
FL-G 383-House Regulators	421,452
FL-G 385-Ind Meas & Reg Stat Equip	111,436
FL-G 387-Other Equipment	93,933
Grand Total	**28,851,094**

County/District	Asset Type	Original Cost
Clay County	Main Gas Lines	26,186,611
Clay County	Gas Distribution Lines & Equip	2,895,009
Green Cove Springs	Gas Distribution Lines & Equip	13,852
Orange Park	Gas Distribution Lines & Equip	311,664

FL-G 376-Mains - Situs	26,165,605

FL-G 378-Meas & Regulating Equip	21,006
FL-G 380-Services - Allocated	2,125,209
FL-G 381-Meters & Regs - Allocated	318,565
FL-G 382-Meter & Installs - Alloc	476,261
FL-G 383-House Regulators	202,038
FL-G 385-Ind Meas & Reg Stat Equip	53,421
FL-G 387-Other Equipment	45,030
Grand Total	**29,407,135**

County/District	Asset Type	Original Cost
Collier County	Main Gas Lines	76,147,100
Collier County	Gas Distribution Lines & Equip	26,442,928
Estero	Gas Distribution Lines & Equip	6,217,679
Marco Island	Gas Distribution Lines & Equip	338,597
Naples	Gas Distribution Lines & Equip	2,484,484

FL-G 376-Mains - Situs	75,710,461
FL-G 378-Meas & Regulating Equip	436,639
FL-G 380-Services - Allocated	23,415,519
FL-G 381-Meters & Regs - Allocated	3,509,946
FL-G 382-Meter & Installs - Alloc	5,247,437
FL-G 383-House Regulators	2,226,051
FL-G 385-Ind Meas & Reg Stat Equip	588,591
FL-G 387-Other Equipment	496,144
Grand Total	**111,630,788**

County/District	Asset Type	Original Cost
Columbia County	Main Gas Lines	244,330
Columbia County	Gas Distribution Lines & Equip	6,926

FL-G 376-Mains - Situs	209,636
FL-G 378-Meas & Regulating Equip	34,694
FL-G 380-Services - Allocated	4,570
FL-G 381-Meters & Regs - Allocated	685
FL-G 382-Meter & Installs - Alloc	1,024
FL-G 383-House Regulators	434
FL-G 385-Ind Meas & Reg Stat Equip	115
FL-G 387-Other Equipment	97
Grand Total	**251,255**

County/District	Asset Type	Original Cost
Dade County	Main Gas Lines	141,742,367
Dade County	Gas Distribution Lines & Equip	443,465
Dade County	Materials & Supplies	621,572
Aventura	Gas Distribution Lines & Equip	840,855
Bal Harbor	Gas Distribution Lines & Equip	492,419
Bay Harbor Islands	Gas Distribution Lines & Equip	1,480,135
Biscayne Park	Gas Distribution Lines & Equip	760,225
El Portal	Gas Distribution Lines & Equip	190,056
Golden Beach	Gas Distribution Lines & Equip	714,150
Indian Creek	Gas Distribution Lines & Equip	80,630
Metro Dade County	Gas Distribution Lines & Equip	5,333,093
Miami	Gas Distribution Lines & Equip	19,417,410
Miami Beach	Gas Distribution Lines & Equip	35,814,078
Miami Garden	Gas Distribution Lines & Equip	40,315
Miami Shores	Gas Distribution Lines & Equip	1,796,895
North Bay Village	Gas Distribution Lines & Equip	806,299
North Miami	Gas Distribution Lines & Equip	3,962,384
North Miami Beach	Gas Distribution Lines & Equip	3,138,807
Sunny Isles Beach	Gas Distribution Lines & Equip	665,197
Surfside	Gas Distribution Lines & Equip	1,992,710

FL-154-Materials & Supplies	621,572

FL-G 376-Mains - Situs	138,596,114
FL-G 378-Meas & Regulating Equip	1,408,251
FL-G 380-Services - Allocated	51,451,459
FL-G 381-Meters & Regs - Allocated	7,712,484
FL-G 382-Meter & Installs - Alloc	11,530,315
FL-G 383-House Regulators	4,891,351
FL-G 385-Ind Meas & Reg Stat Equip	1,293,324
FL-G 387-Other Equipment	1,090,189
FL-G 391-Office Furn & Equip	252,084
FL-G 394-Tools, Shop & Garage Equip	644,529
FL-G 396-Power Operated Equipment	596,434
FL-G 397-Communication Equipment	163,084
FL-G 398-Miscellaneous Equipment	81,871
Grand Total	**220,333,061**

County/District	Asset Type	Original Cost
Duval County	Main Gas Lines	202,692,764
Duval County	Gas Distribution Lines & Equip	5,856,968
Duval County	Materials & Supplies	448,306
Atlantic Beach	Gas Distribution Lines & Equip	625,636
Jacksonville	Gas Distribution Lines & Equip	44,757,210
Neptune Beach	Gas Distribution Lines & Equip	78,493

FL-154-Materials & Supplies	448,306
FL-G 376-Mains - Situs	195,720,108
FL-G 378-Meas & Regulating Equip	5,399,982
FL-G 380-Services - Allocated	33,864,711
FL-G 381-Meters & Regs - Allocated	5,076,261
FL-G 382-Meter & Installs - Alloc	7,589,110
FL-G 383-House Regulators	3,219,427
FL-G 385-Ind Meas & Reg Stat Equip	851,250
FL-G 387-Other Equipment	717,549
FL-G 391-Office Furn & Equip	135,909
FL-G 394-Tools, Shop & Garage Equip	999,953
FL-G 396-Power Operated Equipment	366,584
FL-G 397-Communication Equipment	58,512
FL-G 398-Miscellaneous Equipment	11,717
Grand Total	**254,459,378**

County/District	Asset Type	Original Cost
Flagler County	Main Gas Lines	9,080,160
Flagler County	Gas Distribution Lines & Equip	101,079
Bunnel	Gas Distribution Lines & Equip	1,456,863
Flagler Beach	Gas Distribution Lines & Equip	101,079
Palm Coast	Gas Distribution Lines & Equip	318,620

FL-G 376-Mains - Situs	8,883,319
FL-G 378-Meas & Regulating Equip	196,841
FL-G 380-Services - Allocated	1,305,036
FL-G 381-Meters & Regs - Allocated	195,623
FL-G 382-Meter & Installs - Alloc	292,460
FL-G 383-House Regulators	124,067
FL-G 385-Ind Meas & Reg Stat Equip	32,805
FL-G 387-Other Equipment	27,652
Grand Total	**11,057,803**

County/District	Asset Type	Original Cost
Hardee County	Main Gas Lines	3,018,507
Hardee County	Gas Distribution Lines & Equip	2,450
Zolfo Springs	Gas Distribution Lines & Equip	2,450

FL-G 376-Mains - Situs	3,013,351
FL-G 378-Meas & Regulating Equip	5,156
FL-G 380-Services - Allocated	3,234
FL-G 381-Meters & Regs - Allocated	485
FL-G 382-Meter & Installs - Alloc	725
FL-G 383-House Regulators	307
FL-G 385-Ind Meas & Reg Stat Equip	81
FL-G 387-Other Equipment	68
Grand Total	**3,023,408**

County/District	Asset Type	Original Cost
Hendry	Main Gas Lines	1,090,802
Hendry	Gas Distribution Lines & Equip	131,557
LaBelle	Gas Distribution Lines & Equip	79,797

FL-G 376-Mains - Situs	1,090,802
FL-G 380-Services - Allocated	139,471
FL-G 381-Meters & Regs - Allocated	20,906
FL-G 382-Meter & Installs - Alloc	31,256
FL-G 383-House Regulators	13,259
FL-G 385-Ind Meas & Reg Stat Equip	3,506
FL-G 387-Other Equipment	2,955
Grand Total	**1,302,156**

County/District	Asset Type	Original Cost
Hernando County	Main Gas Lines	52,313,786
Hernando County	Gas Distribution Lines & Equip	1,880,764
Brooksville	Gas Distribution Lines & Equip	1,012,288

FL-G 376-Mains - Situs	52,217,453
FL-G 378-Meas & Regulating Equip	96,333
FL-G 380-Services - Allocated	1,909,111
FL-G 381-Meters & Regs - Allocated	286,172
FL-G 382-Meter & Installs - Alloc	427,833
FL-G 383-House Regulators	181,494
FL-G 385-Ind Meas & Reg Stat Equip	47,989
FL-G 387-Other Equipment	40,452
Grand Total	**55,206,838**

County/District	Asset Type	Original Cost
Highlands County	Main Gas Lines	5,404,665
Highlands County	Gas Distribution Lines & Equip	101,517
Highlands County	Materials & Supplies	23,665
Avon Park	Gas Distribution Lines & Equip	1,153,230

FL-154-Materials & Supplies	23,665
FL-G 376-Mains - Situs	5,177,151
FL-G 378-Meas & Reg Equip - Alloc	28,063
FL-G 380-Services - Allocated	828,001
FL-G 381-Meters & Regs - Allocated	124,116
FL-G 382-Meter & Installs - Alloc	185,556
FL-G 383-House Regulators	78,716
FL-G 385-Ind Meas & Reg Stat Equip	20,813
FL-G 387-Other Equipment	17,544
FL-G 391-Office Furn & Equip	12,202
FL-G 394-Tools, Shop & Garage Equip	102,733
FL-G 396-Power Operated Equipment	83,331
FL-G 398-Miscellaneous Equipment	1,184
Grand Total	**6,683,076**

County/District	Asset Type	Original Cost
Hillsborough County	Main Gas Lines	302,863,915
TA-Tampa	Gas Distribution Lines & Equip	62,296,817
TT-Temple Terrace	Gas Distribution Lines & Equip	739,719
U-Rural Hillsborough	Gas Distribution Lines & Equip	99,743,919
Hillsborough County	Materials & Supplies	295,924

FL-154-Materials & Supplies	295,924
FL-G 376-Mains - Situs	286,419,770
FL-G 378-Meas & Regulating Equip	4,386,178
FL-G 380-Services - Allocated	105,147,361
FL-G 381-Meters & Regs - Allocated	15,761,407
FL-G 382-Meter & Installs - Alloc	23,563,611
FL-G 383-House Regulators	9,996,082
FL-G 385-Ind Meas & Reg Stat Equip	2,643,068
FL-G 387-Other Equipment	2,227,935
FL-G 391-Office Furn & Equip	8,076,171
FL-G 394-Tools, Shop & Garage Equip	3,401,269
FL-G 396-Power Operated Equipment	1,303,342
FL-G 397-Communication Equipment	1,939,465
FL-G 398-Miscellaneous Equipment	778,712
Grand Total	**465,940,295**

County/District	Asset Type	Original Cost
Jackson County	Main Gas Lines	215,473
Jackson County	Gas Distribution Lines & Equip	7,553
Alford	Gas Distribution Lines & Equip	7,553

FL-G 376-Mains - Situs	215,473
FL-G 380-Services - Allocated	9,968
FL-G 381-Meters & Regs - Allocated	1,494
FL-G 382-Meter & Installs - Alloc	2,234
FL-G 383-House Regulators	948
FL-G 385-Ind Meas & Reg Stat Equip	250
FL-G 387-Other Equipment	211
Grand Total	**230,578**

County/District	Asset Type	Original Cost
Lafayette County	Main Gas Lines	127,721
Lafayette County	Gas Distribution Lines & Equip	1,266

FL-G 376-Mains - Situs	127,721
FL-G 380-Services - Allocated	836
FL-G 381-Meters & Regs - Allocated	125
FL-G 382-Meter & Installs - Alloc	187
FL-G 383-House Regulators	79
FL-G 385-Ind Meas & Reg Stat Equip	21
FL-G 387-Other Equipment	18
Grand Total	**128,987**

County/District	Asset Type	Original Cost
Lake County	Main Gas Lines	31,780,620
Lake County	Gas Distribution Lines & Equip	8,106,461
Lake County	Materials & Supplies	85,574
Eustis	Gas Distribution Lines & Equip	2,025,699
Howey in the Hills	Gas Distribution Lines & Equip	131,185
Lady Lake	Gas Distribution Lines & Equip	585,317
Mt. Dora	Gas Distribution Lines & Equip	2,632,216
Tavares	Gas Distribution Lines & Equip	2,151,773
Umatilla	Gas Distribution Lines & Equip	257,259

FL-154-Materials & Supplies	85,574
FL-G 367-Mains - Situs	2,253,956
FL-G 376-Mains - Situs	29,065,518
FL-G 378-Meas & Regulating Equip	237,516
FL-G 380-Services - Allocated	10,485,677
FL-G 381-Meters & Regs - Allocated	1,571,785
FL-G 382-Meter & Installs - Alloc	2,349,849
FL-G 383-House Regulators	996,845
FL-G 385-Ind Meas & Reg Stat Equip	263,576
FL-G 387-Other Equipment	222,178
FL-G 391-Office Furn & Equip	14,998
FL-G 394-Tools, Shop & Garage Equip	61,407
FL-G 396-Power Operated Equipment	98,881
FL-G 397-Communication Equipment	44,067
FL-G 398-Miscellaneous Equipment	4,277
Grand Total	**47,756,104**

County/District	Asset Type	Original Cost
Lee County	Main Gas Lines	81,239,289
Lee County	Gas Distribution Lines & Equip	13,845,820
Lee County	Materials & Supplies	620,544
Bonita Springs	Gas Distribution Lines & Equip	3,439,888
Cape Coral	Gas Distribution Lines & Equip	556,421
Fort Myers	Gas Distribution Lines & Equip	2,434,880
Fort Myers Beach	Gas Distribution Lines & Equip	112,147
	FL-154-Materials & Supplies	620,544
	FL-G 376-Mains - Situs	80,516,781
	FL-G 378-Meas & Regulating Equip	327,143
	FL-G 380-Services - Allocated	13,454,708
	FL-G 381-Meters & Regs - Allocated	2,016,837
	FL-G 382-Meter & Installs - Alloc	3,015,211
	FL-G 383-House Regulators	1,279,103
	FL-G 385-Ind Meas & Reg Stat Equip	338,208
	FL-G 387-Other Equipment	285,087
	FL-G 391-Office Furn & Equip	108,467
	FL-G 394-Tools, Shop & Garage Equip	204,483
	FL-G 396-Power Operated Equipment	23,713
	FL-G 397-Communication Equipment	50,013
	FL-G 398-Miscellaneous Equipment	8,690
	Grand Total	**102,248,988**

County/District	Asset Type	Original Cost
Leon County	Main Gas Lines	315,382
	FL-G 376-Mains - Situs	312,523
	FL-G 378-Meas & Regulating Equip	2,860
	Grand Total	**315,382**

County/District	Asset Type	Original Cost
Levy County	Main Gas Lines	610,485
Levy County	Gas Distribution Lines & Equip	3,801
Levy County	Gas Purification Equip	11,111,248
	FL-G 336 -Gas Purification Equip Situs	11,111,248
	FL-G 376-Mains - Situs	610,485
	FL-G 380-Services - Allocated	2,508
	FL-G 381-Meters & Regs - Allocated	376
	FL-G 382-Meter & Installs - Alloc	562
	FL-G 383-House Regulators	238
	FL-G 385-Ind Meas & Reg Stat Equip	63
	FL-G 387-Other Equipment	53
	Grand Total	**11,725,533**

County/District	Asset Type	Original Cost
Liberty County	Main Gas Lines	153,267
Liberty County	Gas Distribution Lines & Equip	1,888
	FL-G 376-Mains - Situs	153,267
	FL-G 380-Services - Allocated	1,246
	FL-G 381-Meters & Regs - Allocated	187
	FL-G 382-Meter & Installs - Alloc	279
	FL-G 383-House Regulators	118
	FL-G 385-Ind Meas & Reg Stat Equip	31
	FL-G 387-Other Equipment	26
	Grand Total	**155,154**

County/District	Asset Type	Original Cost
Manatee County	Main Gas Lines	53,351,288
Manatee County	Gas Distribution Lines & Equip	52,198,841
Bradenton	Gas Distribution Lines & Equip	2,414,317
Bradenton Beach	Gas Distribution Lines & Equip	57,908

Holmes Beach	Gas Distribution Lines & Equip	164,815
Longboat Key - Manatee	Gas Distribution Lines & Equip	734,986
Palmetto	Gas Distribution Lines & Equip	798,833

FL-G 376-Mains - Situs	52,554,539
FL-G 378-Meas & Regulating Equip	787,936
FL-G 380-Services - Allocated	37,198,100
FL-G 381-Meters & Regs - Allocated	5,575,931
FL-G 382-Meter & Installs - Alloc	8,336,125
FL-G 383-House Regulators	3,536,323
FL-G 385-Ind Meas & Reg Stat Equip	935,041
FL-G 387-Other Equipment	788,179
FL-G 397-Communication Equipment	8,813
Grand Total	**109,720,987**

County/District	Asset Type	Original Cost
Marion County	Main Gas Lines	50,319,544
Marion County	Gas Distribution Lines & Equip	20,631,790
Marion County	Materials & Supplies	544,183
Belleview	Gas Distribution Lines & Equip	131,760
Ocala	Gas Distribution Lines & Equip	11,930,584

FL-154-Materials & Supplies	544,183
FL-G 376-Mains - Situs	49,050,822
FL-G 378-Meas & Regulating Equip	818,074
FL-G 380-Services - Allocated	21,574,706
FL-G 381-Meters & Regs - Allocated	3,234,011
FL-G 382-Meter & Installs - Alloc	4,834,910
FL-G 383-House Regulators	2,051,049
FL-G 385-Ind Meas & Reg Stat Equip	542,319
FL-G 387-Other Equipment	457,140
FL-G 391-Office Furn & Equip	85,118
FL-G 394-Tools, Shop & Garage Equip	191,937
FL-G 396-Power Operated Equipment	81,071
FL-G 397-Communication Equipment	79,455
FL-G 398-Miscellaneous Equipment	13,068
Grand Total	**83,557,861**

County/District	Asset Type	Original Cost
Martin County	Main Gas Lines	7,913,765
Martin County	Gas Distribution Lines & Equip	431,322
Stuart	Gas Distribution Lines & Equip	832,470

FL-G 376-Mains - Situs	7,913,765
FL-G 380-Services - Allocated	833,971
FL-G 381-Meters & Regs - Allocated	125,011
FL-G 382-Meter & Installs - Alloc	186,893
FL-G 383-House Regulators	79,283
FL-G 385-Ind Meas & Reg Stat Equip	20,963
FL-G 387-Other Equipment	17,671
Grand Total	**9,177,558**

County/District	Asset Type	Original Cost
Nassau County	Main Gas Lines	41,654,444
Nassau County	Gas Distribution Lines & Equip	6,926

FL-G 376-Mains - Situs	22,049,055
FL-G 377-Compressor Equip	19,177,801
FL-G 378-Meas & Regulating Equip	427,589
FL-G 380-Services - Allocated	4,570
FL-G 381-Meters & Regs - Allocated	685
FL-G 382-Meter & Installs - Alloc	1,024
FL-G 383-House Regulators	434
FL-G 385-Ind Meas & Reg Stat Equip	115

FL-G 387-Other Equipment	97
Grand Total	**41,661,370**

County/District	Asset Type	Original Cost
Okeechobee County	Gas Purification Equip	35,909,430

County/District	Asset Type	Original Cost
Orange County	Main Gas Lines	175,890,933
Orange County	Gas Distribution Lines & Equip	49,544,552
Orange County	Materials and Supplies	202,710
Belle Isle	Gas Distribution Lines & Equip	11,273
Edgewood	Gas Distribution Lines & Equip	117,244
Maitland	Gas Distribution Lines & Equip	622,294
Orlando	Gas Distribution Lines & Equip	28,321,158
Winter Park	Gas Distribution Lines & Equip	5,625,451

FL-154-Materials & Supplies	202,710
FL-G 367-Mains - Situs	94,021,848
FL-G 376-Mains - Situs	74,894,778
FL-G 378-Meas & Regulating Equip	3,278,241
FL-G 380-Services - Allocated	55,590,883
FL-G 381-Meters & Regs - Allocated	8,332,977
FL-G 382-Meter & Installs - Alloc	12,457,963
FL-G 383-House Regulators	5,284,875
FL-G 385-Ind Meas & Reg Stat Equip	1,397,376
FL-G 387-Other Equipment	1,177,898
FL-G 391-Office Furn & Equip	179,380
FL-G 394-Tools, Shop & Garage Equip	3,021,549
FL-G 396-Power Operated Equipment	176,790
FL-G 397-Communication Equipment	305,346
FL-G 398-Miscellaneous Equipment	13,002
Grand Total	**260,335,615**

County/District	Asset Type	Original Cost
Osceola County	Main Gas Lines	30,779,179
Osceola County	Gas Distribution Lines & Equip	19,600,018
Celebration	Gas Distribution Lines & Equip	24,802
Kissimmee	Gas Distribution Lines & Equip	6,376,263

FL-G 367-Mains - Situs	19,338,906
FL-G 376-Mains - Situs	10,634,637
FL-G 378-Meas & Regulating Equip	805,635
FL-G 380-Services - Allocated	17,157,992
FL-G 381-Meters & Regs - Allocated	2,571,953
FL-G 382-Meter & Installs - Alloc	3,845,121
FL-G 383-House Regulators	1,631,165
FL-G 385-Ind Meas & Reg Stat Equip	431,297
FL-G 387-Other Equipment	363,555
Grand Total	**56,780,261**

County/District	Asset Type	Original Cost
Palm Beach County	Main Gas Lines	23,247,439
Palm Beach County	Gas Distribution Lines & Equip	788,096
Palm Beach County	Materials and Supplies	196,097
Jupiter	Gas Distribution Lines & Equip	5,770,492
Lake Park	Gas Distribution Lines & Equip	8,875
Palm Beach Gardens	Gas Distribution Lines & Equip	17,442,825
Tequesta	Gas Distribution Lines & Equip	67,450

FL-154-Materials & Supplies	196,097
FL-G 376-Mains - Situs	23,019,163
FL-G 378-Meas & Regulating Equip	4,582
FL-G 380-Services - Allocated	15,888,785
FL-G 381-Meters & Regs - Allocated	2,381,701
FL-G 382-Meter & Installs - Alloc	3,560,690
FL-G 383-House Regulators	1,510,504
FL-G 385-Ind Meas & Reg Stat Equip	399,393
FL-G 387-Other Equipment	336,663
FL-G 391-Office Furn & Equip	21,753
FL-G 394-Tools, Shop & Garage Equip	93,565
FL-G 396-Power Operated Equipment	40,956
FL-G 397-Communication Equipment	63,005
FL-G 398-Miscellaneous Equipment	4,415
Grand Total	**47,521,272**

County/District	Asset Type	Original Cost
Pasco County	Main Gas Lines	46,693,355
Pasco County	Gas Distribution Lines & Equip	25,288,520
Dade City	Gas Distribution Lines & Equip	169,143
San Antonio	Gas Distribution Lines & Equip	9,021
St. Leo	Gas Distribution Lines & Equip	9,021
Zephyrhills	Gas Distribution Lines & Equip	85,699

FL-G 376-Mains - Situs	46,110,560
FL-G 378-Meas & Regulating Equip	582,795
FL-G 380-Services - Allocated	16,867,850
FL-G 381-Meters & Regs - Allocated	2,528,462
FL-G 382-Meter & Installs - Alloc	3,780,099
FL-G 383-House Regulators	1,603,581
FL-G 385-Ind Meas & Reg Stat Equip	424,003
FL-G 387-Other Equipment	357,408
Grand Total	**72,254,758**

County/District	Asset Type	Original Cost
Pinellas County	Main Gas Lines	77,739,858
Pinellas County	Gas Distribution Lines & Equip	6,090,536
Pinellas County	Materials and Supplies	235,755
City of Seminole	Gas Distribution Lines & Equip	877,814
Gulfport	Gas Distribution Lines & Equip	812,445
Kenneth City	Gas Distribution Lines & Equip	211,049
Largo	Gas Distribution Lines & Equip	500,541
Madeira Beach	Gas Distribution Lines & Equip	179,298
Pinellas Park	Gas Distribution Lines & Equip	1,679,053
South Pasadena	Gas Distribution Lines & Equip	121,400
St. Petersburg	Gas Distribution Lines & Equip	33,917,246
St. Petersburg Beach	Gas Distribution Lines & Equip	719,061
Treasure Island	Gas Distribution Lines & Equip	201,711

FL-154-Materials & Supplies	235,755
FL-G 376-Mains - Situs	76,615,802
FL-G 378-Meas & Regulating Equip	521,134
FL-G 380-Services - Allocated	29,899,958
FL-G 381-Meters & Regs - Allocated	4,481,952
FL-G 382-Meter & Installs - Alloc	6,700,606
FL-G 383-House Regulators	2,842,508
FL-G 385-Ind Meas & Reg Stat Equip	751,589
FL-G 387-Other Equipment	633,541
FL-G 391-Office Furn & Equip	111,822
FL-G 394-Tools, Shop & Garage Equip	326,125
FL-G 396-Power Operated Equipment	101,084
FL-G 397-Communication Equipment	46,846
FL-G 398-Miscellaneous Equipment	17,045
Grand Total	**123,285,766**

County/District	Asset Type	Original Cost
Polk County	Main Gas Lines	33,117,936
Polk County	Gas Distribution Lines & Equip	2,840,761
Polk County	Materials and Supplies	326,918
Frostproof	Gas Distribution Lines & Equip	215,216
Lakeland	Gas Distribution Lines & Equip	11,166,299

Mulberry	Gas Distribution Lines & Equip	7,353

FL-154-Materials & Supplies	326,918
FL-G 367-Mains - Situs	420,420
FL-G 376-Mains - Situs	31,891,120
FL-G 378-Meas & Reg Equip - Alloc	5,280
FL-G 378-Meas & Regulating Equip	584,374
FL-G 380-Services - Allocated	9,390,065
FL-G 381-Meters & Regs - Allocated	1,407,554
FL-G 382-Meter & Installs - Alloc	2,104,321
FL-G 383-House Regulators	892,688
FL-G 385-Ind Meas & Reg Stat Equip	236,036
FL-G 387-Other Equipment	198,963
FL-G 391-Office Furn & Equip	82,093
FL-G 394-Tools, Shop & Garage Equip	38,583
FL-G 396-Power Operated Equipment	23,891
FL-G 397-Communication Equipment	64,327
FL-G 398-Miscellaneous Equipment	7,848
Grand Total	**47,674,482**

County/District	Asset Type	Original Cost
Putnam County	Main Gas Lines	4,954,445
Putnam County	Gas Distribution Lines & Equip	2,308

FL-G 376-Mains - Situs	4,954,445
FL-G 380-Services - Allocated	1,523
FL-G 381-Meters & Regs - Allocated	228
FL-G 382-Meter & Installs - Alloc	341
FL-G 383-House Regulators	145
FL-G 385-Ind Meas & Reg Stat Equip	38
FL-G 387-Other Equipment	32
Grand Total	**4,956,753**

County/District	Asset Type	Original Cost
Sarasota County	Main Gas Lines	60,772,763
Sarasota County	Gas Distribution Lines & Equip	18,805,243
Sarasota County	Materials and Supplies	1,155,010
City of Sarasota	Gas Distribution Lines & Equip	7,455,280
Longboat Key - Sarasota	Gas Distribution Lines & Equip	1,412,064
North Port	Gas Distribution Lines & Equip	2,096,565
Venice	Gas Distribution Lines & Equip	3,565,052

FL-154-Materials & Supplies	1,155,010
FL-G 376-Mains - Situs	58,746,048
FL-G 378-Meas & Regulating Equip	1,262,323
FL-G 380-Services - Allocated	21,997,086
FL-G 381-Meters & Regs - Allocated	3,297,325
FL-G 382-Meter & Installs - Alloc	4,929,565
FL-G 383-House Regulators	2,091,204
FL-G 385-Ind Meas & Reg Stat Equip	552,936
FL-G 387-Other Equipment	466,089
FL-G 391-Office Furn & Equip	129,525
FL-G 393-Stores Equipment	1,283
FL-G 394-Tools, Shop & Garage Equip	504,893
FL-G 396-Power Operated Equipment	59,514
FL-G 397-Communication Equipment	61,107
FL-G 398-Miscellaneous Equipment	8,071
Grand Total	**95,261,978**

County/District	Asset Type	Original Cost
Seminole County	Main Gas Lines	25,669,878
Seminole County	Gas Distribution Lines & Equip	11,336,580
Altamonte Springs	Gas Distribution Lines & Equip	2,090,098
Casselberry	Gas Distribution Lines & Equip	4,058,442
Longwood	Gas Distribution Lines & Equip	202,922
Oviedo	Gas Distribution Lines & Equip	437,410

FL-G 367-Mains - Situs	10,311,110
FL-G 376-Mains - Situs	13,897,233
FL-G 378-Meas & Regulating Equip	1,461,535
FL-G 380-Services - Allocated	11,960,900
FL-G 381-Meters & Regs - Allocated	1,792,918
FL-G 382-Meter & Installs - Alloc	2,680,448

FL-G 383-House Regulators	1,137,091
FL-G 385-Ind Meas & Reg Stat Equip	300,659
FL-G 387-Other Equipment	253,436
Grand Total	**43,795,329**

County/District	Asset Type	Original Cost
St. Johns County	Main Gas Lines	59,672,274
St. Johns County	Gas Distribution Lines & Equip	69,600,268
St. Augustine	Gas Distribution Lines & Equip	1,031,953
St. Augustine Beach	Gas Distribution Lines & Equip	113,122

FL-G 376-Mains - Situs	58,732,404
FL-G 378-Meas & Regulating Equip	939,870
FL-G 380-Services - Allocated	46,684,520
FL-G 381-Meters & Regs - Allocated	6,997,929
FL-G 382-Meter & Installs - Alloc	10,462,040
FL-G 383-House Regulators	4,438,172
FL-G 385-Ind Meas & Reg Stat Equip	1,173,499
FL-G 387-Other Equipment	989,184
Grand Total	**130,417,618**

County/District	Asset Type	Original Cost
St. Lucie County	Main Gas Lines	3,010,320

County/District	Asset Type	Original Cost
Sumter County	Main Gas Lines	36,748,893
Sumter County	Gas Distribution Lines & Equip	23,612,852
Coleman	Gas Distribution Lines & Equip	1,266
Wildwood	Gas Distribution Lines & Equip	13,663,731

FL-G 376-Mains - Situs	36,438,889
FL-G 378-Meas & Regulating Equip	310,004
FL-G 380-Services - Allocated	24,599,478
FL-G 381-Meters & Regs - Allocated	3,687,419
FL-G 382-Meter & Installs - Alloc	5,512,764
FL-G 383-House Regulators	2,338,606
FL-G 385-Ind Meas & Reg Stat Equip	618,352
FL-G 387-Other Equipment	521,230
Grand Total	**74,026,742**

County/District	Asset Type	Original Cost
Volusia County	Main Gas Lines	30,145,089
Volusia County	Gas Distribution Lines & Equip	813,031
Volusia County	Materials and Supplies	59,609
Daytona Beach	Gas Distribution Lines & Equip	15,054,249
Daytona Beach Shores	Gas Distribution Lines & Equip	329,607
Holly Hill	Gas Distribution Lines & Equip	571,319
Ormond Beach	Gas Distribution Lines & Equip	1,012,992
Port Orange	Gas Distribution Lines & Equip	2,430,302
South Daytona	Gas Distribution Lines & Equip	753,701

FL-154-Materials & Supplies	59,609
FL-G 376-Mains - Situs	28,873,378
FL-G 378-Meas & Regulating Equip	876,787
FL-G 380-Services - Allocated	13,834,837
FL-G 381-Meters & Regs - Allocated	2,073,818
FL-G 382-Meter & Installs - Alloc	3,100,399
FL-G 383-House Regulators	1,315,241
FL-G 385-Ind Meas & Reg Stat Equip	347,763
FL-G 387-Other Equipment	293,142
FL-G 391-Office Furn & Equip	59,791
FL-G 394-Tools, Shop & Garage Equip	172,020
FL-G 396-Power Operated Equipment	128,776
FL-G 397-Communication Equipment	23,208
FL-G 398-Miscellaneous Equipment	11,129
Grand Total	**51,169,898**

County/District	Asset Type	Original Cost
Wakulla County	Main Gas Lines	180,076
Wakulla County	Gas Distribution Lines & Equip	5,664

FL-G 376-Mains - Situs	180,076
FL-G 380-Services - Allocated	3,738
FL-G 381-Meters & Regs - Allocated	560
FL-G 382-Meter & Installs - Alloc	838
FL-G 383-House Regulators	355
FL-G 385-Ind Meas & Reg Stat Equip	94
FL-G 387-Other Equipment	79
Grand Total	**185,740**

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM
Peoples Gas System 2026 Property Tax Budget Appraisal
County Allocation Factors
USE 2024 ACTUAL ALLOCATION FACTORS BELOW FOR 2026 BUDGET APPRAISAL PROJECTIONS

		ALLOCATION FACTOR	--------ORIGINAL COST 12/31/24-------- PLANT	SUPPLIES/NON UTILITY	TOTAL	FMV	
1	Baker	0.092%	$ 2,683,911		$ 2,683,911	$ 1,359,874	
2	Bay	3.526%	102,792,307	228,035	103,020,341	$ 52,310,468	
3	Bradford	0.058%	1,697,152		1,697,152	$ 859,907	
4	Brevard	0.101%	2,947,608		2,947,608	$ 1,493,483	
5	Broward	6.152%	179,340,742		179,340,742	$ 90,867,718	
6	Charlotte	0.990%	28,851,094		28,851,094	$ 14,618,168	
7	Clay	1.009%	29,407,135		29,407,135	$ 14,899,901	
8	Collier	3.830%	111,630,788		111,630,788	$ 56,560,683	
9	Columbia	0.009%	251,255		251,255	$ 127,305	
10	Dade	7.537%	219,711,489	621,572	220,333,061	$ 111,944,194	
11	Duval	8.714%	254,011,071	448,306	254,459,378	$ 129,149,716	
12	Flager	0.379%	11,057,803		11,057,803	$ 5,602,727	
14	Hardee	0.104%	3,023,408		3,023,408	$ 1,531,889	
13	Hendry	0.045%	1,302,156		1,302,156	$ 659,772	
15	Hernando	1.894%	55,206,838		55,206,838	$ 27,972,001	
16	Highlands	0.228%	6,659,411	23,665	6,683,076	$ 3,397,831	
17	Hillsborough	15.974%	465,644,370	295,924	465,940,295	$ 236,226,927	
18	Jackson	0.008%	230,578		230,578	$ 116,828	
19	Lafayette	0.004%	128,987		128,987	$ 65,355	
20	Lake	1.635%	47,670,530	85,574	47,756,104	$ 24,239,106	
21	Lee	3.486%	101,628,444	620,544	102,248,988	$ 52,113,276	
22	Leon	0.011%	315,382		315,382	$ 159,797	
23	Levy	0.021%	614,285	11,111,248	11,725,533	$ 11,236,244	0.95827145
24	Liberty	0.005%	155,154		155,154	$ 78,613	
25	Manatee	3.764%	109,720,987		109,720,987	$ 55,593,032	
26	Marion	2.848%	83,013,679	544,183	83,557,861	$ 42,605,253	
27	Martin	0.315%	9,177,558		9,177,558	$ 4,650,052	
28	Nassau	1.429%	41,661,370		41,661,370	$ 21,108,832	
29	Okeechobee	1.232%	35,909,430		35,909,430	$ 18,194,460	
30	Orange	8.924%	260,132,906	202,710	260,335,615	$ 132,005,908	
31	Osceola	1.948%	56,780,261		56,780,261	$ 28,769,217	
32	Palm Beach	1.624%	47,325,176	196,097	47,521,272	$ 24,174,645	
33	Pasco	2.479%	72,254,758		72,254,758	$ 36,609,779	
34	Pinellas	4.221%	123,050,011	235,755	123,285,766	$ 62,582,289	
35	Polk	1.624%	47,347,565	326,918	47,674,482	$ 24,316,810	
36	Putnam	0.170%	4,956,753		4,956,753	$ 2,511,470	
37	Sarasota	3.228%	94,106,968	1,155,010	95,261,978	$ 48,836,788	
38	Seminole	1.502%	43,795,329		43,795,329	$ 22,190,059	
39	St. Johns	4.474%	130,417,618		130,417,618	$ 66,079,526	
40	St. Lucie	0.103%	3,010,320		3,010,320	$ 1,525,258	
41	Sumter	2.540%	74,026,742		74,026,742	$ 37,507,601	
42	Volusia	1.753%	51,110,289	59,609	51,169,898	$ 25,955,985	
43	Wakulla	0.006%	185,740		185,740	$ 94,110	
	Total	100.000%	$ 2,914,945,360	$ 16,155,149	$ 2,931,100,509	$ 1,492,902,857	
			$ (595,169,640)	#REF!	2,894,351,616		

FPSC EXH NO. 97

ADMITTED

Peoples Gas System
2026 Property Tax Budget
Dollars In Thousands

															Total	Excl Alliance	Net of Brightmark payment
														2026 Budget	$ 29,015	$ 28,859	$ 28,546
	Summary	Allocation	2026 Est Filed	2023 TRIM Assessed TPP	2023 TRIM RealAssessed	2023 TPP TAX ACTUAL	2023 Real Prop Tax Actual	2026 Est'd TPP Assessed	2026 Est Real Est Assessed	2026 Est'd TPP Tax	2026 Est. R.E. Tax	Total 2026 Est Tax		2023 Effective Mils TPP	2023 Effective Mils Real Property
	TPP									$ 27,656	$ 1,359	$ 29,015			
1	Baker	0.092%	1,641	1,314	0	$ 17	$ -	$ 1,641	$ -	$ 21	$ -	$ 21	Baker	0.012938	
2	Bay	3.526%	62,843	44,242	1,069	$ 555	$ 17	$ 62,843	$ 1,101	$ 788	$ 18	$ 806	Bay	0.012545	0.015902713
3	Bradford	0.058%	1,038	822	22	$ 12	$ 1	$ 1,038	$ 23	$ 15	$ 1	$ 16	Bradford	0.014599	0.045454545
4	Brevard	0.101%	1,802	1,365	0	$ 23	$ -	$ 1,802	$ -	$ 30	$ -	$ 30	Brevard	0.016850	
5	Broward	6.152%	109,642	81,140	227	$ 1,547	$ 6	$ 109,642	$ 234	$ 2,090	$ 6	$ 2,097	Broward	0.019066	0.026431718
6	Charlotte	0.990%	17,638	11,668	0	$ 181	$ -	$ 17,638	$ -	$ 274	$ -	$ 274	Charlotte	0.015513	
7	Clay	1.009%	17,978	12,913	190	$ 188	$ 3	$ 17,978	$ 196	$ 262	$ 3	$ 265	Clay	0.014559	0.015789474
8	Collier	3.830%	68,247	51,216	0	$ 487	$ -	$ 68,247	$ -	$ 649	$ -	$ 649	Collier	0.009509	
9	Columbia	0.009%	154	100	0	$ 1	$ -	$ 154	$ -	$ 2	$ -	$ 2	Columbia	0.010000	
10	Dade	7.537%	134,323	97,196	20,945	$ 1,830	$ 465	$ 134,323	$ 21,573	$ 2,529	$ 479	$ 3,008	Dade	0.018828	0.022201003
11	Duval	8.714%	155,293	112,150	4,080	$ 1,934	$ 76	$ 155,293	$ 4,202	$ 2,678	$ 78	$ 2,756	Duval	0.017245	0.018627451
12	Flager	0.379%	6,760	4,728	0	$ 96	$ -	$ 6,760	$ -	$ 137	$ -	$ 137	Flager	0.020305	
14	Hardee	0.104%	1,848	1,952	0	$ 27	$ -	$ 1,848	$ -	$ 26	$ -	$ 26	Hardee	0.013832	
15	Hendry	0.045%	796	609	0	$ 9	$ -	$ 796	$ -	$ 12	$ -	$ 12	Hendry	0.014778	
16	Hernando	1.894%	33,751	5,410	16	$ 81	$ -	$ 33,751	$ 16	$ 505	$ -	$ 505	Hernando	0.014972	
17	Highlands	0.228%	4,071	1,750	0	$ 24	$ -	$ 4,071	$ -	$ 56	$ -	$ 56	Highlands	0.013714	
18	Hillsborough	15.974%	265,307	179,239	5,742	$ 3,106	$ 102	$ 265,307	$ 5,914	$ 4,597	$ 572	$ 5,170	Hillsborough	0.017329	0.017763845
18	Jackson	0.008%	141	121	0	$ 2	$ -	$ 141	$ -	$ 2	$ -	$ 2	Jackson	0.016529	
19	Lafayette	0.004%	79	35	0	$ 1	$ -	$ 79	$ -	$ 2	$ -	$ 2	Lafayette	0.028571	
20	Lake	1.635%	29,144	21,136	521	$ 290	$ 10	$ 29,144	$ 537	$ 400	$ 10	$ 410	Lake	0.013721	0.019193858
21	Lee	3.486%	62,132	48,899	594	$ 682	$ 13	$ 62,132	$ 612	$ 867	$ 13	$ 880	Lee	0.013947	0.021885522
22	Leon	0.011%	193	127	0	$ 2	$ -	$ 193	$ -	$ 3	$ -	$ 3	Leon	0.015748	
23	Levy	0.021%	376	2,389	34	$ 34	$ 1	$ 376	$ 35	$ 5	$ 1	$ 6	Levy	0.014232	0.029411765
	Levy Non Utility		10,925					$ 10,925	$ -	$ 155		**$ 155**	**Levy**		
24	Liberty	0.005%	95	52	0	$ 1	$ -	$ 95	$ -	$ 2	$ -	$ 2	Liberty	0.019231	
25	Manatee	3.764%	67,079	48,591	32	$ 657	$ 1	$ 67,079	$ 33	$ 907	$ 1	$ 908	Manatee	0.013521	0.03125
26	Marion	2.848%	50,751	32,833	627	$ 518	$ 12	$ 50,751	$ 646	$ 801	$ 12	$ 813	Marion	0.015777	0.019138756
27	Martin	0.315%	5,611	4,379	0	$ 71	$ -	$ 5,611	$ -	$ 91	$ -	$ 91	Martin	0.016214	
28	Nassau	1.429%	25,470	20,671	130	$ 373	$ 2	$ 25,470	$ 134	$ 460	$ 2	$ 462	Nassau	0.018045	0.015384615
29	Okeechobee	1.232%	21,954					$ 21,954	$ -	$ 362	$ -	$ 362	Okeechobee		
30	Orange	8.924%	159,035	74,485	2,040	$ 1,171	$ 40	$ 159,035	$ 2,101	$ 2,500	$ 41	$ 2,541	Orange	0.015721	0.019607843
31	Osceola	1.948%	34,713	26,440	0	$ 383	$ -	$ 34,713	$ -	$ 503	$ -	$ 503	Osceola	0.014486	
32	Palm Beach	1.624%	28,933	21,429	1,391	$ 368	$ 25	$ 28,933	$ 1,433	$ 497	$ 26	$ 523	Palm Beach	0.017173	0.017972682
33	Pasco	2.479%	44,174	23,715	87	$ 389	$ 2	$ 44,174	$ 90	$ 725	$ 2	$ 727	Pasco	0.016403	0.022988506
34	Pinellas	4.221%	75,228	56,311	2,280	$ 838	$ 45	$ 75,228	$ 2,348	$ 1,120	$ 46	$ 1,166	Pinellas	0.014882	0.019736842
35	Polk	1.624%	28,947	20,765	571	$ 301	$ 10	$ 28,947	$ 588	$ 420	$ 10	$ 430	Polk	0.014496	0.017513135
36	Putnam	0.170%	3,030	2,243	18	$ 35	$ 1	$ 3,030	$ 19	$ 47	$ 1	$ 48	Putnam	0.015604	0.055555556
37	Sarasota	3.228%	57,533	43,373	1,234	$ 552	$ 19	$ 57,533	$ 1,271	$ 732	$ 20	$ 752	Sarasota	0.012727	0.015397083
38	Seminole	1.502%	26,775	19,630	0	$ 260	$ -	$ 26,775	$ -	$ 355	$ -	$ 355	Seminole	0.013245	
39	St. Johns	4.474%	79,732	54,434	100	$ 681	$ 1	$ 79,732	$ 103	$ 997	$ 1	$ 999	St. Johns	0.012511	0.01
40	St. Lucie	0.103%	1,840	1,591	0	$ 37	$ -	$ 1,840	$ -	$ 43	$ -	$ 43	St. Lucie	0.023256	
41	Sumter	2.540%	45,257	32,273	16	$ 322	$ -	$ 45,257	$ 16	$ 452	$ -	$ 452	Sumter	0.009977	0
42	Volusia	1.753%	31,247	23,216	745	$ 398	$ 14	$ 31,247	$ 767	$ 536	$ 14	$ 550	Volusia	0.017143	0.018791946
43	Wakulla	0.006%	114	67	0	$ 1	$ -	$ 114	$ -	$ 2	$ -	$ 2	Wakulla	0.014925	
		100.00%	1,773,642	$ 1,187,019	$ 42,711	$ 18,485	$ 866	$ 1,773,642	$ 43,992	$ 27,656	$ 1,359	$ 29,015		0.015573	0.020276

PGS Midtown HQ prop tax forecast 2026

Midtown HQ		2025	2026	2027	2028	2029
Garage (includes taxes)		536,757	709,562	730,849	752,774	775,357
Bldg HOA		1,689,686	2,983,503	3,073,009	3,165,199	3,260,155
Interior		775,989	1,443,336	1,496,334	1,544,151	1,614,717
Bldg Taxes		0	1,794,590	2,063,779	2,373,346	2,729,348
Total Midtown O&M Costs		**3,002,432**	**6,930,992**	**7,363,970**	**7,835,470**	**8,379,577**
Moving Costs		**1,000,000**				
9 months of PLAZA expenses		**4,345,762**				
Total O&M costs		**8,348,194**	**6,930,992**	**7,363,970**	**7,835,470**	**8,379,577**
Total						
	Tampa Electric	**6,573,990**	**5,128,934**	**5,449,338**	**5,798,247**	**6,200,887**
	PGS	**1,774,204**	**1,802,058**	**1,914,632**	**2,037,222**	**2,178,690**
			0.26			
			466,593.50	PGS Midtown 2026 Ptax forecast		

Est'd Total Prop Tax for new HQ	PGS% Apportionment	
1794590	26%	466593.4

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ADMITTED

Div.	County	County	Division Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	BPC Cost Center	
			Sum of 1 & 7	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**5,293**	**CC_301000**	
1	Broward	$ 2,168	**1**	$ 2,168	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	2,168	CC_301001	
1	Brevard	$ 31		$ 31	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	31	CC_301000	
2	Hillsborough	$ 5,170	**2**	$ 5,170	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	5,170	CC_302000	
3	Hernando	$ 522																
3	Pasco	$ 751																
3	Pinellas	$ 1,204	**3**	$ 2,478	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	2,478	CC_303000	
4	Orange	$ 2,626																
4	Osceola	$ 520																
4	Seminole	$ 367	**4**	$ 3,513	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	3,513	CC_304000	
5	Lake	$ 424																
5	Sumter	$ 467	**5**	$ 891	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	891	CC_305000	
6	Baker	$ 22																
6	Bradford	$ 17																
6	Clay	$ 274																
6	Columbia	$ 2																
6	Duval	$ 2,847																
6	Lafayette	$ 2																
6	Nassau	$ 477																
6	Putnam	$ 50																
6	St. Johns	$ 1,032																
6	Union	$ -	**6**	$ 4,723	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	4,723	CC_306000	
7	Dade	$ 3,094	**7**	$ 3,094	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	3,094	CC_301001	
8	Polk	$ 444	**8**	$ 444	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	444	CC_308000	
9	Flager	$ 142																
9	Volusia	$ 568	**9**	$ 710	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	710	CC_309000	
10	Hardee	$ 26																
10	Highlands	$ 58	**10**	$ 84	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	84	CC_310000	
11	Manatee	$ 939																
11	Sarasota	$ 777	**11**	$ 1,715	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	1,715	CC_311000	
13	Martin	$ 94																
13	Okeechobee	$ 375																
13	Palm Beach	$ 539																
13	St. Lucie	$ 44	**13**	$ 1,052	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	1,052	CC_313000	$ (312.86) Adjust December for this amount
14	Jackson	$ 2																
14	Leon	$ 3																
14	Liberty	$ 2																
14	Wakulla	$ 2																
14	Bay	$ 833	**14**	$ 842	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	842	CC_314000	
15	Levy	$ 7																
15	Marion	$ 840	**15**	$ 847	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	847	CC_315000	
16	Charlotte	$ 283																
16	Collier	$ 671																
16	Hendry	$ 12																
16	Lee	$ 909	**16**	$ 1,875	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	1,875	CC_316000	
	Total Acct 6900060	$ 29,637		$ 29,636.631	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 29,636.631		
																$ 29,323.772		
15	Levy Non Utility (Acct 6900065)	$ 155		$ 155.000	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917			
	Payable Entry (Account 2360604)			$ 29,791.631	$ 2,482.636	$ 4,965.272	$ 7,447.908	$ 9,930.544	$ 12,413.179	$ 14,895.815	$ 17,365.534	$ 19,848.170	$ 22,330.806	$ 24,813.442	$ (2,482.636)		CC_PC01001	
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		

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ADMITTED

RNG plant	84%	$ 312.86	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 739.46
Gas Main	16%	$ 61.67													

County/District	Asset Type	Original Cost	% Total
Okeechobee County	Gas Purification Equip	35,909,430	0.835336902
	376 Gas Mains & 378 Measuring/Regulating Equip	7,078,531	0.164663098
	Grand Total	**42,987,961**	
	Total Okeechobee 2024 property tax	231,348.24	
	Allocable to RNG Plant	193,253.72	
	Allocable to Gas Main	38,094.52	

FPSC EXH NO. 97

ADMITTED

Tampa Electric Company, dba Peoples Gas System
Plant In Service, Depreciation and Amortization Forecast 12/31/2025F
2026 Property Tax Budget

		12/31/2025F				12/31/2024F				25 v. 24			
		Cost	Dep & Amort.	NBV		Cost	Dep & Amort.	NBV		1	Dep & Amort.	NBV	
301	Organization	$ 13,000	$ -	$ 13,000		$ 11,000	$ -	$ 11,000		$ 2,000	$ -	$ 2,000	
302	Franchsies and Consents	-	(0)	$ (0)		-	(0)	$ (0)		-	-	-	
303	Software	138,245,000	(45,693,000)	$ 92,552,000		121,196,000	(37,727,000)	$ 83,469,000		17,049,000	(7,966,000)	9,083,000	
374	Land Rights / Easements	30,950,000	(1,206,000)	$ 29,744,000		30,912,000	(1,090,000)	$ 29,822,000		38,000	(116,000)	(78,000)	
375/390	Structures and Improvement	103,635,000	(5,664,000)	$ 97,971,000		32,642,000	(9,845,000)	$ 22,797,000		70,993,000	4,181,000	75,174,000	
392	Vehicle Fleet	51,181,000	(22,026,000)	$ 29,155,000		44,886,000	(18,947,000)	$ 25,939,000		6,295,000	(3,079,000)	3,216,000	
	Subtotal	$ 324,024,000	$ (74,589,000)	$ 249,435,000		$ 229,647,000	$ (67,609,000)	$ 162,038,000		$ 94,377,000	$ (6,980,000)	87,397,000	35.0%
	Total Exempt & Separately Assess Property	$ 324,024,000	$ (74,589,000)	$ 249,435,000	8.7%	$ 229,647,000	$ (67,609,000)	$ 162,038,000		$ 94,377,000	$ (6,980,000)	87,397,000	35.0%
												-	
	TPP Plant In Service	$ 3,510,115,000	$ (944,165,000)	$ 2,565,950,000		$ 3,201,209,000	$ (897,276,000)	$ 2,303,933,000		$ 308,906,000	$ (46,889,000)	262,017,000	10.2%
	Taxable TPP Plant In Service	$ 3,510,115,000	$ (944,165,000)	$ 2,565,950,000	89.7%	$ 3,201,209,000	$ (897,276,000)	$ 2,303,933,000		$ 308,906,000	$ (46,889,000)	262,017,000	10.2%
	Total All (Excludes non-utility 121)	$ 3,834,139,000	$ (1,018,754,000)	$ 2,815,385,000		$ 3,430,856,000	$ (964,885,000)	$ 2,465,971,000		$ 403,283,000	$ (53,869,000)	349,414,000	12.4%
												-	
	Accounts 114, 115 Aquistion Adjustment	$ -	$ -	$ -		$ -	$ -	$ -		$ -	$ -	-	#DIV/0!
	Account 105,Property Held For Future Use	1,940,000	-	1,940,000		1,711,000	-	1,711,000		229,000	-	229,000	
	Subtotal	$ 1,940,000	$ -	$ 1,940,000	0.1%	$ 1,711,000	$ -	$ 1,711,000		$ 229,000	$ -	229,000	11.8%
	Total Pages 13 - 16 PGS Annual Report	$ 3,836,079,000	$ (1,018,754,000)	$ 2,817,325,000		$ 3,432,567,000	$ (964,885,000)	$ 2,467,682,000		$ 403,512,000	$ (53,869,000)	349,643,000	12.4%
												-	
	Construction Work In Progress	$ 28,668,000	$ -	$ 28,668,000	1.0%	$ 115,213,000	$ -	$ 115,213,000		$ (86,545,000)	$ -	(86,545,000)	-301.9%
121	RNG	11,939,000	(1,014,000)	$ 10,925,000	0.4%	11,524,000	(512,000)	$ 11,012,000					
	M & S Inventory	3,595,127	-	3,595,127	0.1%	4,704,569	-	4,704,569		(1,109,442)	-	(1,109,442)	
	Total All Property	$ 3,880,281,127	$ (1,019,768,000)	$ 2,860,513,127	100.0%	$ 3,279,241,150	$ (906,708,703)	$ 2,598,611,569		$ 315,857,558	$ (53,869,000)	$ 261,988,558	9.2%

$ 3,848,018,000	NBV - TTPP	$ 2,580,470,127	NBV - TTPP	$ 2,319,649,569
	NBV - Realty	$ 129,655,000	NBV - Realty	$ 54,330,000
		$ 2,710,125,127		$ 2,373,979,569

FPSC EXH NO. 97

ADMITTED

Peoples Gas System, Inc

Plant In Service, Depreciation and Amortization Forecast Using 12+0 SOP Forecast values as of December 31, 2025

301	Organization	13,000.00	-	13,000	
302	Franchise & Consents	-	(0.00)	(0)	
303	Custom Intangible Plant	138,245,000	(45,693,000)	92,552,000	
374	Land Distribution	30,950,000	(1,206,000)	29,744,000	
375	Structures & Improvements	102,225,000	(5,672,000)	96,553,000	
390	Structures & Improvements	1,410,000	8,000	1,418,000	
121	RNG Acct 121 Levy	11,939,000	(1,014,000)	10,925,000	
392	Vehicle Fleet	51,181,000	(22,026,000)	29,155,000	
		$ 335,963,000	$ (75,603,000)	$ 260,360,000	
364	Liquified Natural Gas (LNG)	1,399,000	(12,000)	1,387,000	
376	Main Lines	$ 2,064,858,000	$ (471,374,000)	1,593,484,000	
104	Leased Plant	40,295,000	(6,281,000)	34,014,000	
377	Compressor Station Equip	19,851,000	(2,636,000)	17,215,000	
378	Meas & Reg Station Eqp Gen	27,260,000	(7,194,000)	20,066,000	
379	Meas & Reg Station Eqp City	120,007,000	(24,922,000)	95,085,000	
		2,273,670,000	(512,419,000)	1,761,251,000	
380	Services	840,546,000	(278,864,000)	561,682,000	
381	Meters	116,533,000	(49,919,000)	66,614,000	
382	Meter Installations	146,129,000	(42,628,000)	103,501,000	
383	House Regulators	22,781,000	(9,861,000)	12,920,000	
384	House Regulator Installs	39,276,000	(17,696,000)	21,580,000	
385	Meas & Reg Station Eqp Ind	15,201,000	(7,934,000)	7,267,000	
336	RNG	7,434,000	(89,000)	7,345,000	
386	Gas Heat Pump Initiative	-	-	-	
387	Other Equipment	15,398,000	(6,732,000)	8,666,000	
		1,203,298,000	(413,723,000)	789,575,000	
391	Office Furniture & Eqp.	13,475,000	(6,902,000)	6,573,000	
393	Stores Equipment	1,000	(1,000)	-	
394	Tools, Shop & Garage Equip	10,112,000	(5,189,000)	4,923,000	
395	Laboratory Equipment	-	-	-	
396	Power Operated Equipment	4,428,000	(2,271,000)	2,157,000	
397	Communication Equipment	3,002,000	(3,393,000)	(391,000)	
398	Miscellaneous Equipment	2,129,000	(267,000)	1,862,000	
		33,147,000	(18,023,000)	15,124,000	
18679		-	-	-	91%
	Total Taxable TPP	$ 3,510,115,000	$ (944,165,000)	$ 2,565,950,000	
	Total All Plant	$ 3,846,078,000	$ (1,019,768,000)	$ 2,826,310,000	
		$ 3,846,078,000			
		0			
		$ 3,846,078,000			
	sum of 105 and 115	1,940,000.00	$ -	$ -	
		$ -			
		$ -			
107	CWIP	28,668,000	-	-	
		$ 3,848,018,000			
		$ -			

ACCT	ORIG	DEPR	NBV
10400(394&336)	40,295,000	(6,281,000)	34,014,000
10500	1,940,000	-	-
11501	-	-	-
30100	13,000	-	13,000
30200	-	-	-
30300	815,000	(815,000)	-
			-
30301	137,430,000	(44,878,000)	92,552,000
30302	-	-	-
33602	7,434,000	(89,000)	7,345,000
			-
36400	1,399,000	(37,000)	1,362,000
37400	26,681,000	-	26,681,000
37402	4,269,000	(1,206,000)	3,063,000
37500	102,225,000	(5,672,000)	96,553,000
37600	928,440,000	(234,798,000)	693,642,000
37602	1,136,418,000	(236,576,000)	899,842,000
37700	19,851,000	(2,636,000)	17,215,000
37800	27,260,000	(7,194,000)	20,066,000
37900	120,007,000	(24,922,000)	95,085,000
38000	78,162,000	(35,390,000)	42,772,000
38002	762,384,000	(243,474,000)	518,910,000
38100	116,533,000	(49,919,000)	66,614,000
38200	146,129,000	(42,628,000)	103,501,000
38300	22,781,000	(9,861,000)	12,920,000
38400	39,276,000	(17,696,000)	21,580,000
38500	15,201,000	(7,934,000)	7,267,000
38602	-	-	-
38608	-	-	-
38700	15,398,000	(6,732,000)	8,666,000
39000	1,276,000	52,000	1,328,000
39002	134,000	(44,000)	90,000
39100	2,178,000	(1,335,000)	843,000
39101	9,695,000	(4,400,000)	5,295,000
39102	1,602,000	(1,167,000)	435,000
39103	-	-	-
39201	19,708,000	(7,731,000)	11,977,000
39202	24,474,000	(11,844,000)	12,630,000
39203	-	-	-
39204	4,351,000	(896,000)	3,455,000
39205	2,648,000	(1,555,000)	1,093,000
39300	1,000	(1,000)	-
39400	10,012,000	(5,167,000)	4,845,000
39401	100,000	(22,000)	78,000
39500	-	-	-
39600	4,428,000	(2,271,000)	2,157,000
39700	3,002,000	(3,393,000)	(391,000)
39800	2,129,000	(267,000)	1,862,000
39900	-	-	-
33602-12100	11,939,000	(1,014,000)	10,925,000
Grand Total	**3,848,018,000**	**(1,019,793,000)**	**2,828,225,000**
	3,848,018,000	(1,019,793,000)	2,828,225,000

2024 12+0 SOP Plant Value as of 12/2025 FORECAST

FERC Description	Account #	GROSS	DEPR	NBV
39401 - CNG Station Equipment - 104	39401-10400	4,357,000	(1,088,000)	3,269,000
Future Use	10500	1,940,000	-	1,940,000
PGS Acq Adj (Reserve)	11501	-	-	-
Organization	30100	13,000	-	13,000
Franchise & Consents	30200	-	-	-
Misc Intangible Plant	30300	815,000	(815,000)	-
Custom Intangible Plant	30301	134,417,000	(44,770,000)	89,647,000
SAP Intangible Plant	30302	-	-	-
Renewable Natural Gas (RNG)	33600	7,434,000	(89,000)	7,345,000
33601 - Renewable Natural Gas (RNG)	33601-10400	35,938,000	(5,193,000)	30,745,000
Liquified Natural Gas (LNG)	36400	1,399,000	(37,000)	1,362,000
Land Distribution	37400	26,681,000	-	26,681,000
Land Rights	37402	4,269,000	(1,206,000)	3,063,000
Structures & Improvements - 37500	37500	102,225,000	(5,672,000)	96,553,000
Mains Steel	37600	928,440,000	(234,798,000)	693,642,000
Mains Plastic	37602	1,136,418,000	(236,576,000)	899,843,000
Compressor Equipment	37700	19,851,000	(2,636,000)	17,216,000
Meas & Reg Station Eqp Gen	37800	27,260,000	(7,194,000)	20,066,000
Meas & Reg Station Eqp City	37900	120,007,000	(24,922,000)	95,086,000
Services Steel	38000	78,162,000	(35,390,000)	42,771,000
Services Plastic	38002	762,384,000	(243,474,000)	518,910,000
Meters	38100	116,533,000	(49,919,000)	66,614,000
Meter Installations	38200	146,129,000	(42,628,000)	103,501,000
House Regulators	38300	22,781,000	(9,861,000)	12,920,000
House Regulator Installs	38400	39,276,000	(17,696,000)	21,580,000
Meas & Reg Station Eqp Ind	38500	15,201,000	(7,934,000)	7,267,000
Other Property Cust Premise - 38602	38602	-	-	-
Other Property Cust Premise - 38608	38608	-	-	-
Other Equipment	38700	15,398,000	(6,732,000)	8,667,000
Structures & Improvements - 3900	39000	1,276,000	52,000	1,328,000
Structur & Improv Leasehold	39002	134,000	(44,000)	91,000
Office Furniture - 39100	39100	2,178,000	(1,335,000)	843,000
Computer Equipment	39101	9,695,000	(4,400,000)	5,296,000
Office Equipment	39102	1,602,000	(1,167,000)	435,000
Office Furniture - 39103	39103	-	-	-
Vehicles up to 1/2 Tons	39201	19,708,000	(7,731,000)	11,977,000
Vehicles from 1/2 - 1 Tons	39202	24,474,000	(11,844,000)	12,630,000
Airplane	39203	-	-	-
Trailers & Other	39204	4,351,000	(896,000)	3,455,000
Vehicles over 1 Ton	39205	2,648,000	(1,555,000)	1,093,000
Stores Equipment	39300	1,000	(1,000)	1,000
Tools, Shop & Garage Equip	39400	10,012,000	(5,167,000)	4,845,000
CNG Station Equipment - 39401	39401	100,000	(22,000)	78,000
Laboratory Equipment	39500	-	-	-
Power Operated Equipment	39600	4,428,000	(2,271,000)	2,157,000
Communication Equipment	39700	3,002,000	(3,393,000)	(391,000)
Miscellaneous Equipment	39800	2,129,000	(267,000)	1,862,000
Other Tangible Property	39900	-	-	-
33602 - RNG Alliance 121	33602-12100	11,939,000	(1,014,000)	10,925,000
WAM	99999	3,013,000	(108,000)	2,905,000
SPARE	SPARE	-	-	-
Total		**3,848,018,000**	**(1,019,793,000)**	**2,828,225,000**

Re: PGS 2024 8+4F - 2025-2029

McDuffie, Rose J.
To Gurgel, Brady G.

Reply | Reply All | Forward

Tue 9/17/2024 8:08 AM

Retention Policy Default 1 yr retention (1 year) Expires 9/18/2025

Internal

You replied to this message on 9/17/2024 8:19 AM.

Start your reply all with: Okay, thank you! | Ok, thanks. | Got it, thanks! | Feedback

This is for the WAM change. We don't have an actual approved account number yet. Julie created 99999 to forecast the change. It's in 30301 in the system.

Get Outlook for iOS

From: Gurgel, Brady G. <BGGURGEL@tecoenergy.com>
Sent: Tuesday, September 17, 2024 7:02:02 AM
To: McDuffie, Rose J. <RJMcDuffie@tecoenergy.com>
Subject: RE: PGS 2024 8+4F - 2025-2029

Good morning Rose.

Can you tell me what the plant value associated with "SPARE" represents in the SOP forecast value as of 12/31/25? I need to know what plant acct number this value should be associated with for property taxes please.

Airplane	39203	-	(0)	-
Trailers & Other	39204	4,436,438	(986,225)	3,450,213
Vehicles over 1 Ton	39205	2,647,582	(1,555,052)	1,092,530
Stores Equipment	39300	1,283	(702)	581
Tools, Shop & Garage Equip	39400	9,558,155	(5,190,393)	4,367,761
CNG Station Equipment - 394	39401	99,869	(21,911)	77,959
Laboratory Equipment	39500	-	(0)	-
Power Operated Equipment	39600	4,491,402	(2,263,655)	2,227,747
Communication Equipment	39700	2,981,392	(3,393,206)	(411,814)
Miscellaneous Equipment	39800	2,682,186	(253,077)	2,429,109
Other Tangible Property	39900	-	-	-
33602 - RNG Alliance 121	33602-12100	11,524,950	(994,558)	10,530,393
SPARE	SPARE	41,853,216	(2,909,711)	-
SPARE	SPARE	-	-	-
Total		**3,841,777,022**	**(1,025,091,533)**	**2,816,685,489**

FPSC EXH NO. 97

ADMITTED

Div.	County	County	Division Totals		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	BPC Cost Center
			Sum of 1 & 7		**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**$ 428**	**5,135**	**CC_301000**
1	Broward	$ 2,097	**1**	$ 2,097	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	$ 175	2,097	CC_301001
1	Brevard	$ 30		$ 30	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	30	CC_301000
2	Hillsborough	$ 5,170	**2**	$ 5,170	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	5,170	CC_302000
3	Hernando	$ 505																
3	Pasco	$ 727																
3	Pinellas	$ 1,166	**3**	$ 2,398	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	$ 200	2,398	CC_303000
4	Orange	$ 2,541																
4	Osceola	$ 503																
4	Seminole	$ 355	**4**	$ 3,399	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	$ 283	3,399	CC_304000
5	Lake	$ 410																
5	Sumter	$ 452	**5**	$ 862	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	$ 72	862	CC_305000
6	Baker	$ 21																
6	Bradford	$ 16																
6	Clay	$ 265																
6	Columbia	$ 2																
6	Duval	$ 2,756																
6	Lafayette	$ 2																
6	Nassau	$ 462																
6	Putnam	$ 48																
6	St. Johns	$ 999																
6	Union	$ -	**6**	$ 4,571	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	$ 381	4,571	CC_306000
7	Dade	$ 3,008	**7**	$ 3,008	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	$ 251	3,008	CC_301001
8	Polk	$ 430	**8**	$ 430	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	$ 36	430	CC_308000
9	Flager	$ 137																
9	Volusia	$ 550	**9**	$ 687	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	$ 57	687	CC_309000
10	Hardee	$ 26																
10	Highlands	$ 56	**10**	$ 81	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	81	CC_310000
11	Manatee	$ 908																
11	Sarasota	$ 752	**11**	$ 1,660	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	$ 138	1,660	CC_311000
13	Martin	$ 91																
13	Okeechobee	$ 362																
13	Palm Beach	$ 523																
13	St. Lucie	$ 43	**13**	$ 1,019	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	$ 85	1,019	CC_313000
14	Jackson	$ 2																
14	Leon	$ 3																
14	Liberty	$ 2																
14	Wakulla	$ 2																
14	Bay	$ 806	**14**	$ 815	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	815	CC_314000
15	Levy	$ 6																
15	Marion	$ 813	**15**	$ 819	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	$ 68	819	CC_315000
16	Charlotte	$ 274																
16	Collier	$ 649																

FPSC EXH NO. 97

ADMITTED

16	Hendry	$ 12																				
16	Lee	$ 880	16	$ 1,814	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 151	$ 1,814	CC_316000
	Total Acct 6900060	$ 28,859		$ 28,859.283	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 2,404.940	$ 28,859.283	
15	Levy Non Utility (Acct 6900065)	$ 155		$ 155.000	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917			
	Payable Entry (Account 2360604)			$ 29,014.283	$ 2,417.857	$ 4,835.714	$ 7,253.571	$ 9,671.428	$ 12,089.284	$ 14,507.141	$ 16,912.082	$ 19,329.938	$ 21,747.795	$ 24,165.652	$ (2,417.857)				CC_PC01001
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		

FPSC EXH NO. 97

ADMITTED

Ok

PGS LTF 2023
i.Global To Map

Timeline Flags and Helpers

Period		**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**	**#VALUE!**
Section		Actual	Actual	Bugdet	Bugdet	Forecast	Forecast	Forecast	Forecast
Start date		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
End date		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
x **Global Inputs**									
lightly review inputs annually to ensure no changes YoY									
Payroll Tax Inflation Rate	%								
TPI / Subsidiary Earnings	%								
Property Tax									
Real Estate Tax	$000s	425	-						
Real Estate Growth Rate	%			#DIV/0!					
Tax Rate	%			1.56%					
Cap Rate	%			8.78%					
Income Approach Weighting - 80/20 except Hillsborough (conservative assumption)	%			80.0%					
Weighted Net Income									
Year 1	%			16.7%					
Year 2	%			33.3%					
Year 3	%			50.0%					
% TTPP	%			90.2%					
x END									

FPSC EXH NO. 97

ADMITTED

RE: Working Group - Property Tax

Kelley, Amanda M.
To Gurgel, Brady G.
Cc Fanger, Daniel
Retention Policy Default 1 yr retention (1 year)

Internal

Start your reply all with: Thank you! Perfect, thank you! Got it, thanks! Feedback

Account 154 values are now $3,507,441 for 2024 $3,595,127 for 2025 $3,677.815 for 2026

12/31/25 forecast	3,595,127

	12/2023 actuals
Dade	621,572.44
Hillsborough	295,924.22
Pinellas	235,754.87
Orange	202,709.78
Lake	85,574.13
Duval	448,306.49
Polk	326,917.59
Volusia	59,608.87
Highlands	23,664.65
Sarasota	1,155,009.88
Palm Beach	196,096.58
Bay	228,034.94
Marion	544,182.50
Lee	620,543.98
Total	**5,043,900.92**

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Cost Approach to Value
January 1, 2026F

Property Accounts		Balance 12/31/2025F
Utility Plant in Service (101, 104, 106, 18679)	$	4,261,060,049
Acquisition Adjustment (114)		-
Property Held for Future Use (105)		1,939,552
Construction Work in Progress (107)		20,355,860
Total Utility Plant	$	4,283,355,460
Less Depreciation & Amortization (108, 115)		(1,073,816,891)
Net Utility Plant	$	3,209,538,569
Materials & Supplies Inventory		3,887,980
Non-Utility RNG (121,122)		10,423,758
Total Property @ Cost	$	3,223,850,307
Less Obsolescence	$	-
Cost Indicator of Value (All Property)	**$**	**3,223,850,307**

Schedule 1

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Summary of Property
January 1, 2026F

	Original Cost	Depreciation & Amortization	Net Book Value	% of Total
Property Accounts (101,104,105,106,114, 18679)	$ 4,262,999,600	$ (1,073,816,891)	$ 3,189,182,709	
Constuction Work in Progress (107)	20,355,860	-	20,355,860	
Total Utility Plant	$ 4,283,355,460	$ (1,073,816,891)	$ 3,209,538,569	
Fuel (151)	-	-	-	
Non Utility RNG (121)	11,939,000	(1,515,242)	10,423,758	
Materials & Supples (154)	3,887,980	-	3,887,980	
All Property Cost Approach To Value	$ 4,299,182,440	$ (1,075,332,133)	**$ 3,223,850,307**	100.00%
Less Separately Assessed & Exempt Property:				
Construction Work in Progress	$ 20,355,860	$ -	$ 20,355,860	
Gas Plant Acquistion Adjustment	-	-	$ -	
Fuel Inventory	-	-	$ -	
Non Utility RNG (121)	11,939,000	(1,515,242)	$ 10,423,758	
Materials & Supplies Inventory	3,887,980	-	$ 3,887,980	
Software	164,968,974	(55,033,223)	$ 109,935,751	
Vehicles	57,509,371	(26,167,220)	$ 31,342,150	
Franchise & Consents and Organizational Costs	12,620	(0)	$ 12,620	
Real Estate - Land & Structures, Easements	146,352,075	(8,967,280)	$ 137,384,794	
Real Estate - PHFFU Land (105)	1,939,552	-	$ 1,939,552	
Total Exempt & Separately Assessed	$ 406,965,431	$ (91,682,966)	$ 315,282,465	9.78%
Property in Unit Valuation at Cost	$ 3,892,217,009	$ (983,649,167)	$ 2,908,567,842	90.22%
Non-Utility RNG (121)	$ 11,939,000	$ (1,515,242)	$ 10,423,758	
Materials & Supplies Inventory	3,887,980	-	3,887,980	
Total Taxable TPP Cost Approach to Value	$ 3,908,043,989	$ (985,164,409)	**$ 2,922,879,580**	

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Capitalization Rate

Capital	Balance	Ratio	Cost	Weighted Average Cost
Long-Term Debt	$ 1,023,341,196	43.06%	5.65%	2.43%
Common Equity	1,353,136,935	56.94%	11.15%	6.35%
Total	$ 2,376,478,131	100.00%		**8.78%**

Beginning 2024 11.15% is the new high point in the range of allowed ROE following rate case resolution Nov 2023

2025F YE from Amanda

207	5,575,333.00
211	1,216,474,836.00
216	131,086,766.00
Total	**1,353,136,935.00**

2025
207 5,575,333
211 1,216,474,836
216 132,086,766

RE: 2025 PGS Property Tax Budget

Kelley, Amanda M.
To Gurgel, Brady G.
2:41 P

Retention Policy Default 1 yr retention (1 year) Expires 8/16/2025

Internal

You replied to this message on 8/15/2024 3:26 PM.

2025 PGS LTD Schedule Updt needed.xlsx
20 KB

Start your reply all with: Thank you! Got it, thanks! Received, thank you. (

2024 Equity Forecast
207 5,575,333
211 1,098,474,836
216 131,291,659

Net Income
2024F 116,720,000
2025F 116,630,000

Debt is attached.

Amanda

Schedule 3

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Return Budget Appraisal
Long Term Debt

Long Term Notes		(1) Principle Balance - Forecast 12/31/2024	(2) Months Outstanding	(3) Budget Balance 12/31/2025	(4) Principle 12-Months 2025 Average	(5) Interest Expense	Interest Rate
5.42% Due in 2028		$ 350,000,000	12	$ 350,000,000	350,000,000	18,970,000	5.42%
5.63% Due in 2033		$ 350,000,000	12	$ 350,000,000	350,000,000	19,705,000	5.63%
5.94% Due in 2053		$ 225,000,000	12	$ 225,000,000	225,000,000	13,365,000	5.94%
5.20 % New Loan		-	7	100,000,000	$ 58,333,333	$ 3,033,333	5.20%
	Subtotal	$ 925,000,000		$ 1,025,000,000	$ 983,333,333	$ 55,073,333	
Amortization of Debt Expense		$ (1,992,576)		$ (1,658,804)	$ (1,825,690)	$ 333,772	
	Total	$ 923,007,424		$ 1,023,341,196	$ 981,507,643	$ 55,407,106	

Weighted Cost of Debt (5) / (4) **5.65%**

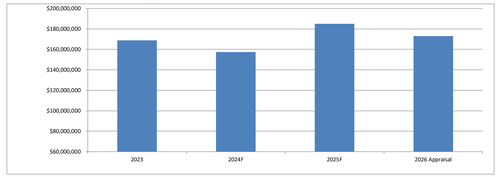
Updated with LTD sch received from Amanda Kelley 8/615/24 bg

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Income Approach to Value - As Adjusted by OPC
Determine 2026 Net Operating Income to Capitalize

	(1)	(2)	(3) (1) x (2)		
Year	NOI As Booked	Weight	Weighted NOI		NOI As Filed
2024 Act	$ 168,827,176	1	$ 28,137,863	Per 2024 SR	168,827,176
2025F	$ 157,385,906	2	$ 52,461,969	Per 2025 SR	157,385,906
2026F w/Rates	$ 184,873,821	3	$ 92,436,911	**Per G-5, line 3**	223,651,232
	Mean Average		**Weighted Average**	**Use**	
2026 Appraisal NOI	**$ 170,362,301**		**$ 173,036,742**	**$ 173,100,000**	*due to 2026F being so much higher, will be raised up in negotiations with appraisers*

2023 Through 2026 N.O.I. - Dollars In Thousands



2026 Appraisal NOI	**$**	**173,100,000**
Capitalization Rate		**8.78%**
Income Approach Indicator of Value (All Property)	**$**	**1,971,633,534**

2023	$	168,827,176
2024F	$	157,385,906
2025F	$	184,873,821
2026 Appraisal	$	173,100,000

2013 Actual	**2014 Actual**	**2015 Actual**	**2016 Actual**	**2017 Actual**	**2018 Actual**	**2019 Actual**	**2020 Actual**	**2021 Actual**	**2022 Actual**	**2023 Actual**
34,729,226.00	35,834,101.87	35,265,270	34,859,000	43,000,000	47,700,000	54,029,133	51,915,389	77,282,929	82,237,618	78,534,752
11,965,023.00	12,237,167.64	13,468,366	13,347,622	14,113,428	14,891,315	15,895,709	15,614,669	19,937,821	21,425,081	40,307,126
46,694,249.00	**48,071,269.51**	**48,733,636**	**48,206,622**	**57,113,428**	**62,591,315**	**69,924,842**	**67,530,058**	**97,220,750**	**103,662,699**	**118,841,878**

2024F 2025F NI from Amanda below

	(1) Principle Balance - Forecast 12/31/2023	(2) Months Outstanding	(3) Budget Balance 12/31/2024	(4) Principle 12-Months 2024 Average	(5) Interest Expense	Interest Rate
	$ 350,000,000	12	$ 350,000,000	350,000,000	18,970,000	5.42%
	$ 350,000,000	12	$ 350,000,000	350,000,000	19,705,000	5.63%
	$ 225,000,000	12	$ 225,000,000	225,000,000	13,365,000	5.94%
	(97,500)		-	-	$ -	
Subtotal	$ 924,902,500		$ 925,000,000	$ 925,000,000	$ 52,040,000	
	$ (2,223,013)		$ (1,955,263)	$ (2,089,138)	$ 267,750	
Total	$ 922,679,487		$ 923,044,737	$ 922,910,862	$ ~~52,307,750~~	

78534752.49

Weighted Cost of Debt (5) / (4) **5.67%**

2024 forecast interest on LTD

52307750

2025 int on LTD forecast

	(1) Principle Balance - Forecast 12/31/2024	(2) Months Outstanding	(3) Budget Balance 12/31/2025	(4) Principle 12-Months 2025 Average	(5) Interest Expense	Interest Rate
	$ 350,000,000	12	$ 350,000,000	350,000,000	18,970,000	5.42%
	$ 350,000,000	12	$ 350,000,000	350,000,000	19,705,000	5.63%
	$ 225,000,000	12	$ 225,000,000	225,000,000	13,365,000	5.94%
	-	7	100,000,000	$ 58,333,333	$ 3,033,333	5.20%
Subtotal	$ 925,000,000		$ 1,025,000,000	$ 983,333,333	$ 55,073,333	
	$ (1,992,576)		$ (1,658,804)	$ (1,825,690)	$ 333,772	
Total	$ 923,007,424		$ 1,023,341,196	$ 981,507,643	$ ~~55,407,106~~	

Weighted Cost of Debt (5) / (4) **5.65%**

Total 2023 Int on LTD

Intercompany		38,419,373.00
	7500110	1,879,222.00
	7500130	8,531.00
		40,307,126.00

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
January 1, 2026F
Dollars in Thousands

Line No.			
	Cost Approach Calculation		
1	Utility Plant (Accounts 101 & 106)	$	4,261,060
2	Construction Work in Progress (Account 107)		20,356
3	Total Utility Plant	$	4,281,416
4	Less: Accumulated Depreciation & Amortization (Accounts 108 & 111)		(1,073,817)
5	Net Utility Plant	$	3,207,599
6	Materials & Supplies Inventory (Account 154) Appraise @ Situs		3,888
7	Real Estate - PHFFU (Account 105)		1,940
8	RNG Non-Utility Property (Account 121)		10,424
9	Net Book Value of All Operating Property	$	3,223,850
10	Obsolescense Percentage - See Cost Approach to Value Page		0.00%
11	Obsolescense (line 10 x line 9)	$	-
12	**Cost Approach Indicator of Value - All Operating Property**	**$**	**3,223,850**
13			
14	*Income Approach Calculation*		
15	Appraisal Net Operating Income - December 31, 2024	$	173,100
16	Capitalization Rate		8.78%
17	**Income Approach Indicator of Value - All Operating Property (Line 15 / Line 16)**	**$**	**1,971,634**
18			
19	*Calculate Value of Taxable Tangible Personal Property in Unit*		
20	Cost Approach Indicator of Value - All Operating Property (Line 12)	$	3,223,850
21	Cost Approach Indicator of Value - TTPP Excl. M&S Inventory	$	2,908,568
22	Income Approach Indicator of Value - All Operating Property (Line 17)	$	1,971,634
23	Percent of All Property Value Attributable to TTPP (Line 21 / Line 20)		90.22%
24	Income Approach Indicator of Value - TTPP (Line 22 x Line 23)	$	1,778,814
25			
26	Reconcile Cost & Income Approach		
27	Income		80%
28	Cost		20%
29			
30	Reconciled Indicator of Unit Value [(Line 24 x Line 27) + (Line 21 x Line 28)]	$	2,004,765
	Add: RNG Non Utility Property	$	10,424
31	Add: Materials & Supples Inventory		3,888
32	**Estimate of Fair Market Value - Taxable Tangible Personal Property**	**$**	**2,019,076**

Dollars in Thousands

	Allocation Factor	Original Cost	Valuation 100% Cost	Valuation 100% Income	Reconciled Value
Wakulla					
Estimate of FMV - Unit Appraisal	**0.01%**	**$ 186**	**$ 185**	**$ 113**	**$ 128**
M&S Inventory/Non Utility	**NA**	**-**	**-**	**-**	**-**
Wakulla Total		**$ 186**	**$ 185**	**$ 113**	**$ 128**
Unit Appraisal	99.99%	$ 2,914,760	$ 2,908,383	$ 1,778,701	$ 2,004,637
M&S Inventory/Non Utility		16,155	16,155	16,155	16,155
Total All Other Counties		$ 2,930,915	$ 2,924,538	$ 1,794,856	$ 2,020,792
Estimate of FMV - Unit Appraisal	100.00%	$ 2,914,945	$ 2,908,568	$ 1,778,814	$ 2,004,765
M&S Inventory/Non Utility		16,155	16,155	16,155	16,155
Total All Counties		$ 2,931,101	$ 2,924,723	$ 1,794,969	$ 2,020,920

updt county and these 2 fields and make copy for each county

$127,743.39

Schedule 6

FPSC EXH NO. 97
ADMITTED

Peoples Gas System 2026 Property Tax Budget Appraisal
Reconciliation of Fair Market Value
January 1, 2026

Approach	Indicated Value	Weight	Weighted Value	% TTPP	TTPP	
Income Approach	$ 1,971,633,534	80%	$ 1,577,306,827	90.2%	$ 1,423,051,158	0.515070131 FMV Factor
Cost Approach	$ 3,223,850,307	20%	$ 644,770,061	90.2%	$ 581,713,568	
Estimate of Fair Market Value (All Property)		**100%**	**$ 2,222,076,888**			

Estimate of FMV - TTPP Unit Apprasisal	$ 2,004,764,727
Material & Supplies Inventory	3,887,980
RNG Non Utility NBV	10,423,758
Total System Estimate of FMV	**$ 2,019,076,465**

E18934

Peoples Gas System 2024 Property Tax Appraisal
TPP by County/District
THIS TAB IS N/A TO 2026 BUDGET APPRAISAL-ACTUAL 2024 VALUES BELOW ARE USED TO DERIVE ALLOCATION FACTORS UTILIZED IN 2026 BUDGET PROJECTION HOWEVER

County/District	Asset Type	Original Cost
Baker County	Gas Distribution Lines & Equip	25,394
Baker County	Main Gas Lines	2,598,492
Macclenny	Gas Distribution Lines & Equip	60,024
	FL-G 376-Mains - Situs	2,488,711
	FL-G 378-Meas & Regulating Equip	109,781
	FL-G 380-Services - Allocated	56,367
	FL-G 381-Meters & Regs - Allocated	8,449
	FL-G 382-Meter & Installs - Alloc	12,632
	FL-G 383-House Regulators	5,359
	FL-G 385-Ind Meas & Reg Stat Equip	1,417
	FL-G 387-Other Equipment	1,194
	Grand Total	**2,683,911**

County/District	Asset Type	Original Cost
Bay County	Gas Distribution Lines & Equip	10,258,535
Bay County	Material and Supplies Inv (154)	228,035
Bay County	Main Gas Lines	67,991,081
Callaway	Gas Distribution Lines & Equip	2,726,546
Lynn Haven	Gas Distribution Lines & Equip	3,079,637
Panama City	Gas Distribution Lines & Equip	10,211,330
Panama City Beach	Gas Distribution Lines & Equip	7,987,043
Parker	Gas Distribution Lines & Equip	407,849
Springfield	Gas Distribution Lines & Equip	130,285
	FL-154-Materials & Supplies	228,035
	FL-G 376-Mains - Situs	67,027,488
	FL-G 378-Meas & Regulating Equip	470,775
	FL-G 380-Services - Allocated	22,965,166
	FL-G 381-Meters & Regs - Allocated	3,442,439
	FL-G 382-Meter & Installs - Alloc	5,146,513
	FL-G 383-House Regulators	2,183,236
	FL-G 385-Ind Meas & Reg Stat Equip	577,271
	FL-G 387-Other Equipment	486,601
	FL-G 391-Office Furn & Equip	102,847
	FL-G 394-Tools, Shop & Garage Equip	246,528
	FL-G 396-Power Operated Equipment	117,510
	FL-G 397-Communication Equipment	18,417
	FL-G 398-Miscellaneous Equipment	7,515
	Grand Total	**103,020,341**

County/District	Asset Type	Original Cost
Bradford County	Main Gas Lines	1,687,918
Bradford County	Gas Distribution Lines & Equip	9,234
	FL-G 376-Mains - Situs	1,687,918
	FL-G 380-Services - Allocated	6,094
	FL-G 381-Meters & Regs - Allocated	913
	FL-G 382-Meter & Installs - Alloc	1,366
	FL-G 383-House Regulators	579
	FL-G 385-Ind Meas & Reg Stat Equip	153
	FL-G 387-Other Equipment	129
	Grand Total	**1,697,152**

County/District	Asset Type	Original Cost
Brevard County	Main Gas Lines	2,947,608

County/District	Asset Type	Original Cost
Broward County	Main Gas Lines	81,035,606

Broward County	Gas Distribution Lines & Equip	4,405,848
Coconut Creek	Gas Distribution Lines & Equip	192,936
Cooper City	Gas Distribution Lines & Equip	80,630
Coral Springs	Gas Distribution Lines & Equip	668,077
Dania	Gas Distribution Lines & Equip	1,056,828
Davie	Gas Distribution Lines & Equip	760,225
Deerfield Beach	Gas Distribution Lines & Equip	486,659
Ft. Lauderdale	Gas Distribution Lines & Equip	21,649,131
Hallendale	Gas Distribution Lines & Equip	1,874,645
Hollywood	Gas Distribution Lines & Equip	20,598,062
Lauderdale Lakes	Gas Distribution Lines & Equip	97,908
Lauderdale-by-the-Sea	Gas Distribution Lines & Equip	918,605
Lauderhill	Gas Distribution Lines & Equip	408,909
Lighthouse Point	Gas Distribution Lines & Equip	77,750
Margate	Gas Distribution Lines & Equip	1,722,024
North Lauderdale	Gas Distribution Lines & Equip	17,278
Oakland Park	Gas Distribution Lines & Equip	2,836,445
Parkland	Gas Distribution Lines & Equip	10,939,751
Pembroke Pines	Gas Distribution Lines & Equip	14,418,356
Plantation	Gas Distribution Lines & Equip	3,677,300
Pompano Beach	Gas Distribution Lines & Equip	11,175,881
Tamarac	Gas Distribution Lines & Equip	51,833
Weston	Gas Distribution Lines & Equip	190,056

FL-G 376-Mains - Situs	80,583,974
FL-G 378-Meas & Regulating Equip	390,055
FL-G 380-Services - Allocated	64,871,099
FL-G 381-Meters & Regs - Allocated	9,724,065
FL-G 382-Meter & Installs - Alloc	14,537,668
FL-G 383-House Regulators	6,167,120
FL-G 385-Ind Meas & Reg Stat Equip	1,630,651
FL-G 387-Other Equipment	1,374,533
FL-G 391-Office Furn & Equip	24,482
FL-G 394-Tools, Shop & Garage Equip	1,319
FL-G 397-Communication Equipment	34,486
FL-G 398-Miscellaneous Equipment	1,290
Grand Total	**179,340,742**

County/District	Asset Type	Original Cost
Charlotte County	Main Gas Lines	22,133,068
Charlotte County	Gas Distribution Lines & Equip	3,539,095
Babcock Ranch	Gas Distribution Lines & Equip	2,307,637
Punta Gorda	Gas Distribution Lines & Equip	871,294

FL-G 376-Mains - Situs	21,820,541
FL-G 378-Meas & Regulating Equip	312,528
FL-G 380-Services - Allocated	4,433,194
FL-G 381-Meters & Regs - Allocated	664,528
FL-G 382-Meter & Installs - Alloc	993,482
FL-G 383-House Regulators	421,452
FL-G 385-Ind Meas & Reg Stat Equip	111,436
FL-G 387-Other Equipment	93,933
Grand Total	**28,851,094**

County/District	Asset Type	Original Cost
Clay County	Main Gas Lines	26,186,611
Clay County	Gas Distribution Lines & Equip	2,895,009
Green Cove Springs	Gas Distribution Lines & Equip	13,852
Orange Park	Gas Distribution Lines & Equip	311,664

FL-G 376-Mains - Situs	26,165,605

FL-G 378-Meas & Regulating Equip	21,006
FL-G 380-Services - Allocated	2,125,209
FL-G 381-Meters & Regs - Allocated	318,565
FL-G 382-Meter & Installs - Alloc	476,261
FL-G 383-House Regulators	202,038
FL-G 385-Ind Meas & Reg Stat Equip	53,421
FL-G 387-Other Equipment	45,030
Grand Total	**29,407,135**

County/District	Asset Type	Original Cost
Collier County	Main Gas Lines	76,147,100
Collier County	Gas Distribution Lines & Equip	26,442,928
Estero	Gas Distribution Lines & Equip	6,217,679
Marco Island	Gas Distribution Lines & Equip	338,597
Naples	Gas Distribution Lines & Equip	2,484,484

FL-G 376-Mains - Situs	75,710,461
FL-G 378-Meas & Regulating Equip	436,639
FL-G 380-Services - Allocated	23,415,519
FL-G 381-Meters & Regs - Allocated	3,509,946
FL-G 382-Meter & Installs - Alloc	5,247,437
FL-G 383-House Regulators	2,226,051
FL-G 385-Ind Meas & Reg Stat Equip	588,591
FL-G 387-Other Equipment	496,144
Grand Total	**111,630,788**

County/District	Asset Type	Original Cost
Columbia County	Main Gas Lines	244,330
Columbia County	Gas Distribution Lines & Equip	6,926

FL-G 376-Mains - Situs	209,636
FL-G 378-Meas & Regulating Equip	34,694
FL-G 380-Services - Allocated	4,570
FL-G 381-Meters & Regs - Allocated	685
FL-G 382-Meter & Installs - Alloc	1,024
FL-G 383-House Regulators	434
FL-G 385-Ind Meas & Reg Stat Equip	115
FL-G 387-Other Equipment	97
Grand Total	**251,255**

County/District	Asset Type	Original Cost
Dade County	Main Gas Lines	141,742,367
Dade County	Gas Distribution Lines & Equip	443,465
Dade County	Materials & Supplies	621,572
Aventura	Gas Distribution Lines & Equip	840,855
Bal Harbor	Gas Distribution Lines & Equip	492,419
Bay Harbor Islands	Gas Distribution Lines & Equip	1,480,135
Biscayne Park	Gas Distribution Lines & Equip	760,225
El Portal	Gas Distribution Lines & Equip	190,056
Golden Beach	Gas Distribution Lines & Equip	714,150
Indian Creek	Gas Distribution Lines & Equip	80,630
Metro Dade County	Gas Distribution Lines & Equip	5,333,093
Miami	Gas Distribution Lines & Equip	19,417,410
Miami Beach	Gas Distribution Lines & Equip	35,814,078
Miami Garden	Gas Distribution Lines & Equip	40,315
Miami Shores	Gas Distribution Lines & Equip	1,796,895
North Bay Village	Gas Distribution Lines & Equip	806,299
North Miami	Gas Distribution Lines & Equip	3,962,384
North Miami Beach	Gas Distribution Lines & Equip	3,138,807
Sunny Isles Beach	Gas Distribution Lines & Equip	665,197
Surfside	Gas Distribution Lines & Equip	1,992,710

FL-154-Materials & Supplies	621,572

FL-G 376-Mains - Situs	138,596,114
FL-G 378-Meas & Regulating Equip	1,408,251
FL-G 380-Services - Allocated	51,451,459
FL-G 381-Meters & Regs - Allocated	7,712,484
FL-G 382-Meter & Installs - Alloc	11,530,315
FL-G 383-House Regulators	4,891,351
FL-G 385-Ind Meas & Reg Stat Equip	1,293,324
FL-G 387-Other Equipment	1,090,189
FL-G 391-Office Furn & Equip	252,084
FL-G 394-Tools, Shop & Garage Equip	644,529
FL-G 396-Power Operated Equipment	596,434
FL-G 397-Communication Equipment	163,084
FL-G 398-Miscellaneous Equipment	81,871
Grand Total	**220,333,061**

County/District	Asset Type	Original Cost
Duval County	Main Gas Lines	202,692,764
Duval County	Gas Distribution Lines & Equip	5,856,968
Duval County	Materials & Supplies	448,306
Atlantic Beach	Gas Distribution Lines & Equip	625,636
Jacksonville	Gas Distribution Lines & Equip	44,757,210
Neptune Beach	Gas Distribution Lines & Equip	78,493

FL-154-Materials & Supplies	448,306
FL-G 376-Mains - Situs	195,720,108
FL-G 378-Meas & Regulating Equip	5,399,982
FL-G 380-Services - Allocated	33,864,711
FL-G 381-Meters & Regs - Allocated	5,076,261
FL-G 382-Meter & Installs - Alloc	7,589,110
FL-G 383-House Regulators	3,219,427
FL-G 385-Ind Meas & Reg Stat Equip	851,250
FL-G 387-Other Equipment	717,549
FL-G 391-Office Furn & Equip	135,909
FL-G 394-Tools, Shop & Garage Equip	999,953
FL-G 396-Power Operated Equipment	366,584
FL-G 397-Communication Equipment	58,512
FL-G 398-Miscellaneous Equipment	11,717
Grand Total	**254,459,378**

County/District	Asset Type	Original Cost
Flagler County	Main Gas Lines	9,080,160
Flagler County	Gas Distribution Lines & Equip	101,079
Bunnel	Gas Distribution Lines & Equip	1,456,863
Flagler Beach	Gas Distribution Lines & Equip	101,079
Palm Coast	Gas Distribution Lines & Equip	318,620

FL-G 376-Mains - Situs	8,883,319
FL-G 378-Meas & Regulating Equip	196,841
FL-G 380-Services - Allocated	1,305,036
FL-G 381-Meters & Regs - Allocated	195,623
FL-G 382-Meter & Installs - Alloc	292,460
FL-G 383-House Regulators	124,067
FL-G 385-Ind Meas & Reg Stat Equip	32,805
FL-G 387-Other Equipment	27,652
Grand Total	**11,057,803**

County/District	Asset Type	Original Cost
Hardee County	Main Gas Lines	3,018,507
Hardee County	Gas Distribution Lines & Equip	2,450
Zolfo Springs	Gas Distribution Lines & Equip	2,450

FL-G 376-Mains - Situs	3,013,351
FL-G 378-Meas & Regulating Equip	5,156
FL-G 380-Services - Allocated	3,234
FL-G 381-Meters & Regs - Allocated	485
FL-G 382-Meter & Installs - Alloc	725
FL-G 383-House Regulators	307
FL-G 385-Ind Meas & Reg Stat Equip	81
FL-G 387-Other Equipment	68
Grand Total	**3,023,408**

County/District	Asset Type	Original Cost
Hendry	Main Gas Lines	1,090,802
Hendry	Gas Distribution Lines & Equip	131,557
LaBelle	Gas Distribution Lines & Equip	79,797

FL-G 376-Mains - Situs	1,090,802
FL-G 380-Services - Allocated	139,471
FL-G 381-Meters & Regs - Allocated	20,906
FL-G 382-Meter & Installs - Alloc	31,256
FL-G 383-House Regulators	13,259
FL-G 385-Ind Meas & Reg Stat Equip	3,506
FL-G 387-Other Equipment	2,955
Grand Total	**1,302,156**

County/District	Asset Type	Original Cost
Hernando County	Main Gas Lines	52,313,786
Hernando County	Gas Distribution Lines & Equip	1,880,764
Brooksville	Gas Distribution Lines & Equip	1,012,288

FL-G 376-Mains - Situs	52,217,453
FL-G 378-Meas & Regulating Equip	96,333
FL-G 380-Services - Allocated	1,909,111
FL-G 381-Meters & Regs - Allocated	286,172
FL-G 382-Meter & Installs - Alloc	427,833
FL-G 383-House Regulators	181,494
FL-G 385-Ind Meas & Reg Stat Equip	47,989
FL-G 387-Other Equipment	40,452
Grand Total	**55,206,838**

County/District	Asset Type	Original Cost
Highlands County	Main Gas Lines	5,404,665
Highlands County	Gas Distribution Lines & Equip	101,517
Highlands County	Materials & Supplies	23,665
Avon Park	Gas Distribution Lines & Equip	1,153,230

FL-154-Materials & Supplies	23,665
FL-G 376-Mains - Situs	5,177,151
FL-G 378-Meas & Reg Equip - Alloc	28,063
FL-G 380-Services - Allocated	828,001
FL-G 381-Meters & Regs - Allocated	124,116
FL-G 382-Meter & Installs - Alloc	185,556
FL-G 383-House Regulators	78,716
FL-G 385-Ind Meas & Reg Stat Equip	20,813
FL-G 387-Other Equipment	17,544
FL-G 391-Office Furn & Equip	12,202
FL-G 394-Tools, Shop & Garage Equip	102,733
FL-G 396-Power Operated Equipment	83,331
FL-G 398-Miscellaneous Equipment	1,184
Grand Total	**6,683,076**

County/District	Asset Type	Original Cost
Hillsborough County	Main Gas Lines	302,863,915
TA-Tampa	Gas Distribution Lines & Equip	62,296,817
TT-Temple Terrace	Gas Distribution Lines & Equip	739,719
U-Rural Hillsborough	Gas Distribution Lines & Equip	99,743,919
Hillsborough County	Materials & Supplies	295,924

FL-154-Materials & Supplies	295,924
FL-G 376-Mains - Situs	286,419,770
FL-G 378-Meas & Regulating Equip	4,386,178
FL-G 380-Services - Allocated	105,147,361
FL-G 381-Meters & Regs - Allocated	15,761,407
FL-G 382-Meter & Installs - Alloc	23,563,611
FL-G 383-House Regulators	9,996,082
FL-G 385-Ind Meas & Reg Stat Equip	2,643,068
FL-G 387-Other Equipment	2,227,935
FL-G 391-Office Furn & Equip	8,076,171
FL-G 394-Tools, Shop & Garage Equip	3,401,269
FL-G 396-Power Operated Equipment	1,303,342
FL-G 397-Communication Equipment	1,939,465
FL-G 398-Miscellaneous Equipment	778,712
Grand Total	**465,940,295**

County/District	Asset Type	Original Cost
Jackson County	Main Gas Lines	215,473
Jackson County	Gas Distribution Lines & Equip	7,553
Alford	Gas Distribution Lines & Equip	7,553

FL-G 376-Mains - Situs	215,473
FL-G 380-Services - Allocated	9,968
FL-G 381-Meters & Regs - Allocated	1,494
FL-G 382-Meter & Installs - Alloc	2,234
FL-G 383-House Regulators	948
FL-G 385-Ind Meas & Reg Stat Equip	250
FL-G 387-Other Equipment	211
Grand Total	**230,578**

County/District	Asset Type	Original Cost
Lafayette County	Main Gas Lines	127,721
Lafayette County	Gas Distribution Lines & Equip	1,266

FL-G 376-Mains - Situs	127,721
FL-G 380-Services - Allocated	836
FL-G 381-Meters & Regs - Allocated	125
FL-G 382-Meter & Installs - Alloc	187
FL-G 383-House Regulators	79
FL-G 385-Ind Meas & Reg Stat Equip	21
FL-G 387-Other Equipment	18
Grand Total	**128,987**

County/District	Asset Type	Original Cost
Lake County	Main Gas Lines	31,780,620
Lake County	Gas Distribution Lines & Equip	8,106,461
Lake County	Materials & Supplies	85,574
Eustis	Gas Distribution Lines & Equip	2,025,699
Howey in the Hills	Gas Distribution Lines & Equip	131,185
Lady Lake	Gas Distribution Lines & Equip	585,317
Mt. Dora	Gas Distribution Lines & Equip	2,632,216
Tavares	Gas Distribution Lines & Equip	2,151,773
Umatilla	Gas Distribution Lines & Equip	257,259

FL-154-Materials & Supplies	85,574
FL-G 367-Mains - Situs	2,253,956
FL-G 376-Mains - Situs	29,065,518
FL-G 378-Meas & Regulating Equip	237,516
FL-G 380-Services - Allocated	10,485,677
FL-G 381-Meters & Regs - Allocated	1,571,785
FL-G 382-Meter & Installs - Alloc	2,349,849
FL-G 383-House Regulators	996,845
FL-G 385-Ind Meas & Reg Stat Equip	263,576
FL-G 387-Other Equipment	222,178
FL-G 391-Office Furn & Equip	14,998
FL-G 394-Tools, Shop & Garage Equip	61,407
FL-G 396-Power Operated Equipment	98,881
FL-G 397-Communication Equipment	44,067
FL-G 398-Miscellaneous Equipment	4,277
Grand Total	**47,756,104**

County/District	Asset Type	Original Cost
Lee County	Main Gas Lines	81,239,289
Lee County	Gas Distribution Lines & Equip	13,845,820
Lee County	Materials & Supplies	620,544
Bonita Springs	Gas Distribution Lines & Equip	3,439,888
Cape Coral	Gas Distribution Lines & Equip	556,421
Fort Myers	Gas Distribution Lines & Equip	2,434,880
Fort Myers Beach	Gas Distribution Lines & Equip	112,147
	FL-154-Materials & Supplies	620,544
	FL-G 376-Mains - Situs	80,516,781
	FL-G 378-Meas & Regulating Equip	327,143
	FL-G 380-Services - Allocated	13,454,708
	FL-G 381-Meters & Regs - Allocated	2,016,837
	FL-G 382-Meter & Installs - Alloc	3,015,211
	FL-G 383-House Regulators	1,279,103
	FL-G 385-Ind Meas & Reg Stat Equip	338,208
	FL-G 387-Other Equipment	285,087
	FL-G 391-Office Furn & Equip	108,467
	FL-G 394-Tools, Shop & Garage Equip	204,483
	FL-G 396-Power Operated Equipment	23,713
	FL-G 397-Communication Equipment	50,013
	FL-G 398-Miscellaneous Equipment	8,690
	Grand Total	**102,248,988**

County/District	Asset Type	Original Cost
Leon County	Main Gas Lines	315,382
	FL-G 376-Mains - Situs	312,523
	FL-G 378-Meas & Regulating Equip	2,860
	Grand Total	**315,382**

County/District	Asset Type	Original Cost
Levy County	Main Gas Lines	610,485
Levy County	Gas Distribution Lines & Equip	3,801
Levy County	Gas Purification Equip	11,111,248
	FL-G 336 -Gas Purification Equip Situs	11,111,248
	FL-G 376-Mains - Situs	610,485
	FL-G 380-Services - Allocated	2,508
	FL-G 381-Meters & Regs - Allocated	376
	FL-G 382-Meter & Installs - Alloc	562
	FL-G 383-House Regulators	238
	FL-G 385-Ind Meas & Reg Stat Equip	63
	FL-G 387-Other Equipment	53
	Grand Total	**11,725,533**

County/District	Asset Type	Original Cost
Liberty County	Main Gas Lines	153,267
Liberty County	Gas Distribution Lines & Equip	1,888
	FL-G 376-Mains - Situs	153,267
	FL-G 380-Services - Allocated	1,246
	FL-G 381-Meters & Regs - Allocated	187
	FL-G 382-Meter & Installs - Alloc	279
	FL-G 383-House Regulators	118
	FL-G 385-Ind Meas & Reg Stat Equip	31
	FL-G 387-Other Equipment	26
	Grand Total	**155,154**

County/District	Asset Type	Original Cost
Manatee County	Main Gas Lines	53,351,288
Manatee County	Gas Distribution Lines & Equip	52,198,841
Bradenton	Gas Distribution Lines & Equip	2,414,317
Bradenton Beach	Gas Distribution Lines & Equip	57,908

Holmes Beach	Gas Distribution Lines & Equip	164,815
Longboat Key - Manatee	Gas Distribution Lines & Equip	734,986
Palmetto	Gas Distribution Lines & Equip	798,833

FL-G 376-Mains - Situs	52,554,539
FL-G 378-Meas & Regulating Equip	787,936
FL-G 380-Services - Allocated	37,198,100
FL-G 381-Meters & Regs - Allocated	5,575,931
FL-G 382-Meter & Installs - Alloc	8,336,125
FL-G 383-House Regulators	3,536,323
FL-G 385-Ind Meas & Reg Stat Equip	935,041
FL-G 387-Other Equipment	788,179
FL-G 397-Communication Equipment	8,813
Grand Total	**109,720,987**

County/District	Asset Type	Original Cost
Marion County	Main Gas Lines	50,319,544
Marion County	Gas Distribution Lines & Equip	20,631,790
Marion County	Materials & Supplies	544,183
Belleview	Gas Distribution Lines & Equip	131,760
Ocala	Gas Distribution Lines & Equip	11,930,584

FL-154-Materials & Supplies	544,183
FL-G 376-Mains - Situs	49,050,822
FL-G 378-Meas & Regulating Equip	818,074
FL-G 380-Services - Allocated	21,574,706
FL-G 381-Meters & Regs - Allocated	3,234,011
FL-G 382-Meter & Installs - Alloc	4,834,910
FL-G 383-House Regulators	2,051,049
FL-G 385-Ind Meas & Reg Stat Equip	542,319
FL-G 387-Other Equipment	457,140
FL-G 391-Office Furn & Equip	85,118
FL-G 394-Tools, Shop & Garage Equip	191,937
FL-G 396-Power Operated Equipment	81,071
FL-G 397-Communication Equipment	79,455
FL-G 398-Miscellaneous Equipment	13,068
Grand Total	**83,557,861**

County/District	Asset Type	Original Cost
Martin County	Main Gas Lines	7,913,765
Martin County	Gas Distribution Lines & Equip	431,322
Stuart	Gas Distribution Lines & Equip	832,470

FL-G 376-Mains - Situs	7,913,765
FL-G 380-Services - Allocated	833,971
FL-G 381-Meters & Regs - Allocated	125,011
FL-G 382-Meter & Installs - Alloc	186,893
FL-G 383-House Regulators	79,283
FL-G 385-Ind Meas & Reg Stat Equip	20,963
FL-G 387-Other Equipment	17,671
Grand Total	**9,177,558**

County/District	Asset Type	Original Cost
Nassau County	Main Gas Lines	41,654,444
Nassau County	Gas Distribution Lines & Equip	6,926

FL-G 376-Mains - Situs	22,049,055
FL-G 377-Compressor Equip	19,177,801
FL-G 378-Meas & Regulating Equip	427,589
FL-G 380-Services - Allocated	4,570
FL-G 381-Meters & Regs - Allocated	685
FL-G 382-Meter & Installs - Alloc	1,024
FL-G 383-House Regulators	434
FL-G 385-Ind Meas & Reg Stat Equip	115

FL-G 387-Other Equipment	97
Grand Total	**41,661,370**

County/District	Asset Type	Original Cost
Okeechobee County	Gas Purification Equip	35,909,430

County/District	Asset Type	Original Cost
Orange County	Main Gas Lines	175,890,933
Orange County	Gas Distribution Lines & Equip	49,544,552
Orange County	Materials and Supplies	202,710
Belle Isle	Gas Distribution Lines & Equip	11,273
Edgewood	Gas Distribution Lines & Equip	117,244
Maitland	Gas Distribution Lines & Equip	622,294
Orlando	Gas Distribution Lines & Equip	28,321,158
Winter Park	Gas Distribution Lines & Equip	5,625,451

FL-154-Materials & Supplies	202,710
FL-G 367-Mains - Situs	94,021,848
FL-G 376-Mains - Situs	74,894,778
FL-G 378-Meas & Regulating Equip	3,278,241
FL-G 380-Services - Allocated	55,590,883
FL-G 381-Meters & Regs - Allocated	8,332,977
FL-G 382-Meter & Installs - Alloc	12,457,963
FL-G 383-House Regulators	5,284,875
FL-G 385-Ind Meas & Reg Stat Equip	1,397,376
FL-G 387-Other Equipment	1,177,898
FL-G 391-Office Furn & Equip	179,380
FL-G 394-Tools, Shop & Garage Equip	3,021,549
FL-G 396-Power Operated Equipment	176,790
FL-G 397-Communication Equipment	305,346
FL-G 398-Miscellaneous Equipment	13,002
Grand Total	**260,335,615**

County/District	Asset Type	Original Cost
Osceola County	Main Gas Lines	30,779,179
Osceola County	Gas Distribution Lines & Equip	19,600,018
Celebration	Gas Distribution Lines & Equip	24,802
Kissimmee	Gas Distribution Lines & Equip	6,376,263

FL-G 367-Mains - Situs	19,338,906
FL-G 376-Mains - Situs	10,634,637
FL-G 378-Meas & Regulating Equip	805,635
FL-G 380-Services - Allocated	17,157,992
FL-G 381-Meters & Regs - Allocated	2,571,953
FL-G 382-Meter & Installs - Alloc	3,845,121
FL-G 383-House Regulators	1,631,165
FL-G 385-Ind Meas & Reg Stat Equip	431,297
FL-G 387-Other Equipment	363,555
Grand Total	**56,780,261**

County/District	Asset Type	Original Cost
Palm Beach County	Main Gas Lines	23,247,439
Palm Beach County	Gas Distribution Lines & Equip	788,096
Palm Beach County	Materials and Supplies	196,097
Jupiter	Gas Distribution Lines & Equip	5,770,492
Lake Park	Gas Distribution Lines & Equip	8,875
Palm Beach Gardens	Gas Distribution Lines & Equip	17,442,825
Tequesta	Gas Distribution Lines & Equip	67,450

FL-154-Materials & Supplies	196,097
FL-G 376-Mains - Situs	23,019,163
FL-G 378-Meas & Regulating Equip	4,582
FL-G 380-Services - Allocated	15,888,785
FL-G 381-Meters & Regs - Allocated	2,381,701
FL-G 382-Meter & Installs - Alloc	3,560,690
FL-G 383-House Regulators	1,510,504
FL-G 385-Ind Meas & Reg Stat Equip	399,393
FL-G 387-Other Equipment	336,663
FL-G 391-Office Furn & Equip	21,753
FL-G 394-Tools, Shop & Garage Equip	93,565
FL-G 396-Power Operated Equipment	40,956
FL-G 397-Communication Equipment	63,005
FL-G 398-Miscellaneous Equipment	4,415
Grand Total	**47,521,272**

County/District	Asset Type	Original Cost
Pasco County	Main Gas Lines	46,693,355
Pasco County	Gas Distribution Lines & Equip	25,288,520
Dade City	Gas Distribution Lines & Equip	169,143
San Antonio	Gas Distribution Lines & Equip	9,021
St. Leo	Gas Distribution Lines & Equip	9,021
Zephyrhills	Gas Distribution Lines & Equip	85,699

FL-G 376-Mains - Situs	46,110,560
FL-G 378-Meas & Regulating Equip	582,795
FL-G 380-Services - Allocated	16,867,850
FL-G 381-Meters & Regs - Allocated	2,528,462
FL-G 382-Meter & Installs - Alloc	3,780,099
FL-G 383-House Regulators	1,603,581
FL-G 385-Ind Meas & Reg Stat Equip	424,003
FL-G 387-Other Equipment	357,408
Grand Total	**72,254,758**

County/District	Asset Type	Original Cost
Pinellas County	Main Gas Lines	77,739,858
Pinellas County	Gas Distribution Lines & Equip	6,090,536
Pinellas County	Materials and Supplies	235,755
City of Seminole	Gas Distribution Lines & Equip	877,814
Gulfport	Gas Distribution Lines & Equip	812,445
Kenneth City	Gas Distribution Lines & Equip	211,049
Largo	Gas Distribution Lines & Equip	500,541
Madeira Beach	Gas Distribution Lines & Equip	179,298
Pinellas Park	Gas Distribution Lines & Equip	1,679,053
South Pasadena	Gas Distribution Lines & Equip	121,400
St. Petersburg	Gas Distribution Lines & Equip	33,917,246
St. Petersburg Beach	Gas Distribution Lines & Equip	719,061
Treasure Island	Gas Distribution Lines & Equip	201,711

FL-154-Materials & Supplies	235,755
FL-G 376-Mains - Situs	76,615,802
FL-G 378-Meas & Regulating Equip	521,134
FL-G 380-Services - Allocated	29,899,958
FL-G 381-Meters & Regs - Allocated	4,481,952
FL-G 382-Meter & Installs - Alloc	6,700,606
FL-G 383-House Regulators	2,842,508
FL-G 385-Ind Meas & Reg Stat Equip	751,589
FL-G 387-Other Equipment	633,541
FL-G 391-Office Furn & Equip	111,822
FL-G 394-Tools, Shop & Garage Equip	326,125
FL-G 396-Power Operated Equipment	101,084
FL-G 397-Communication Equipment	46,846
FL-G 398-Miscellaneous Equipment	17,045
Grand Total	**123,285,766**

County/District	Asset Type	Original Cost
Polk County	Main Gas Lines	33,117,936
Polk County	Gas Distribution Lines & Equip	2,840,761
Polk County	Materials and Supplies	326,918
Frostproof	Gas Distribution Lines & Equip	215,216
Lakeland	Gas Distribution Lines & Equip	11,166,299

Mulberry	Gas Distribution Lines & Equip	7,353

FL-154-Materials & Supplies	326,918
FL-G 367-Mains - Situs	420,420
FL-G 376-Mains - Situs	31,891,120
FL-G 378-Meas & Reg Equip - Alloc	5,280
FL-G 378-Meas & Regulating Equip	584,374
FL-G 380-Services - Allocated	9,390,065
FL-G 381-Meters & Regs - Allocated	1,407,554
FL-G 382-Meter & Installs - Alloc	2,104,321
FL-G 383-House Regulators	892,688
FL-G 385-Ind Meas & Reg Stat Equip	236,036
FL-G 387-Other Equipment	198,963
FL-G 391-Office Furn & Equip	82,093
FL-G 394-Tools, Shop & Garage Equip	38,583
FL-G 396-Power Operated Equipment	23,891
FL-G 397-Communication Equipment	64,327
FL-G 398-Miscellaneous Equipment	7,848
Grand Total	**47,674,482**

County/District	Asset Type	Original Cost
Putnam County	Main Gas Lines	4,954,445
Putnam County	Gas Distribution Lines & Equip	2,308

FL-G 376-Mains - Situs	4,954,445
FL-G 380-Services - Allocated	1,523
FL-G 381-Meters & Regs - Allocated	228
FL-G 382-Meter & Installs - Alloc	341
FL-G 383-House Regulators	145
FL-G 385-Ind Meas & Reg Stat Equip	38
FL-G 387-Other Equipment	32
Grand Total	**4,956,753**

County/District	Asset Type	Original Cost
Sarasota County	Main Gas Lines	60,772,763
Sarasota County	Gas Distribution Lines & Equip	18,805,243
Sarasota County	Materials and Supplies	1,155,010
City of Sarasota	Gas Distribution Lines & Equip	7,455,280
Longboat Key - Sarasota	Gas Distribution Lines & Equip	1,412,064
North Port	Gas Distribution Lines & Equip	2,096,565
Venice	Gas Distribution Lines & Equip	3,565,052

FL-154-Materials & Supplies	1,155,010
FL-G 376-Mains - Situs	58,746,048
FL-G 378-Meas & Regulating Equip	1,262,323
FL-G 380-Services - Allocated	21,997,086
FL-G 381-Meters & Regs - Allocated	3,297,325
FL-G 382-Meter & Installs - Alloc	4,929,565
FL-G 383-House Regulators	2,091,204
FL-G 385-Ind Meas & Reg Stat Equip	552,936
FL-G 387-Other Equipment	466,089
FL-G 391-Office Furn & Equip	129,525
FL-G 393-Stores Equipment	1,283
FL-G 394-Tools, Shop & Garage Equip	504,893
FL-G 396-Power Operated Equipment	59,514
FL-G 397-Communication Equipment	61,107
FL-G 398-Miscellaneous Equipment	8,071
Grand Total	**95,261,978**

County/District	Asset Type	Original Cost
Seminole County	Main Gas Lines	25,669,878
Seminole County	Gas Distribution Lines & Equip	11,336,580
Altamonte Springs	Gas Distribution Lines & Equip	2,090,098
Casselberry	Gas Distribution Lines & Equip	4,058,442
Longwood	Gas Distribution Lines & Equip	202,922
Oviedo	Gas Distribution Lines & Equip	437,410

FL-G 367-Mains - Situs	10,311,110
FL-G 376-Mains - Situs	13,897,233
FL-G 378-Meas & Regulating Equip	1,461,535
FL-G 380-Services - Allocated	11,960,900
FL-G 381-Meters & Regs - Allocated	1,792,918
FL-G 382-Meter & Installs - Alloc	2,680,448

FL-G 383-House Regulators	1,137,091
FL-G 385-Ind Meas & Reg Stat Equip	300,659
FL-G 387-Other Equipment	253,436
Grand Total	**43,795,329**

County/District	Asset Type	Original Cost
St. Johns County	Main Gas Lines	59,672,274
St. Johns County	Gas Distribution Lines & Equip	69,600,268
St. Augustine	Gas Distribution Lines & Equip	1,031,953
St. Augustine Beach	Gas Distribution Lines & Equip	113,122

FL-G 376-Mains - Situs	58,732,404
FL-G 378-Meas & Regulating Equip	939,870
FL-G 380-Services - Allocated	46,684,520
FL-G 381-Meters & Regs - Allocated	6,997,929
FL-G 382-Meter & Installs - Alloc	10,462,040
FL-G 383-House Regulators	4,438,172
FL-G 385-Ind Meas & Reg Stat Equip	1,173,499
FL-G 387-Other Equipment	989,184
Grand Total	**130,417,618**

County/District	Asset Type	Original Cost
St. Lucie County	Main Gas Lines	3,010,320

County/District	Asset Type	Original Cost
Sumter County	Main Gas Lines	36,748,893
Sumter County	Gas Distribution Lines & Equip	23,612,852
Coleman	Gas Distribution Lines & Equip	1,266
Wildwood	Gas Distribution Lines & Equip	13,663,731

FL-G 376-Mains - Situs	36,438,889
FL-G 378-Meas & Regulating Equip	310,004
FL-G 380-Services - Allocated	24,599,478
FL-G 381-Meters & Regs - Allocated	3,687,419
FL-G 382-Meter & Installs - Alloc	5,512,764
FL-G 383-House Regulators	2,338,606
FL-G 385-Ind Meas & Reg Stat Equip	618,352
FL-G 387-Other Equipment	521,230
Grand Total	**74,026,742**

County/District	Asset Type	Original Cost
Volusia County	Main Gas Lines	30,145,089
Volusia County	Gas Distribution Lines & Equip	813,031
Volusia County	Materials and Supplies	59,609
Daytona Beach	Gas Distribution Lines & Equip	15,054,249
Daytona Beach Shores	Gas Distribution Lines & Equip	329,607
Holly Hill	Gas Distribution Lines & Equip	571,319
Ormond Beach	Gas Distribution Lines & Equip	1,012,992
Port Orange	Gas Distribution Lines & Equip	2,430,302
South Daytona	Gas Distribution Lines & Equip	753,701

FL-154-Materials & Supplies	59,609
FL-G 376-Mains - Situs	28,873,378
FL-G 378-Meas & Regulating Equip	876,787
FL-G 380-Services - Allocated	13,834,837
FL-G 381-Meters & Regs - Allocated	2,073,818
FL-G 382-Meter & Installs - Alloc	3,100,399
FL-G 383-House Regulators	1,315,241
FL-G 385-Ind Meas & Reg Stat Equip	347,763
FL-G 387-Other Equipment	293,142
FL-G 391-Office Furn & Equip	59,791
FL-G 394-Tools, Shop & Garage Equip	172,020
FL-G 396-Power Operated Equipment	128,776
FL-G 397-Communication Equipment	23,208
FL-G 398-Miscellaneous Equipment	11,129
Grand Total	**51,169,898**

County/District	Asset Type	Original Cost
Wakulla County	Main Gas Lines	180,076
Wakulla County	Gas Distribution Lines & Equip	5,664

FL-G 376-Mains - Situs	180,076
FL-G 380-Services - Allocated	3,738
FL-G 381-Meters & Regs - Allocated	560
FL-G 382-Meter & Installs - Alloc	838
FL-G 383-House Regulators	355
FL-G 385-Ind Meas & Reg Stat Equip	94
FL-G 387-Other Equipment	79
Grand Total	**185,740**

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM
Peoples Gas System 2026 Property Tax Budget Appraisal
County Allocation Factors
USE 2024 ACTUAL ALLOCATION FACTORS BELOW FOR 2026 BUDGET APPRAISAL PROJECTIONS

		ALLOCATION FACTOR	--------ORIGINAL COST 12/31/24-------- PLANT	SUPPLIES/NON UTILITY	TOTAL	FMV	
1	Baker	0.092%	$ 2,683,911		$ 2,683,911	$ 1,382,402	
2	Bay	3.526%	102,792,307	228,035	103,020,341	$ 53,173,282	
3	Bradford	0.058%	1,697,152		1,697,152	$ 874,152	
4	Brevard	0.101%	2,947,608		2,947,608	$ 1,518,225	
5	Broward	6.152%	179,340,742		179,340,742	$ 92,373,060	
6	Charlotte	0.990%	28,851,094		28,851,094	$ 14,860,337	
7	Clay	1.009%	29,407,135		29,407,135	$ 15,146,737	
8	Collier	3.830%	111,630,788		111,630,788	$ 57,497,685	
9	Columbia	0.009%	251,255		251,255	$ 129,414	
10	Dade	7.537%	219,711,489	621,572	220,333,061	$ 113,788,398	
11	Duval	8.714%	254,011,071	448,306	254,459,378	$ 131,281,822	
12	Flager	0.379%	11,057,803		11,057,803	$ 5,695,544	
14	Hardee	0.104%	3,023,408		3,023,408	$ 1,557,267	
13	Hendry	0.045%	1,302,156		1,302,156	$ 670,701	
15	Hernando	1.894%	55,206,838		55,206,838	$ 28,435,393	
16	Highlands	0.228%	6,659,411	23,665	6,683,076	$ 3,453,729	
17	Hillsborough	15.974%	465,644,370	295,924	465,940,295	$ 240,135,431	
18	Jackson	0.008%	230,578		230,578	$ 118,764	
19	Lafayette	0.004%	128,987		128,987	$ 66,438	
20	Lake	1.635%	47,670,530	85,574	47,756,104	$ 24,639,240	
21	Lee	3.486%	101,628,444	620,544	102,248,988	$ 52,966,320	
22	Leon	0.011%	315,382		315,382	$ 162,444	
23	Levy	0.021%	614,285	11,111,248	11,725,533	$ 10,740,158	0.91596330
24	Liberty	0.005%	155,154		155,154	$ 79,915	
25	Manatee	3.764%	109,720,987		109,720,987	$ 56,514,003	
26	Marion	2.848%	83,013,679	544,183	83,557,861	$ 43,302,049	
27	Martin	0.315%	9,177,558		9,177,558	$ 4,727,086	
28	Nassau	1.429%	41,661,370		41,661,370	$ 21,458,527	
29	Okeechobee	1.232%	35,909,430		35,909,430	$ 18,495,875	
30	Orange	8.924%	260,132,906	202,710	260,335,615	$ 134,189,400	
31	Osceola	1.948%	56,780,261		56,780,261	$ 29,245,816	
32	Palm Beach	1.624%	47,325,176	196,097	47,521,272	$ 24,571,881	
33	Pasco	2.479%	72,254,758		72,254,758	$ 37,216,267	
34	Pinellas	4.221%	123,050,011	235,755	123,285,766	$ 63,615,140	
35	Polk	1.624%	47,347,565	326,918	47,674,482	$ 24,714,234	
36	Putnam	0.170%	4,956,753		4,956,753	$ 2,553,076	
37	Sarasota	3.228%	94,106,968	1,155,010	95,261,978	$ 49,626,699	
38	Seminole	1.502%	43,795,329		43,795,329	$ 22,557,666	
39	St. Johns	4.474%	130,417,618		130,417,618	$ 67,174,219	
40	St. Lucie	0.103%	3,010,320		3,010,320	$ 1,550,526	
41	Sumter	2.540%	74,026,742		74,026,742	$ 38,128,964	
42	Volusia	1.753%	51,110,289	59,609	51,169,898	$ 26,384,992	
43	Wakulla	0.006%	185,740		185,740	$ 95,669	
	Total	100.000%	$ 2,914,945,360	$ 16,155,149	$ 2,931,100,509	$ 1,516,868,949	
			$ (977,271,650)	16,155,149	2,894,351,616		

FPSC EXH NO. 97

ADMITTED

Peoples Gas System
2026 Property Tax Budget
Dollars In Thousands

																Total	Excl Alliance	Net of Brightmark payment
															2026 YE SYA Budget	$ 33,022	$ 32,874	$ 32,561
		Allocation	2026 Est	2023 TRIM	2023 TRIM	2023 TPP TAX	2023 Real Prop Tax	2026 Est'd TPP	2026 Est Real Est	2026 Est'd TPP Tax	2026 Est. R.E.		Total 2026		2023 Effective	2023 Effective
	Summary		Filed	Assessed TPP	RealAssessed	ACTUAL	Actual	Assessed	Assessed		Tax		Est Tax		Mils TPP	Mils Real Property
	TPP									$ 31,663	$ 1,359		$ 33,022			
1	Baker	0.092%	1,849	1,314	0	$ 17	$ -	$ 1,849	$ -	$ 24	$ -		$ 24	Baker	0.012938	
2	Bay	3.526%	70,833	44,242	1,069	$ 555	$ 17	$ 70,833	$ 1,101	$ 889	$ 18		$ 906	Bay	0.012545	0.015902713
3	Bradford	0.058%	1,169	822	22	$ 12	$ 1	$ 1,169	$ 23	$ 17	$ 1		$ 18	Bradford	0.014599	0.045454545
4	Brevard	0.101%	2,031	1,365	0	$ 23	$ -	$ 2,031	$ -	$ 34	$ -		$ 34	Brevard	0.016850	
5	Broward	6.152%	123,581	81,140	227	$ 1,547	$ 6	$ 123,581	$ 234	$ 2,356	$ 6		$ 2,362	Broward	0.019066	0.026431718
6	Charlotte	0.990%	19,881	11,668	0	$ 181	$ -	$ 19,881	$ -	$ 308	$ -		$ 308	Charlotte	0.015513	
7	Clay	1.009%	20,264	12,913	190	$ 188	$ 3	$ 20,264	$ 196	$ 295	$ 3		$ 298	Clay	0.014559	0.015789474
8	Collier	3.830%	76,923	51,216	0	$ 487	$ -	$ 76,923	$ -	$ 731	$ -		$ 731	Collier	0.009509	
9	Columbia	0.009%	173	100	0	$ 1	$ -	$ 173	$ -	$ 2	$ -		$ 2	Columbia	0.010000	
10	Dade	7.537%	151,400	97,196	20,945	$ 1,830	$ 465	$ 151,400	$ 21,573	$ 2,851	$ 479		$ 3,330	Dade	0.018828	0.022201003
11	Duval	8.714%	175,036	112,150	4,080	$ 1,934	$ 76	$ 175,036	$ 4,202	$ 3,018	$ 78		$ 3,097	Duval	0.017245	0.018627451
12	Flager	0.379%	7,620	4,728	0	$ 96	$ -	$ 7,620	$ -	$ 155	$ -		$ 155	Flager	0.020305	
14	Hardee	0.104%	2,083	1,952	0	$ 27	$ -	$ 2,083	$ -	$ 29	$ -		$ 29	Hardee	0.013832	
15	Hendry	0.045%	897	609	0	$ 9	$ -	$ 897	$ -	$ 13	$ -		$ 13	Hendry	0.014778	
16	Hernando	1.894%	38,042	5,410	16	$ 81	$ -	$ 38,042	$ 16	$ 570	$ -		$ 570	Hernando	0.014972	
17	Highlands	0.228%	4,589	1,750	0	$ 24	$ -	$ 4,589	$ -	$ 63	$ -		$ 63	Highlands	0.013714	
18	Hillsborough	15.974%	328,934	179,239	5,742	$ 3,106	$ 102	$ 328,934	$ 5,914	$ 5,700	$ 572		$ 6,272	Hillsborough	0.017329	0.017763845
18	Jackson	0.008%	159	121	0	$ 2	$ -	$ 159	$ -	$ 3	$ -		$ 3	Jackson	0.016529	
19	Lafayette	0.004%	89	35	0	$ 1	$ -	$ 89	$ -	$ 3	$ -		$ 3	Lafayette	0.028571	
20	Lake	1.635%	32,849	21,136	521	$ 290	$ 10	$ 32,849	$ 537	$ 451	$ 10		$ 461	Lake	0.013721	0.019193858
21	Lee	3.486%	70,031	48,899	594	$ 682	$ 13	$ 70,031	$ 612	$ 977	$ 13		$ 990	Lee	0.013947	0.021885522
22	Leon	0.011%	217	127	0	$ 2	$ -	$ 217	$ -	$ 3	$ -		$ 3	Leon	0.015748	
23	Levy	0.021%	423	2,389	34	$ 34	$ 1	$ 423	$ 35	$ 6	$ 1		$ 7	Levy	0.014232	0.029411765
	Levy Non Utility		10,424					$ 10,424	$ -	$ 148			**$ 148**	**Levy**		
24	Liberty	0.005%	107	52	0	$ 1	$ -	$ 107	$ -	$ 2	$ -		$ 2	Liberty	0.019231	
25	Manatee	3.764%	75,607	48,591	32	$ 657	$ 1	$ 75,607	$ 33	$ 1,022	$ 1		$ 1,023	Manatee	0.013521	0.03125
26	Marion	2.848%	57,204	32,833	627	$ 518	$ 12	$ 57,204	$ 646	$ 902	$ 12		$ 915	Marion	0.015777	0.019138756
27	Martin	0.315%	6,324	4,379	0	$ 71	$ -	$ 6,324	$ -	$ 103	$ -		$ 103	Martin	0.016214	
28	Nassau	1.429%	28,708	20,671	130	$ 373	$ 2	$ 28,708	$ 134	$ 518	$ 2		$ 520	Nassau	0.018045	0.015384615
29	Okeechobee	1.232%	24,745					$ 24,745	$ -	$ 408	$ -		$ 408	Okeechobee		
30	Orange	8.924%	179,254	74,485	2,040	$ 1,171	$ 40	$ 179,254	$ 2,101	$ 2,818	$ 41		$ 2,859	Orange	0.015721	0.019607843
31	Osceola	1.948%	39,127	26,440	0	$ 383	$ -	$ 39,127	$ -	$ 567	$ -		$ 567	Osceola	0.014486	
32	Palm Beach	1.624%	32,611	21,429	1,391	$ 368	$ 25	$ 32,611	$ 1,433	$ 560	$ 26		$ 586	Palm Beach	0.017173	0.017972682
33	Pasco	2.479%	49,790	23,715	87	$ 389	$ 2	$ 49,790	$ 90	$ 817	$ 2		$ 819	Pasco	0.016403	0.022988506
34	Pinellas	4.221%	84,792	56,311	2,280	$ 838	$ 45	$ 84,792	$ 2,348	$ 1,262	$ 46		$ 1,308	Pinellas	0.014882	0.019736842
35	Polk	1.624%	32,627	20,765	571	$ 301	$ 10	$ 32,627	$ 588	$ 473	$ 10		$ 483	Polk	0.014496	0.017513135
36	Putnam	0.170%	3,416	2,243	18	$ 35	$ 1	$ 3,416	$ 19	$ 53	$ 1		$ 54	Putnam	0.015604	0.055555556
37	Sarasota	3.228%	64,848	43,373	1,234	$ 552	$ 19	$ 64,848	$ 1,271	$ 825	$ 20		$ 845	Sarasota	0.012727	0.015397083
38	Seminole	1.502%	30,179	19,630	0	$ 260	$ -	$ 30,179	$ -	$ 400	$ -		$ 400	Seminole	0.013245	
39	St. Johns	4.474%	89,869	54,434	100	$ 681	$ 1	$ 89,869	$ 103	$ 1,124	$ 1		$ 1,125	St. Johns	0.012511	0.01
40	St. Lucie	0.103%	2,074	1,591	0	$ 37	$ -	$ 2,074	$ -	$ 48	$ -		$ 48	St. Lucie	0.023256	
41	Sumter	2.540%	51,011	32,273	16	$ 322	$ -	$ 51,011	$ 16	$ 509	$ -		$ 509	Sumter	0.009977	0
42	Volusia	1.753%	35,219	23,216	745	$ 398	$ 14	$ 35,219	$ 767	$ 604	$ 14		$ 618	Volusia	0.017143	0.018791946
43	Wakulla	0.006%	128	67	0	$ 1	$ -	$ 128	$ -	$ 2	$ -		$ 2	Wakulla	0.014925	
		100.00%	2,027,141	$ 1,187,019	$ 42,711	$ 18,485	$ 866	$ 2,027,141	$ 43,992	$ 31,663	$ 1,359		$ 33,022		0.015573	0.020276

PGS Midtown HQ prop tax forecast 2026

Midtown HQ		2025	2026	2027	2028	2029
Garage (includes taxes)		536,757	709,562	730,849	752,774	775,357
Bldg HOA		1,689,686	2,983,503	3,073,009	3,165,199	3,260,155
Interior		775,989	1,443,336	1,496,334	1,544,151	1,614,717
Bldg Taxes		0	1,794,590	2,063,779	2,373,346	2,729,348
Total Midtown O&M Costs		**3,002,432**	**6,930,992**	**7,363,970**	**7,835,470**	**8,379,577**
Moving Costs		**1,000,000**				
9 months of PLAZA expenses		**4,345,762**				
Total O&M costs		**8,348,194**	**6,930,992**	**7,363,970**	**7,835,470**	**8,379,577**
Total						
	Tampa Electric	**6,573,990**	**5,128,934**	**5,449,338**	**5,798,247**	**6,200,887**
	PGS	**1,774,204**	**1,802,058**	**1,914,632**	**2,037,222**	**2,178,690**
			0.26			
			466,593.50	PGS Midtown 2026 Ptax forecast		

Est'd Total Prop Tax for new HQ	PGS% Apportionment	
1794590	26%	466593.4

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ADMITTED

Div.	County	County	Division Totals	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	BPC Cost Center	
			Sum of 1 & 7	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**$ 441**	**5,293**	**CC_301000**	
1	Broward	$ 2,168	**1**	$ 2,168	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	$ 181	2,168	CC_301001	
1	Brevard	$ 31		$ 31	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	31	CC_301000	
2	Hillsborough	$ 5,170	**2**	$ 5,170	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	$ 431	5,170	CC_302000	
3	Hernando	$ 522																
3	Pasco	$ 751																
3	Pinellas	$ 1,204	**3**	$ 2,478	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	$ 206	2,478	CC_303000	
4	Orange	$ 2,626																
4	Osceola	$ 520																
4	Seminole	$ 367	**4**	$ 3,513	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	$ 293	3,513	CC_304000	
5	Lake	$ 424																
5	Sumter	$ 467	**5**	$ 891	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	$ 74	891	CC_305000	
6	Baker	$ 22																
6	Bradford	$ 17																
6	Clay	$ 274																
6	Columbia	$ 2																
6	Duval	$ 2,847																
6	Lafayette	$ 2																
6	Nassau	$ 477																
6	Putnam	$ 50																
6	St. Johns	$ 1,032																
6	Union	$ -	**6**	$ 4,723	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	$ 394	4,723	CC_306000	
7	Dade	$ 3,094	**7**	$ 3,094	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	$ 258	3,094	CC_301001	
8	Polk	$ 444	**8**	$ 444	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	$ 37	444	CC_308000	
9	Flager	$ 142																
9	Volusia	$ 568	**9**	$ 710	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	$ 59	710	CC_309000	
10	Hardee	$ 26																
10	Highlands	$ 58	**10**	$ 84	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	$ 7	84	CC_310000	
11	Manatee	$ 939																
11	Sarasota	$ 777	**11**	$ 1,715	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	$ 143	1,715	CC_311000	
13	Martin	$ 94																
13	Okeechobee	$ 375																
13	Palm Beach	$ 539																
13	St. Lucie	$ 44	**13**	$ 1,052	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	$ 88	1,052	CC_313000	$ (312.86) Adjust December for this amount
14	Jackson	$ 2																
14	Leon	$ 3																
14	Liberty	$ 2																
14	Wakulla	$ 2																
14	Bay	$ 833	**14**	$ 842	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	$ 70	842	CC_314000	
15	Levy	$ 7																
15	Marion	$ 840	**15**	$ 847	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	$ 71	847	CC_315000	
16	Charlotte	$ 283																
16	Collier	$ 671																
16	Hendry	$ 12																
16	Lee	$ 909	**16**	$ 1,875	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	1,875	CC_316000	
	Total Acct 6900060	$ 29,637		$ 29,636.631	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 2,469.719	$ 29,636.631		
																$ 29,323.772		
15	Levy Non Utility (Acct 6900065)	$ 155		$ 155.000	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917			
	Payable Entry (Account 2360604)			$ 29,791.631	$ 2,482.636	$ 4,965.272	$ 7,447.908	$ 9,930.544	$ 12,413.179	$ 14,895.815	$ 17,365.534	$ 19,848.170	$ 22,330.806	$ 24,813.442	$ (2,482.636)		CC_PC01001	
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		

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ADMITTED

RNG plant	84%	$ 312.86	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 61.62	$ 739.46
Gas Main	16%	$ 61.67													

County/District	Asset Type	Original Cost	% Total
Okeechobee County	Gas Purification Equip	35,909,430	0.835336902
	376 Gas Mains & 378 Measuring/Regulating Equip	7,078,531	0.164663098
	Grand Total	**42,987,961**	
	Total Okeechobee 2024 property tax	231,348.24	
	Allocable to RNG Plant	193,253.72	
	Allocable to Gas Main	38,094.52	

FPSC EXH NO. 97

ADMITTED

Tampa Electric Company, dba Peoples Gas System
Plant In Service, Depreciation and Amortization Forecast 12/31/2025F
2026 Property Tax Budget

		12/31/2025F				12/31/2024F				25 v. 24			
		Cost	Dep & Amort.	NBV		Cost	Dep & Amort.	NBV		1	Dep & Amort.	NBV	
301	Organization	$ 12,620	$ -	$ 12,620		$ 11,000	$ -	$ 11,000		$ 1,620	$ -	$ 1,620	
302	Franchsies and Consents	-	(0)	$ (0)		-	(0)	$ (0)		-	-	-	
303	Software	164,968,974	(55,033,223)	$ 109,935,751		121,196,000	(37,727,000)	$ 83,469,000		43,772,974	(17,306,223)	26,466,751	
374	Land Rights / Easements	30,949,748	(1,261,115)	$ 29,688,633		30,912,000	(1,090,000)	$ 29,822,000		37,748	(171,115)	(133,367)	
375/390	Structures and Improvement	115,402,327	(7,706,165)	$ 107,696,161		32,642,000	(9,845,000)	$ 22,797,000		82,760,327	2,138,835	84,899,161	
392	Vehicle Fleet	57,509,371	(26,167,220)	$ 31,342,150		44,886,000	(18,947,000)	$ 25,939,000		12,623,371	(7,220,220)	5,403,150	
	Subtotal	$ 368,843,040	$ (90,167,724)	$ 278,675,316		$ 229,647,000	$ (67,609,000)	$ 162,038,000		$ 139,196,040	$ (22,558,724)	116,637,316	41.9%
	Total Exempt & Separately Assess Property	$ 368,843,040	$ (90,167,724)	$ 278,675,316	8.6%	$ 229,647,000	$ (67,609,000)	$ 162,038,000		$ 139,196,040	$ (22,558,724)	116,637,316	41.9%
												-	
	TPP Plant In Service	$ 3,892,217,009	$ (983,649,167)	$ 2,908,567,842		$ 3,201,209,000	$ (897,276,000)	$ 2,303,933,000		$ 691,008,009	$ (86,373,167)	604,634,842	20.8%
	Taxable TPP Plant In Service	$ 3,892,217,009	$ (983,649,167)	$ 2,908,567,842	90.2%	$ 3,201,209,000	$ (897,276,000)	$ 2,303,933,000		$ 691,008,009	$ (86,373,167)	604,634,842	20.8%
	Total All (Excludes non-utility 121)	$ 4,261,060,049	$ (1,073,816,891)	$ 3,187,243,158		$ 3,430,856,000	$ (964,885,000)	$ 2,465,971,000		$ 830,204,049	$(108,931,891)	721,272,158	22.6%
												-	
	Accounts 114, 115 Aquistion Adjustment	$ -	$ -	$ -		$ -	$ -	$ -		$ -	$ -	-	#DIV/0!
	Account 105,Property Held For Future Use	1,939,552	-	1,939,552		1,711,000	-	1,711,000		228,552	-	228,552	
	Subtotal	$ 1,939,552	$ -	$ 1,939,552	0.1%	$ 1,711,000	$ -	$ 1,711,000		$ 228,552	$ -	228,552	11.8%
	Total Pages 13 - 16 PGS Annual Report	$ 4,262,999,600	$ (1,073,816,891)	$ 3,189,182,709		$ 3,432,567,000	$ (964,885,000)	$ 2,467,682,000		$ 830,432,600	$(108,931,891)	721,500,709	22.6%
												-	
	Construction Work In Progress	$ 20,355,860	$ -	$ 20,355,860	0.6%	$ 115,213,000	$ -	$ 115,213,000		$ (94,857,140)	$ -	(94,857,140)	-466.0%
121	RNG Alliance	11,939,000	(1,515,242)	$ 10,423,758	0.3%	11,524,000	(512,000)	$ 11,012,000					
	M & S Inventory	3,887,980	-	3,887,980	0.1%	4,704,569	-	4,704,569		(816,589)	-	(816,589)	
	Total All Property	$ 4,299,182,440	$ (1,075,332,133)	$ 3,223,850,307	100.0%	$ 3,279,241,150	$ (906,708,703)	$ 2,598,611,569		$ 734,758,871	$(108,931,891)	$ 625,826,980	19.4%

$ 4,274,938,600	NBV - TTPP	$ 2,922,879,580	NBV - TTPP	$ 2,319,649,569
	NBV - Realty	$ 139,324,346	NBV - Realty	$ 54,330,000
		$ 3,062,203,926		$ 2,373,979,569

$000s	Reconciliation to As Filed amounts
$ 4,261,060	per above excl. 121
$ 4,261,060	per Comm Adj excl. 121 Alliance
$ (0)	Diff
$ (1,073,817)	per above excl. 121
$ (1,073,817)	per Filing
$ -	Diff

FPSC EXH NO. 97

ADMITTED

Peoples Gas System, Inc

Plant In Service, Depreciation and Amortization Forecast Using 12+0 SOP Forecast values as of December 31, 2025

301	Organization	12,620.10	-	12,620	
302	Franchise & Consents	-	(0.00)	(0)	
303	Custom Intangible Plant	164,968,974	(55,033,223)	109,935,751	
374	Land Distribution	30,949,748	(1,261,115)	29,688,633	
375	Structures & Improvements	113,991,736	(7,658,574)	106,333,162	
390	Structures & Improvements	1,410,591	(47,591)	1,363,000	
121	RNG Acct 121 Levy	11,939,000	(1,515,242)	10,423,758	
392	Vehicle Fleet	57,509,371	(26,167,220)	31,342,150	
		$ 380,782,040	$ (91,682,966)	$ 289,099,074	
364	Liquified Natural Gas (LNG)	1,399,000	(85,663)	1,313,337	
376	Main Lines	$ 2,315,507,400	$ (480,787,842)	1,834,719,558	
104	Leased Plant	41,079,035	(8,935,537)	32,143,498	
377	Compressor Station Equip	19,851,446	(3,231,201)	16,620,245	
378	Meas & Reg Station Eqp Gen	29,777,825	(7,807,418)	21,970,407	
379	Meas & Reg Station Eqp City	134,207,884	(25,670,608)	108,537,276	
		2,541,822,590	(526,518,269)	2,015,304,321	
380	Services	904,687,639	(293,704,915)	610,982,723	
381	Meters	128,366,173	(54,542,119)	73,824,054	
382	Meter Installations	161,945,076	(44,550,216)	117,394,860	
383	House Regulators	23,598,937	(9,789,980)	13,808,957	
384	House Regulator Installs	39,276,068	(18,638,290)	20,637,778	
385	Meas & Reg Station Eqp Ind	15,200,847	(8,268,189)	6,932,658	
336	RNG	25,430,298	(724,298)	24,706,000	
386	Gas Heat Pump Initiative	-	-	-	
387	Other Equipment	15,398,238	(7,193,449)	8,204,790	
		1,313,903,276	(437,411,456)	876,491,819	
391	Office Furniture & Eqp.	13,995,001	(7,889,590)	6,105,411	
393	Stores Equipment	1,283	(757)	526	
394	Tools, Shop & Garage Equip	11,237,625	(5,567,473)	5,670,152	
395	Laboratory Equipment	-	-	-	
396	Power Operated Equipment	5,560,097	(2,317,135)	3,242,962	
397	Communication Equipment	3,012,389	(3,623,201)	(610,813)	
398	Miscellaneous Equipment	2,684,749	(321,285)	2,363,464	
		36,491,143	(19,719,442)	16,771,701	
18679		-	-	-	91%
	Total Taxable TPP	$ 3,892,217,009	$ (983,649,167)	$2,908,567,842	
	Total All Plant	$ 4,272,999,049	$ (1,075,332,133)	$3,197,666,916	
		$ 4,272,998,636			
		-413			
		$ 4,272,998,636			
	sum of 105 and 115	1,939,551.55	$ -	$ -	
		$ -			
		$ -			
107	CWIP	20,355,860			
		$ 4,274,938,600			
		$ (413)			

Per MFR ACCT	G1-10 ORIG	G1-12 & 14 DEPR	NBV
10400(394&336)	41,079,035	(8,935,537)	32,143,498
10500	1,939,552	-	-
11501	-	-	-
30100	12,620	-	12,620
30200	-	-	-
30300	815,325	(815,325)	-
			-
30301	164,153,649	(54,217,898)	109,935,751
30302	-	-	-
33602	25,430,298	(724,298)	24,706,000
			-
36400	1,398,587	(85,663)	1,312,923
37400	26,680,875	-	26,680,875
37402	4,268,873	(1,261,115)	3,007,758
37500	113,991,736	(7,658,574)	106,333,162
37600	930,915,244	(256,892,254)	674,022,990
37602	1,384,592,156	(223,895,588)	1,160,696,568
37700	19,851,446	(3,231,201)	16,620,245
37800	29,777,825	(7,807,418)	21,970,407
37900	134,207,884	(25,670,608)	108,537,276
38000	78,161,725	(38,751,420)	39,410,305
38002	826,525,913	(254,953,495)	571,572,418
38100	128,366,173	(54,542,119)	73,824,054
38200	161,945,076	(44,550,216)	117,394,860
38300	23,598,937	(9,789,980)	13,808,957
38400	39,276,068	(18,638,290)	20,637,778
38500	15,200,847	(8,268,189)	6,932,658
38602	-	-	-
38608	-	-	-
38700	15,398,238	(7,193,449)	8,204,790
39000	1,276,431	(720)	1,275,711
39002	134,160	(46,871)	87,289
39100	2,178,347	(1,446,541)	731,806
39101	10,214,759	(5,175,281)	5,039,478
39102	1,601,895	(1,267,768)	334,126
39103	-	-	-
39201	26,036,437	(9,778,636)	16,257,801
39202	24,474,124	(13,679,690)	10,794,435
39203	-	(0)	-
39204	4,351,228	(1,000,283)	3,350,945
39205	2,647,582	(1,708,612)	938,970
39300	1,283	(757)	526
39400	11,237,625	(5,567,473)	5,670,152
39401			-
39500	-	(0)	-
39600	5,560,097	(2,317,135)	3,242,962
39700	3,012,389	(3,623,201)	(610,813)
39800	2,684,749	(321,285)	2,363,464
39900	-	-	-
33602-12100	11,939,000	(1,515,242)	10,423,758
Grand Total	**4,274,938,187**	**(1,075,332,133)**	**3,199,606,054**
Excl. PHFFU & Alliance	4,261,059,636	(1,073,816,891)	3,187,242,744
Tie out	$4,261,059,636	($1,073,816,891)	
	G-1, p 10	G-1, p 12	
	-	-	

2024 12+0 SOP Plant Value as of 12/2025 FORECAST

FERC Description	Account #	Per MFR GROSS	G1-12 & 14 DEPR	NBV
39401 - CNG Station Equipment - 104	39401-10400	5,140,982	(1,334,501)	3,806,481
Future Use	10500	1,939,552	-	1,939,552
PGS Acq Adj (Reserve)	11501	-	-	-
Organization	30100	12,620	-	12,620
Franchise & Consents	30200	-	-	-
Misc Intangible Plant	30300	815,325	(815,325)	-
Custom Intangible Plant	30301	164,153,649	(54,217,898)	109,935,751
SAP Intangible Plant	30302	-	-	-
Renewable Natural Gas (RNG)	33600	25,430,298	(724,298)	24,706,000
33601 - Renewable Natural Gas (RNG	33601-10400	35,938,052	(7,601,036)	28,337,017
Liquified Natural Gas (LNG)	36400	1,398,587	(85,663)	1,312,923
Land Distribution	37400	26,680,875	-	26,680,875
Land Rights	37402	4,268,873	(1,261,115)	3,007,758
Structures & Improvements - 37500	37500	113,991,736	(7,658,574)	106,333,162
Mains Steel	37600	930,915,244	(256,892,254)	674,022,990
Mains Plastic	37602	1,384,592,156	(223,895,588)	1,160,696,568
Compressor Equipment	37700	19,851,446	(3,231,201)	16,620,245
Meas & Reg Station Eqp Gen	37800	29,777,825	(7,807,418)	21,970,407
Meas & Reg Station Eqp City	37900	134,207,884	(25,670,608)	108,537,276
Services Steel	38000	78,161,725	(38,751,420)	39,410,305
Services Plastic	38002	826,525,913	(254,953,495)	571,572,418
Meters	38100	128,366,173	(54,542,119)	73,824,054
Meter Installations	38200	161,945,076	(44,550,216)	117,394,860
House Regulators	38300	23,598,937	(9,789,980)	13,808,957
House Regulator Installs	38400	39,276,068	(18,638,290)	20,637,778
Meas & Reg Station Eqp Ind	38500	15,200,847	(8,268,189)	6,932,658
Other Property Cust Premise - 38602	38602	-	-	-
Other Property Cust Premise - 38608	38608	-	-	-
Other Equipment	38700	15,398,238	(7,193,449)	8,204,790
Structures & Improvements - 3900	39000	1,276,431	(720)	1,275,711
Structur & Improv Leasehold	39002	134,160	(46,871)	87,289
Office Furniture - 39100	39100	2,178,347	(1,446,541)	731,806
Computer Equipment	39101	10,214,759	(5,175,281)	5,039,478
Office Equipment	39102	1,601,895	(1,267,768)	334,126
Office Furniture - 39103	39103	-	-	-
Vehicles up to 1/2 Tons	39201	26,036,437	(9,778,636)	16,257,801
Vehicles from 1/2 - 1 Tons	39202	24,474,124	(13,679,690)	10,794,435
Airplane	39203	-	(0)	(0)
Trailers & Other	39204	4,351,228	(1,000,283)	3,350,945
Vehicles over 1 Ton	39205	2,647,582	(1,708,612)	938,970
Stores Equipment	39300	1,283	(757)	526
Tools, Shop & Garage Equip	39400	11,237,625	(5,567,473)	5,670,152
CNG Station Equipment - 39401	39401	5,140,982	(1,334,501)	3,806,481
Laboratory Equipment	39500	-	(0)	(0)
Power Operated Equipment	39600	5,560,097	(2,317,135)	3,242,962
Communication Equipment	39700	3,012,389	(3,623,201)	(610,813)
Miscellaneous Equipment	39800	2,684,749	(321,285)	2,363,464
Other Tangible Property	39900	-	-	-
33602 - RNG Alliance 121	33602-12100	11,939,000	(1,515,242)	10,423,758
WAM	99999			-
SPARE	SPARE	-	-	-
Total		**4,280,079,170**	**(1,076,666,634)**	**3,203,412,535**

FPSC EXH NO. 97

ADMITTED

Div.	County	County	Division Totals		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	BPC Cost Center
			Sum of 1 & 7		**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 477**	**$ 5,726**	**CC_301000**
1	Broward	$ 2,362	**1**	$ 2,362	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 197	$ 2,362	CC_301001
1	Brevard	$ 34		$ 34	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3	$ 34	CC_301000
2	Hillsborough	$ 6,272	**2**	$ 6,272	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 523	$ 6,272	CC_302000
3	Hernando	$ 570																
3	Pasco	$ 819																
3	Pinellas	$ 1,308	**3**	$ 2,697	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 225	$ 2,697	CC_303000
4	Orange	$ 2,859																
4	Osceola	$ 567																
4	Seminole	$ 400	**4**	$ 3,826	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 319	$ 3,826	CC_304000
5	Lake	$ 461																
5	Sumter	$ 509	**5**	$ 970	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 81	$ 970	CC_305000
6	Baker	$ 24																
6	Bradford	$ 18																
6	Clay	$ 298																
6	Columbia	$ 2																
6	Duval	$ 3,097																
6	Lafayette	$ 3																
6	Nassau	$ 520																
6	Putnam	$ 54																
6	St. Johns	$ 1,125																
6	Union	$ -	**6**	$ 5,141	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 428	$ 5,141	CC_306000
7	Dade	$ 3,330	**7**	$ 3,330	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 277	$ 3,330	CC_301001
8	Polk	$ 483	**8**	$ 483	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 40	$ 483	CC_308000
9	Flager	$ 155																
9	Volusia	$ 618	**9**	$ 773	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 64	$ 773	CC_309000
10	Hardee	$ 29																
10	Highlands	$ 63	**10**	$ 92	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 8	$ 92	CC_310000
11	Manatee	$ 1,023																
11	Sarasota	$ 845	**11**	$ 1,868	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 156	$ 1,868	CC_311000
13	Martin	$ 103																
13	Okeechobee	$ 408																
13	Palm Beach	$ 586																
13	St. Lucie	$ 48	**13**	$ 1,145	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 95	$ 1,145	CC_313000
14	Jackson	$ 3																
14	Leon	$ 3																
14	Liberty	$ 2																
14	Wakulla	$ 2																
14	Bay	$ 906	**14**	$ 916	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 76	$ 916	CC_314000
15	Levy	$ 7																

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ADMITTED

15	Marion	$ 915	**15**	$ 922	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 77	$ 922	CC_315000
16	Charlotte	$ 308																	
16	Collier	$ 731																	
16	Hendry	$ 13																	
16	Lee	$ 990	**16**	$ 2,043	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 170	$ 2,043	CC_316000
	Total Acct 6900060	######		$ 32,873.610	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 2,739.468	$ 32,873.610	
15	Levy Non Utility (Acct 6900065)	$ 148		$ 155.000	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917	$ 12.917			
	Payable Entry (Account 2360604)			$ 33,028.610	$ 2,752.384	$ 5,504.768	$ 8,257.153	$ 11,009.537	$ 13,761.921	$ 16,514.305	$ 19,253.773	$ 22,006.157	$ 24,758.541	$ 27,510.925	$ (2,752.384)				CC_PC01001
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total		

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
REVENUE REQUIREMENT RECOMMENDED BY OPC - BASE RATES
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
($ MILLIONS)

	Adjustment Before Gross Up	Gross-Up Factor	Adjustment After Gross Up		Application	W/O CI/BSR
Base Rate Increase Requested by Company Per Filing			**103.591**	Includes Roll-in of Cast Iron/Bare Steel Rider	**$ 6.733**	**$ 96.858**
Operating Income Adjustments:						
Reduce Depreciation Expense to Limit Growth in Capital Expenditures	(1.707)	1.00789	(1.721)			
Reduce Depreciation Expense to Reflect Restatement of Test Year CWIP Closures to Plant	(3.418)	1.00789	(3.445)			
Reduce Payroll and Related Expenses for Reduction in Projected Staffing Increases	(6.028)	1.00789	(6.075)			
Increase Off-System Sales Net Revenues Included in Base Rates to Reflect 4-Year Average	(1.506)	1.00789	(1.518)			
Increase Off-System Sales Net Revenues to Reflect PGS's Requested 50/50 Sharing	(4.152)	1.00789	(4.184)	Docket No. 20250026-GU		
Remove Excessive Property Tax Expense Using Corrected Net Operating Income	(0.777)	1.00789	(0.783)			
Remove SERP Expense	(0.124)	1.00789	(0.125)	OPC ROG 1-30 and OPC ROG 1-38		
Reduce Board of Directors Expenses to Correct Filing Error	(0.105)	1.00789	(0.106)			
Remove 50% of D&O Insurance Expense to Share with Shareholders	(0.037)	1.00789	(0.037)			
Remove 50% of Investor Relations Expense to Share with Shareholders	(0.021)	1.00789	(0.021)			
Remove 50% of Board of Directors Expenses to Share with Shareholders	(0.116)	1.00789	(0.117)			
Reflect Amortization of WAM Costs Over 20 Years Instead of 15 Years	(0.718)	1.00789	(0.723)	Buzzard Testimony at 19. OPC ROG 2-112		
Increase Parent Debt Income Tax Adjustment, Grossed Up for Income Taxes	(0.264)	1.00789	(0.266)			
Rate Base Adjustments:						
Reduce Plant, Net of A/D, to Limit Growth on Capital Expenditures			(5.989)			
Adjust A/D to Reflect Restatement of Test Year CWIP Closures to Plant			0.162			
Adjust Accum Amortization of WAM Costs Over Extended Amortization Period			0.034	Increase in Rate Base		
Capital Structure and Rate of Return Adjustments:						
Adjust Capital Structure - Financial Capital Structure of 51% Debt 49% Equity			(13.709)			
Set Return on Equity at 9.0%			(35.154)			
Total OPC Adjustments			**($73.778)**			
Maximum Base Rate Increase After OPC Adjustments			**$29.813**			

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM, INC.
REVENUE REQUIREMENT RECOMMENDED BY OPC
BASE RATES CHANGE FOR 2027 SYA
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
($ MILLIONS)

	2027 SYA
Base Rate Change for 2027 SYA per PGS Filing	**26.709**
Remove Requested Rate Change	(26.709)
OPC Recommended Maximum 2027 SYA Rate Change	**-**
OPC Alternative Recommendation	
Revenue Requirement Adjustments:	
Reflect Additional Revenue Due to Customer Growth Through Test Year End	(6.649)
Reflect Additional Accumualted Depreciation on 2026 Plant Additions	(0.534)
Remove Excessive Property Tax Expense	(2.842)
Adjust Rate of Return Based on Changes to Capital Structure and ROE	(2.422)
Total OPC Adjustments	**(12.446)**
OPC Recommended Maximum 2027 SYA Rate Change	**14.263**

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED RATE BASE - BASE RATES
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
($ MILLIONS)

	Amount	
Jurisdictional Rate Base per PGS Filing	2,954.442	
Less:		
Reduce Plant, Net of A/D, to Limit Growth on Capital Expenditures	(63.332)	
Adjust A/D to Reflect Restatement of Test Year CWIP Closures to Plant	1.709	
Adjust Accum Amortization of WAM Costs Over Extended Amortization Period	0.356	OPC ROG 2-112
Net Change in Rate Base OPC Recommendation	(61.268)	
Adjusted Rate Base OPC Recommendation	2,893.174	

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
($ MILLIONS)

I. PGS Cost of Capital Per Filing

	Jurisdictional Adjusted Capital	Capital Ratio	Cost Rate	Weighted Avg Cost	(1) Grossed Up Cost
Long Term Debt	1,082.596	36.64%	5.64%	2.07%	2.09%
Short Term Debt	93.604	3.17%	4.24%	0.13%	0.13%
Customer Deposits	29.475	1.00%	2.52%	0.03%	0.03%
Deferred Income Tax	327.784	11.09%	0.00%	0.00%	0.00%
Investment Tax Credits	-	0.00%	0.00%	0.00%	0.00%
Common Equity	1,420.982	48.10%	11.10%	5.34%	7.21%
Total Capital	2,954.442	100.00%		7.57%	9.46%

II. PGS Cost of Capital Adjusted to Reflect Changes to Capital Structure

	Jurisdictional Capital Before Adjustment	Jurisdictional Adjustment	Jurisdictional Adjusted Capital	Capital Ratio	Cost Rate	Weighted Avg Cost	(1) Grossed Up Cost	Sch G-3 Financial Cap Structure Before Adjustment	Capital Ratio	Adjustments	Financial Cap Structure Before Adjustment	Capital Ratio
Long Term Debt	1,082.596	148.363	1,230.959	41.66%	5.64%	2.35%	2.37%	1,082.596	41.68%	148.363	1,230.959	47.40%
Short Term Debt	93.604	-	93.604	3.17%	4.24%	0.13%	0.13%	93.604	3.60%		93.604	3.60%
Customer Deposits	29.475		29.475	1.00%	2.52%	0.03%	0.03%					
Deferred Income Tax	327.784		327.784	11.09%	0.00%	0.00%	0.00%					
Investment Tax Credits	-		-	0.00%	0.00%	0.00%	0.00%					
Common Equity	1,420.982	(148.363)	1,272.619	43.07%	11.10%	4.78%	6.45%	1,420.982	54.71%	(148.363)	1,272.619	49.00%
Total Capital	2,954.442	-	2,954.442	100.00%		7.29%	8.98%	2,597.182	100.00%	-	2,597.182	100.00%
Incremental Grossed Up ROR							-0.47%	1,272.619				
OPC Recommended Rate Base							2,893.174					
Revenue Requirement Effect - Base Rates							(13.709)					

III. PGS Cost of Capital Adjusted to Restate ROE at 9.0%

	Jurisdictional Adjusted Capital	Capital Ratio	Cost Rate	Weighted Avg Cost	(1) Grossed Up Cost
Long Term Debt	1,230.959	41.66%	5.64%	2.35%	2.37%
Short Term Debt	93.604	3.17%	4.24%	0.13%	0.13%
Customer Deposits	29.475	1.00%	2.52%	0.03%	0.03%
Deferred Income Tax	327.784	11.09%	0.00%	0.00%	0.00%
Investment Tax Credits	-	0.00%	0.00%	0.00%	0.00%
Common Equity	1,272.619	43.07%	9.00%	3.88%	5.24%
Total Capital	2,954.442	100.00%		6.39%	7.77%
Incremental Grossed Up ROR					-1.22%
OPC Recommended Rate Base					2,893.174
Revenue Requirement Effect - Base Rates					(35.154)
Effect of each 0.10% ROE					(1.758)

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM, INC.
AS-FILED REVENUE EXPANSION FACTOR
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026

		As Filed By Company	Tax Only	Fees Only
Assume pre-tax income of		100.0000%	100.0000%	100.0000%
Regulatory Assessment		0.5000%	0.00000%	0.5000%
Bad Debt Rate		0.2830%	0.00000%	0.2830%
Net Pretax Subtotal		99.2170%	100.00000%	99.2170%
State income tax	5.5%	5.4569%	5.50000%	0.0000%
Taxable income for Federal income tax		93.7600%	94.50000%	99.2170%
Federal income tax at 21%	21.0%	19.6896%	19.84500%	0.0000%
Revenue Expansion Factor		74.0704%	74.65500%	99.2170%
Gross-Up		1.3501	1.3395	1.0079
Effective Income Tax Rate			25.3450%	

PEOPLES GAS SYSTEM, INC.
COST OF CAPITAL
DOCKET NO. 20250029-GU

PGS Cost of Capital Per Filing

	Jurisdictional Adjusted Capital $ Millions	Capital Ratio	Component Costs	Weighted Avg Cost	Grossed-Up WACC
Long Term Debt	1,082.596	36.64%	5.64%	2.07%	2.09%
Short Term Debt	93.604	3.17%	4.24%	0.13%	0.13%
Customer Deposits	29.475	1.00%	2.52%	0.03%	0.03%
Deferred Income Tax	327.784	11.09%	0.00%	0.00%	0.00%
Investment Tax Credits	-	0.00%	0.00%	0.00%	0.00%
Common Equity	1,420.982	48.10%	11.10%	5.34%	7.21%
Total Capital	2,954.442	100.00%		7.57%	9.46%

PGS Cost of Capital Recommended by OPC

	Jurisdictional Adjusted Capital $ Millions	Capital Ratio	Component Costs	Weighted Avg Cost	Grossed-Up WACC
Long Term Debt	1,230.959	41.66%	5.64%	2.35%	2.37%
Short Term Debt	93.604	3.17%	4.24%	0.13%	0.13%
Customer Deposits	29.475	1.00%	2.52%	0.03%	0.03%
Deferred Income Tax	327.784	11.09%	0.00%	0.00%	0.00%
Investment Tax Credits	-	0.00%	0.00%	0.00%	0.00%
Common Equity	1,272.619	43.07%	9.00%	3.88%	5.24%
Total Capital	2,954.442	100.00%		6.39%	7.77%

FPSC EXH NO. 97

ADMITTED

E18962

PEOPLES GAS SYSTEM, INC.
2027 SYA

LINE NO.	DESCRIPTION	$000s AMOUNT	
1	2026 YE NET UTILITY PLANT	$3,105,644	
2	LESS: 2026 TEST YEAR AVERAGE NET UTILITY PLANT	($2,953,333)	
3	EQUALS: 2026 YE NET UTILITY PLANT IN EXCESS OF 2026 AVERAGE	$152,310	
4	LESS: ANNUALIZATION OF SUBSEQUENT YEAR ACCUMULATED DEPRECIATION (line 16 / 2)	($3,267)	
5	EQUALS: INCREMENTAL NET UTILITY PLANT AT END OF TEST YEAR (w/ ANNUALIZATION OF ACCUM. DEP)	$149,043	
6	RATE OF RETURN - DEBT (PORTION OF 7.57% REQUESTED RATE)	2.23%	
7	NOI REQUESTED - DEBT (line 5 * line 6)	$3,324	
8	NOI MULTIPLIER - DEBT	1.0079	
9	EQUALS: RETURN ON RATE BASE- DEBT		$3,350
10	RATE OF RETURN - EQUITY (PORTION OF 7.57% REQUESTED RATE)	5.34%	
11	N.O.I. REQUESTED - EQUITY (line 5 * line 10)	$7,959	
12	NOI MULTIPLIER - EQUITY	1.3501	
13	EQUALS: RETURN ON RATE BASE- EQUITY		$10,745
14	ADD: ANNUALIZED YEAR-END PLANT IN SERVICE DEPRECIATION	$112,687	
15	LESS: 2026 TEST YEAR DEPRECIATION (As filed)	($106,153)	
16	EQUALS: INCREMENTAL DEPRECIATION EXPENSE		$6,534
17	ADD: 2027 PROPERTY TAX BASED ON YE 2026 NET UTILITY PLANT	$35,403	
18	LESS: 2026 TEST YEAR APPROVED PROPERTY TAX (As filed)	($29,323)	
19	EQUALS: INCREMENTAL PROPERTY TAX EXPENSE		$6,080
20	TOTAL REVENUE REQUIREMENT		$26,709.076

E18962

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
2027 SYA

LINE NO.	DESCRIPTION	$000s AMOUNT	
1	2026 YE NET UTILITY PLANT	$3,105,644	
2	LESS: 2026 TEST YEAR AVERAGE NET UTILITY PLANT	($2,953,333)	
3	EQUALS: 2026 YE NET UTILITY PLANT IN EXCESS OF 2026 AVERAGE	$152,310	
4	LESS: ANNUALIZATION OF SUBSEQUENT YEAR ACCUMULATED DEPRECIATION (line 16 / 2)	($3,267)	
5	EQUALS: INCREMENTAL NET UTILITY PLANT AT END OF TEST YEAR (w/ ANNUALIZATION OF ACCUM. DEP)	$149,043	
6	RATE OF RETURN - DEBT (PORTION OF 7.57% REQUESTED RATE)	2.23%	
7	NOI REQUESTED - DEBT (line 5 * line 6)	$3,324	
8	NOI MULTIPLIER - DEBT	1.0079	
9	EQUALS: RETURN ON RATE BASE- DEBT		$3,350
10	RATE OF RETURN - EQUITY (PORTION OF 7.57% REQUESTED RATE)	5.34%	
11	N.O.I. REQUESTED - EQUITY (line 5 * line 10)	$7,959	
12	NOI MULTIPLIER - EQUITY	1.3501	
13	EQUALS: RETURN ON RATE BASE- EQUITY		$10,745
13A	INCREASE 2027 REVENUE BASED ON CUSTOMER COUNT INCREASE		($6,649)
14	ADD: ANNUALIZED YEAR-END PLANT IN SERVICE DEPRECIATION	$112,687	
15	LESS: 2026 TEST YEAR DEPRECIATION (As filed)	($106,153)	
16	EQUALS: INCREMENTAL DEPRECIATION EXPENSE		$6,534
17	ADD: 2027 PROPERTY TAX BASED ON YE 2026 NET UTILITY PLANT	$35,403	
18	LESS: 2026 TEST YEAR APPROVED PROPERTY TAX (As filed)	($29,323)	
19	EQUALS: INCREMENTAL PROPERTY TAX EXPENSE		$6,080
20	TOTAL REVENUE REQUIREMENT		$20,060.484

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM, INC.
2027 SYA

LINE NO.	DESCRIPTION	$000s AMOUNT	
1	2026 YE NET UTILITY PLANT	$3,105,644	
2	LESS: 2026 TEST YEAR AVERAGE NET UTILITY PLANT	($2,953,333)	
3	EQUALS: 2026 YE NET UTILITY PLANT IN EXCESS OF 2026 AVERAGE	$152,310	
4	LESS: ANNUALIZATION OF SUBSEQUENT YEAR ACCUMULATED DEPRECIATION (line 16 / 2)	($3,267)	
4A	LESS: ADDITIONAL ACCUMULATED DEPRECIATION	($5,645)	
5	EQUALS: INCREMENTAL NET UTILITY PLANT AT END OF TEST YEAR (w/ ANNUALIZATION OF ACCUM. DEP)	$143,398	
6	RATE OF RETURN - DEBT (PORTION OF 7.57% REQUESTED RATE)	2.23%	
7	NOI REQUESTED - DEBT (line 5 * line 6)	$3,198	
8	NOI MULTIPLIER - DEBT	1.0079	
9	EQUALS: RETURN ON RATE BASE- DEBT		$3,223
10	RATE OF RETURN - EQUITY (PORTION OF 7.57% REQUESTED RATE)	5.34%	
11	N.O.I. REQUESTED - EQUITY (line 5 * line 10)	$7,657	
12	NOI MULTIPLIER - EQUITY	1.3501	
13	EQUALS: RETURN ON RATE BASE- EQUITY		$10,338
13A	INCREASE 2027 REVENUE BASED ON CUSTOMER COUNT INCREASE		($6,649)
14	ADD: ANNUALIZED YEAR-END PLANT IN SERVICE DEPRECIATION	$112,687	
15	LESS: 2026 TEST YEAR DEPRECIATION (As filed)	($106,153)	
16	EQUALS: INCREMENTAL DEPRECIATION EXPENSE		$6,534
17	ADD: 2027 PROPERTY TAX BASED ON YE 2026 NET UTILITY PLANT	$35,403	
18	LESS: 2026 TEST YEAR APPROVED PROPERTY TAX (As filed)	($29,323)	
19	EQUALS: INCREMENTAL PROPERTY TAX EXPENSE		$6,080
20	TOTAL REVENUE REQUIREMENT		$19,526.484

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
2027 SYA

LINE NO.	DESCRIPTION	$000s AMOUNT	
1	2026 YE NET UTILITY PLANT	$3,105,644	
2	LESS: 2026 TEST YEAR AVERAGE NET UTILITY PLANT	($2,953,333)	
3	EQUALS: 2026 YE NET UTILITY PLANT IN EXCESS OF 2026 AVERAGE	$152,310	
4	LESS: ANNUALIZATION OF SUBSEQUENT YEAR ACCUMULATED DEPRECIATION (line 16 / 2)	($3,267)	
4A	LESS: ADDITIONAL ACCUMULATED DEPRECIATION	($5,645)	
5	EQUALS: INCREMENTAL NET UTILITY PLANT AT END OF TEST YEAR (w/ ANNUALIZATION OF ACCUM. DEP)	$143,398	
6	RATE OF RETURN - DEBT (PORTION OF 7.57% REQUESTED RATE)	2.23%	
7	NOI REQUESTED - DEBT (line 5 * line 6)	$3,198	
8	NOI MULTIPLIER - DEBT	1.0079	
9	EQUALS: RETURN ON RATE BASE- DEBT		$3,223
10	RATE OF RETURN - EQUITY (PORTION OF 7.57% REQUESTED RATE)	5.34%	
11	N.O.I. REQUESTED - EQUITY (line 5 * line 10)	$7,657	
12	NOI MULTIPLIER - EQUITY	1.3501	
13	EQUALS: RETURN ON RATE BASE- EQUITY		$10,338
13A	INCREASE 2027 REVENUE BASED ON CUSTOMER COUNT INCREASE		($6,649)
14	ADD: ANNUALIZED YEAR-END PLANT IN SERVICE DEPRECIATION	$112,687	
15	LESS: 2026 TEST YEAR DEPRECIATION (As filed)	($106,153)	
16	EQUALS: INCREMENTAL DEPRECIATION EXPENSE		$6,534
17	ADD: 2027 PROPERTY TAX BASED ON YE 2026 NET UTILITY PLANT	$32,561	
18	LESS: 2026 TEST YEAR APPROVED PROPERTY TAX (As filed)	($29,323)	
19	EQUALS: INCREMENTAL PROPERTY TAX EXPENSE		$3,238
20	TOTAL REVENUE REQUIREMENT		$16,684.655

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM, INC.
2027 SYA

LINE NO.	DESCRIPTION	$000s AMOUNT	
1	2026 YE NET UTILITY PLANT	$3,105,644	
2	LESS: 2026 TEST YEAR AVERAGE NET UTILITY PLANT	($2,953,333)	
3	EQUALS: 2026 YE NET UTILITY PLANT IN EXCESS OF 2026 AVERAGE	$152,310	
4	LESS: ANNUALIZATION OF SUBSEQUENT YEAR ACCUMULATED DEPRECIATION (line 16 / 2)	($3,267)	
4A	LESS: ADDITIONAL ACCUMULATED DEPRECIATION	($5,645)	
5	EQUALS: INCREMENTAL NET UTILITY PLANT AT END OF TEST YEAR (w/ ANNUALIZATION OF ACCUM. DEP)	$143,398	
6	RATE OF RETURN - DEBT (PORTION OF 7.57% REQUESTED RATE)	2.51%	
7	NOI REQUESTED - DEBT (line 5 * line 6)	$3,599	
8	NOI MULTIPLIER - DEBT	1.0079	
9	EQUALS: RETURN ON RATE BASE- DEBT		$3,627
10	RATE OF RETURN - EQUITY (PORTION OF 7.57% REQUESTED RATE)	3.88%	
11	N.O.I. REQUESTED - EQUITY (line 5 * line 10)	$5,564	
12	NOI MULTIPLIER - EQUITY	1.3501	
13	EQUALS: RETURN ON RATE BASE- EQUITY		$7,512
13A	INCREASE 2027 REVENUE BASED ON CUSTOMER COUNT INCREASE		($6,649)
14	ADD: ANNUALIZED YEAR-END PLANT IN SERVICE DEPRECIATION	$112,687	
15	LESS: 2026 TEST YEAR DEPRECIATION (As filed)	($106,153)	
16	EQUALS: INCREMENTAL DEPRECIATION EXPENSE		$6,534
17	ADD: 2027 PROPERTY TAX BASED ON YE 2026 NET UTILITY PLANT	$32,561	
18	LESS: 2026 TEST YEAR APPROVED PROPERTY TAX (As filed)	($29,323)	
19	EQUALS: INCREMENTAL PROPERTY TAX EXPENSE		$3,238
20	TOTAL REVENUE REQUIREMENT		$14,262.655

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENTS TO TEST YEAR AND SYA PROPERTY TAX EXPENSE
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
$ MILLIONS

NOTE - Be sure to synchronize final NOI requirement below with 2027 Property Tax File

Source: Schedule G-5 and OPC Rev Req Summary and Rate Base

See File OPC Property Tax Recommendation Support File - 2026 TY

As Filed Property Tax Expense (See Cell Q3 on tab CountyDetailEstimate)	29.324
OPC Recommended Property Tax Expense (See Cell Q3 on tab CountyDetailEstimate)	28.546
Reduction in Property Tax Expense - 2026 TY	(0.777)

Note for 2026 TY: Replaced 2024 Forecast NOI With 2024 Actual
Replaced 2025 Forecast NOI With Updated Surv Rep 2025
(Matches MFR NOI on Sch G-2)

See File OPC Property Tax Recommendation Support File - 2027 SYA

As Filed Property Tax Expense (See Cell Q3 on tab CountyDetailEstimate)	35.403
OPC Recommended Property Tax Expense (See Cell Q3 on tab CountyDetailEstimate)	32.561
Reduction in Property Tax Expense - 2027 SYA	(2.842)

To Replace 2026 NOI Projection in 2027 Property Tax Calc
SYA - 2027

As Filed Descriptions	As Filed Sch G-5	As Recommended by OPC
ADJUSTED RATE BASE	$2,954,441,634	$2,893,174,034
REQUESTED RATE OF RETURN	7.57%	6.39%
N.O.I. REQUIREMENTS - 2026 TY	223,651,232	184,873,821
LESS: ADJUSTED N.O.I.	146,922,776	
N.O.I. DEFICIENCY	$76,728,456	
EXPANSION FACTOR	1.3501	
REVENUE DEFICIENCY	$103,591,089	

Note for 2027 SYA:
$223,651,232 was used as the 2026 Forecast NOI in Company's Property Tax Expense Forecast for the SYA.
See tab "Inc Approach" at cell B-10. The As Recommmended NOI above for 2026 Replaced that amount.

FPSC EXH NO. 97

ADMITTED

E18968

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENTS TO INCREASE BASE REVENUE DURING SYA BASED ON CUSTOMER COUNT GROWTH
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026

Source: Buzzard Document No. 2 and OPC IRR 1-4

	Residential	Small Commercial	Large Commercial	Industrial	OSS	Total	
Budget 2025 Customers at YE	486,431	41,317	346	61	4	528,159	
Budget 2026 Customers at YE	504,073	42,015	355	63	4	546,510	
Average 2026 Customers	495,252	41,666	351	62	4	537,335	
YE 2026 Customers Over Average	8,821	349	5	1	-	9,176	
($000s)							
Budget 2026 Base Revenues	189,361	167,563	54,835	47,297	2,646	461,702	
Percentage of Total Base Revenues	41%	37%	12%	10%	0%	100%	
Base Rev Per Customer Before Incr	0.382	4.022	156.448	762.855	661.500		
							Check
OPC Recom Increase Jan 1, 2027	12,298	10,882	3,561	3,072	-	29,813	29,813
OPC Recom Increase Per Customer	0.025	0.261	10.160	49.543	-		
Base Rev Per Customer After Incr	0.407	4.283	166.608	812.398	661.500		
SYA Avg Customer Growth	3,592	1,495	750	812	-	6,649	
Times Base Rev Per Cust After Incr							

E18968

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENTS TO REFLECT INCREASED ACCUMULATED DEPRECIATION IN SYA
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026

Source: Chronister SYA Electronic WPs

Depreciation Expense for all Plant as of 12/31/2026 Per Chronister WPs		112,687,406
Gross Plant as of 12/31/2026 Per Chronister WPs		4,261,059,636
Average Depreciation Rate for all Plant as of 12/31/2026 Per Chronister WPs		2.64%
Beginning of Year Total Plant 1/1/2026	3,834,140,214	
Ending of Year Total Plant 12/31/2026	4,261,059,636	
Plant Adds During TY		426,919,422
Total Annualized Depreciation Expense Associated With 2027 for 2026 Adds		11,290,253
Less A/D Balance Change in Test Year for Test Year Adds		(5,645,127)
Additional A/D To Be Reflected		5,645,127

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENT TO REDUCE PROJECTED CAPITAL EXPENDITURES AND RELATED PLANT ADDITIONS
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
$ MILLIONS

Sources: Andrew Nichols Exhibit AN-1 Document 2 and Growth Rates from Sch G-2 p 12a

As Filed Growth Rates for 2025 and 2026	Historic Base Year + 1 12/31/2025	Projected Test Year 12/31/2026	Compounded		
Growth: Inflation Only	2.50%	2.33%	4.89%		
Customer Growth	3.86%	3.58%	7.58%		
Customer Growth x Inflation	6.46%	5.99%	12.84%		
Total As Filed Asset Amounts from Below	87.901	138.266	267.781		Compounded
Growth Rates - Year over Year		57.30%	93.67%		Check
Total Compounded Growth 2026 over 2024			204.64%		2.0464
	2024	2025	2026		
Customer and Inflation Growth					
As Filed New Revenue Mains - Cap Ex	55.331	59.576	87.354		
2024 Amount After Combined Customer and Inflation Growth		58.905	62.433		
Reduction in New Revenue Mains - Cap Ex				(24.921)	0.1284
	2024	2025	2026		
Inflation Growth					
As Filed Distribution System Improvements	3.961	22.377	60.670		
As Filed Measuring and Regulation Station Equipment	0.343	1.899	17.049		
As Filed Improvements in Property	2.831	4.133	13.025		
As Filed Technology Projects	5.173	14.391	21.880		
As Filed Technology Projects (Shared)	3.460	3.875	7.366		
Total	15.768	46.675	119.990		
2024 Amount After Inflation Growth		16.162	16.539		0.0489
Reduction in Inflation Only Growth Categories - Cap Ex				(103.451)	
Overall Reduction in Cap Ex				(128.372)	
Average Reduction in Plant in Service			(64.186)		
Average Reduction in A/D - Increase to Rate Base			0.854		
Average Reduction to Rate Base			(63.332)		
Grossed Up Rate of Return As Filed			9.46%		
Recommended Test Year Increase in Return On Rate Base				(5.989)	
Average Depreciation Expense Rate					
Depreciation and Amortization Expense As Filed for Test Year (Sch G-2 page 23)			106.153		
13-Month Average Plant Balances as Filed (Sch G-1 page 10)		4,021.684			
Less: Land and Land Rights Not Depreciable (Sch G-1 page 10)		(30.950)			
13-Month Depreciable Plant			3,990.735		
Average Depreciation Expense Rate			2.66%		
Recommended Reduction in Depreciation Expense			(1.707)		
Gross-Up Factor for Regulatory Fees and Bad Debt Expense			1.0079		
Recommended Test Year Reduction in Depreciation Expense-Grossed Up				(1.721)	
Recommended Revenue Requirement Reduction - Return of and on RB				(7.710)	

No Change in ADIT Projected for this Adjustment as both Book and Tax Depreciation Expense Would Decrease
No Change to Ad Valorem Taxes as the Change in 2026 Plant Would Not Impact Taxes Until 2027 Assuming a January 1, 2027 Asset Valuation Date

Inflation Growth on Problematic Plastic Pipe - Included in CI/BSR Rider and Not Base Rates Yet			
As Filed New Revenue Mains - Cap Ex	16.802	32.015	60.437

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENT TO RESTATE TEST YEAR CWIP CLOSURES TO PLANT
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
$ MILLIONS

Sources: Schedule E-6

	13-Month Avg CWIP 12/31/2020	13-Month Avg CWIP 12/31/2021	13-Month Avg CWIP 12/31/2022	13-Month Avg CWIP 12/31/2023	13-Month Avg CWIP 12/31/2024	5 Yr Weighted Avg
13 Month Average CWIP	120.248	148.987	195.972	256.977	101.150	164.667
13 Month Average CWIP Projected in Test Year						36.166
Reflect CWIP Closures Based on Historic Average (Increase in CWIP in Rae Base - Decrease in Plant In Service in Rate Base)						(128.501)

Average Depreciation Expense Rate			
Depreciation and Amortization Expense As Filed for Test Year (Sch G-2 page 23)		106.153	
13-Month Average Plant Balances as Filed (Sch G-1 page 10)	4,021.684		
Less: Land and Land Rights Not Depreciable (Sch G-1 page 10)	(30.950)		
13-Month Depreciable Plant		3,990.735	
Average Depreciation Expense Rate		2.66%	
Recommended Reduction in Depreciation Expense			(3.418)
Gross-Up Factor for Regulatory Fees and Bad Debt Expense			1.0079
Recommended Test Year Reduction in Depreciation Expense-Grossed Up			(3.445)
			-
Recommended Decrease in Accumulated Depreciation and Increase to Rate Base			1.709
Grossed Up Rate of Return As Filed			9.46%
Recommended Test Year Increase in Return On Rate Base			0.162
Recommended Revenue Requirement Reduction - Return of and on RB			(3.283)

No Change in ADIT Projected for this Adjustment as both Book and Tax Depreciation Expense Would Decrease
No Change to Ad Valorem Taxes as CWIP is Included in the Asset Valuation Methodology.

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENTS TO INCREASE OFF-SYTEM SALES REVENUE
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
$ MILLIONS

Source: Response to ROG 2-109 and Staff 2-2 in 2-2500026-GU

	Total OSS Net Revenue	75% Offset To PGA Clause	25% Retained By Company
2022 Actual	$ 17,840,585	$ 13,380,440	$ 4,460,146
2023 Actual	$ 10,770,429	$ 8,077,821	$ 2,692,607
2024 Actual	$ 19,353,496	$ 14,515,122	$ 4,838,374
2025 Forecast	$ 10,428,550	$ 7,821,412	$ 2,607,137
2026 Forecast	$ 10,583,550	$ 7,937,663	$ 2,645,888

	Total OSS Net Revenue	75% Offset To PGA Clause	25% Retained By Company
2022 Actual	$ 17,840,585	$ 13,380,440	$ 4,460,146
2023 Actual	$ 10,770,429	$ 8,077,821	$ 2,692,607
2024 Actual	$ 19,353,496	$ 14,515,122	$ 4,838,374
2025 Actual Jan-Apr	$ 11,542,416	$ 8,656,812	$ 2,885,604
2025 Forecast May-Dec	$ 6,918,372	$ 5,188,779	$ 1,729,593
2025 Total Actual/Forecast	$ 18,460,788	$ 13,845,591	$ 4,615,197
2026 Forecast	$ 10,583,550	$ 7,937,663	$ 2,645,888
Average 2022,2023,2024, and 2025 Retained By Company			$ 4,151,581

OPC Recommended Increase Over 2026 Forecast #1	1,505,693
OPC Recommended Increase Over 2026 Forecast #2 (Update 25% Retained by Company to 50%)	4,151,581

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENT TO REDUCE PAYROLL AND PAYROLL RELATED COSTS
FOR REDUCTIONS IN PROJECTED STAFFING
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
$ MILLIONS

Sources: Sch G-2 pages 12a, 19c through 19e of 31: Response to OPC IRR 1-06

2026 Test Year Payroll Expense Related to 2025 and 2026 Employee Additions (Page 19e)	7.150
Number of Employees Associated With Payroll Expense Additions (Page 19e)	169
Payroll Expense Per Employee	0.042

	Historic Base Year + 1 12/31/2025	Projected Test Year 12/31/2026	Compounded
Customer Growth Rate	3.86%	3.58%	7.58%
One half Compounded Growth Rate			3.79%

Number of Employees at 12/31/2024 OPC IRR 1-06	812	
Additions Using One-Half of Compound Growth Rate	31	
Additional Employees Associated With New Meter Readers	9	
Total Emplyees Recommended by OPC	852	
Total Employees in Test Year	956	
OPC Recommended Reduction in Employees	(104)	
Payroll Expense Per Employees Computed Above	0.042	
Annual Reduction in Payroll Expense for Staffing Reductions		(4.400)
Payroll Tax Expense Rate - 8% per OPC IRR 4-131	8%	
Annual Reduction in Payroll Tax Expenses		(0.352)
Fringe Benefits Loader - 29% per OPC IRR 4-131	29%	
Annual Reduction in Fringe Benefits Expenses		(1.276)
Annual Reduction in Payroll and Payroll Related Costs for Staffing Reductions - Before Gross-Up		(6.028)
Gross-Up Factor for Regulatory Fees and Bad Debt Expense		1.007892
Annual Reduction in Payroll and Payroll Related Costs for Staffing Reductions - After Gross-Up		(6.075)

5% Pay Raises Projected in January 2024
Sources: Sch G-2 pages 12a through 18b of 31

As Filed - Payroll Trended - 2022	44.621	
As Filed Payroll Trended - 2023 (5% Pay Raises)	46.852	
As Filed Payroll Trended - 2024 (5% Pay Raises)		49.195
Recommended - Payroll Trended - 2022 - Same As Filed	44.621	
Recommended Payroll Trended - 2023 (4% Pay Raises)	46.406	
Recommended Payroll Trended - 2024 (3% Pay Raises)		47.798
Reduction in Test Year Payroll Expense		(1.397)
Payroll Tax Expense Rate - 8% as Assumed in Company's Projections - Schedule G-2 WPs	8.00%	
Annual Reduction in Payroll Tax Expenses		(0.112)
Fringe Benefits Loader - Actual Per Data Response Assumed in Company's Projections	29.00%	
Annual Reduction in Fringe Benefits Expenses		(0.405)
Annual Reduction in Payroll and Payroll Related Costs - Before Gross-Up		(1.913)
Gross-Up Factor for Regulatory Fees and Bad Debt Expense		1.007892
Annual Reduction in Payroll and Payroll Related Costs - After Gross-Up		(1.928)

FPSC EXH NO. 97

ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENTS TO INCREASE PARENT DEBT INCOME TAX ADJUSTMENT
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
$ MILLIONS

Source: Sch C-26

As Filed Common Equity (Without Reduction for Retained Earnings)				
Weighted Cost of Parent Debt	0.88%			
Combined Effective Income Tax Rate	25.345%			
As Filed Common Equity (Without Reduction for Retained Earnings)	1,420.982			
Parent Debt Income Tax Adjustment		3.164		
Parent Debt Income Tax Adjustment As Filed on Sch C-26		2.967		
Additional Parent Debt Income Tax Adjustment		(0.197)		
Amount After Income Tax Gross Up for Revenue Requirement		(0.264)	Check	(0.264)

FPSC EXH NO. 97
ADMITTED

PEOPLES GAS SYSTEM, INC.
OPC RECOMMENDED ADJUSTMENTS TO REMOVE 50% OF COSTS TO SHARE WITH SHARELHOLDERS - BASE RATES
DOCKET NO. 20250029-GU
TEST YEAR ENDING DECEMBER 31, 2026
($ MILLIONS)

Sources: OPC 2-115, 2-116, and 2-117

			Amount
D&O Liability Insurance Expense			
Total D&O Insurance Expense in Test Year	OPC 2-115	0.073	
Percentage of D&O Insurance to Share With Shareholders		50%	
Removal of D&O Liability Insurance Expense To Share with Shareholders			(0.037)
Investor Relations Expense			
Total Investor Relations Expense in Test Year	OPC 2-117	0.041	
Percentage of Investor Relations Expensse to Share With Shareholders		50%	
Removal of D&O Liability Insurance Expense To Share with Shareholders			(0.021)
Board of Directors Expenses			
PGS Board Expenses - As Filed	OPC 2-116	0.137	
Emera Allocated Board Expenses - As Filed	OPC 2-116	0.200	
Total Board of Directors Expenses in Test Year - As Filed		0.337	
Error Reported by PGS Reducing the Amount of Emera Allocated Expenses	OPC 2-116	(0.105)	
Total Board of Directors Expenses in Test Year - As Corrected		0.232	
Percentage of Board of Directors Expenses to Share With Shareholders	Line 2	50%	
Removal of Board of Directors Expenses To Share with Shareholders			(0.116)

ADMITTED

Calculation for Testimony

Capex	Cap Ex Inv Present P 39	Gross Plant	Rate Iterated 11.5764%		
2024 Actual		$ 3,236.1	3,611	2025	Per Books Sch G-1
2025 F	360	$ 3,596.12	4,029	2026	Assumes Capex = Plant Adds
2026 F	430	$ 4,026.12	4,495	2027	
2027 F	510	$ 4,536.12	5,015	2028	
2028 F	560	$ 5,096.12	5,596	2029	
2029 F	500	$ 5,596.12			

Compound Growth Rate 5 Years	11.5764%
Compound Growth Rate 2 Years	11.5401%

P 40 Rate Base Growth Check

Rate Base		Rate Iterated 10.3296%	
2023 A	2,190	2,416	2024
2024 A	2,380	2,666	2025
2025 F	2,720	2,941	2026
2026 F	2,930	3,245	2027
2027 F	3,180	3,580	2028
2028 F	3,460	3,950	2029
2029 F	3,950		

Check

Excel Rate Formula 10.3296% Matches Investor Presentation on page 40

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Proxy Group Summary

Company	Ticker	Market Cap. ($ millions)	Market Category	Value Line Safety Rank	Financial Strength
Atmos Energy Corp	ATO	24,700	Large Cap	1	A
New Jersey Resources Corp	NJR	4,600	Mid Cap	2	A
NiSource Inc	NI	18,000	Large Cap	2	A
Northwest Natural Holding Company	NWN	1,700	Small Cap	2	A
ONE Gas Inc	OGS	4,500	Mid Cap	2	A
Southwest Gas Holdings Inc	SWX	5,000	Mid Cap	2	A
Spire Inc.	SR	4,300	Mid Cap	2	B++

Value Line Investment Survey

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DCF - Stock and Index Prices

Exhibit DJG-3

Ticker	^GSPC	ATO	NJR	NI	NWN	OGS	SWX	SR
30-day Average	5817	156.36	46.32	39.15	41.57	75.45	71.51	74.62
Standard Deviation	153.8	3.14	1.55	0.55	1.38	2.27	2.05	1.59
06/09/25	6006	151.97	44.47	39.35	39.97	73.61	71.27	73.84
06/06/25	6000	152.18	44.27	39.28	39.70	73.44	71.09	73.63
06/05/25	5939	152.35	44.20	38.99	39.81	73.41	71.48	73.60
06/04/25	5971	152.15	44.32	39.08	39.76	73.49	71.97	73.31
06/03/25	5970	154.61	45.59	39.43	40.70	75.30	73.68	75.21
06/02/25	5936	154.64	45.35	39.59	40.72	74.67	71.64	74.65
05/30/25	5912	154.68	45.43	39.54	40.97	74.76	71.83	75.28
05/29/25	5912	154.34	45.26	38.99	40.90	74.33	71.90	74.79
05/28/25	5889	153.72	44.85	38.75	40.96	73.54	71.00	73.74
05/27/25	5922	156.49	45.74	39.28	41.41	75.21	72.40	75.40
05/23/25	5803	156.41	45.28	39.02	40.76	74.46	70.81	74.62
05/22/25	5842	154.43	45.01	38.50	40.45	73.49	69.10	73.47
05/21/25	5845	156.09	45.59	38.85	40.95	74.79	69.06	74.24
05/20/25	5940	158.22	46.27	39.51	41.76	76.13	71.06	75.14
05/19/25	5964	159.10	46.61	39.92	41.54	75.73	71.35	74.45
05/16/25	5958	156.81	46.14	39.08	41.10	74.62	69.02	73.31
05/15/25	5917	155.11	45.78	38.69	40.73	73.49	69.18	72.59
05/14/25	5893	151.41	45.04	37.88	39.78	71.18	67.46	71.03
05/13/25	5887	152.81	45.72	37.82	40.53	72.64	67.48	71.79
05/12/25	5844	154.37	45.83	38.32	41.22	73.94	69.16	72.19
05/09/25	5660	158.98	46.81	39.58	42.83	76.35	74.99	74.66
05/08/25	5664	160.36	47.50	39.61	43.57	79.00	75.26	75.02
05/07/25	5631	161.76	48.32	40.48	43.95	80.66	75.74	76.11
05/06/25	5607	161.06	48.25	39.36	43.63	80.15	73.02	76.62
05/05/25	5650	160.51	48.61	39.31	43.55	77.55	72.37	76.04
05/02/25	5687	160.61	49.02	39.30	43.20	77.74	73.39	76.48
05/01/25	5604	159.29	48.42	38.96	42.94	77.18	72.63	76.29
04/30/25	5569	159.74	48.45	39.11	43.10	77.81	71.55	76.54
04/29/25	5561	158.81	48.58	39.44	43.29	77.59	72.21	77.06
04/28/25	5529	157.85	48.74	39.45	43.27	77.28	72.09	77.39

All prices are adjusted closing prices reported by Yahoo! Finance, http://finance.yahoo.com

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DCF - Dividend Yields

Company	Ticker	[1] Annualized Dividend	[2] Stock Price	[3] Dividend Yield
Atmos Energy Corp	ATO	3.48	156.36	2.23%
New Jersey Resources Corp	NJR	1.80	46.32	3.89%
NiSource Inc	NI	1.12	39.15	2.86%
Northwest Natural Holding Company	NWN	1.96	41.57	4.72%
ONE Gas Inc	OGS	2.68	75.45	3.55%
Southwest Gas Holdings Inc	SWX	2.48	71.51	3.47%
Spire Inc.	SR	3.14	74.62	4.21%
Average		**$2.38**	**$72.14**	**3.56%**

[1] Yahoo Finance
[2] Average stock price from Exhibit DJG-3
[3] = [1] / [2]

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DCF - Terminal Growth Rate Determinants

Terminal Growth Determinants	Rate
Nominal GDP	3.7%
Real GDP	1.6%
Long-Term Growth Ceiling	**3.7%**

CBO, The Long-Term Budget Outlook: 2025-2055, , p. 32

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DCF - Final Result

Company	Ticker	[1] Dividend Yield	[2] Analyst Growth	[3] Sustainable Growth	[4] DCF Result (Analyst Growth)	[5] DCF Result (Sustainable Growth)
Atmos Energy Corp	ATO	2.2%	7.0%	3.7%	9.4%	6.0%
New Jersey Resources Corp	NJR	3.9%	5.0%	3.7%	9.1%	7.7%
NiSource Inc	NI	2.9%	4.5%	3.7%	7.5%	6.7%
Northwest Natural Holding Company	NWN	4.7%	0.5%	3.7%	5.2%	8.6%
ONE Gas Inc	OGS	3.6%	2.0%	3.7%	5.6%	7.4%
Southwest Gas Holdings Inc	SWX	3.5%	5.5%	3.7%	9.2%	7.3%
Spire Inc.	SR	4.2%	4.0%	3.7%	8.4%	8.1%
Average		**3.6%**	**4.1%**	**3.7%**	**7.8%**	**7.4%**

[1] Dividend Yield from Exhibit DJG-4
[2] Forecasted dividend growth rates - Value Line
[3] Sustainable growth rate from Exhibit DJG-5
[4] Annual Compounding DCF = D_0 (1 + g) / P_0 + g (using analyst growth rate)
[5] Annual Compounding DCF = D_0 (1 + g) / P_0 + g (using sustainable growth rate)

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CAPM - Risk-Free Rate Estimate

Date	Rate
04/28/25	4.69%
04/29/25	4.64%
04/30/25	4.66%
05/01/25	4.74%
05/02/25	4.79%
05/05/25	4.83%
05/06/25	4.81%
05/07/25	4.77%
05/08/25	4.83%
05/09/25	4.83%
05/12/25	4.89%
05/13/25	4.94%
05/14/25	4.97%
05/15/25	4.91%
05/16/25	4.89%
05/19/25	4.92%
05/20/25	4.96%
05/21/25	5.08%
05/22/25	5.05%
05/23/25	5.04%
05/27/25	4.94%
05/28/25	4.97%
05/29/25	4.92%
05/30/25	4.92%
06/02/25	4.99%
06/03/25	4.98%
06/04/25	4.89%
06/05/25	4.88%
06/06/25	4.97%
06/09/25	4.95%
Average	**4.89%**

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CAPM - Beta Coefficients

Company	Ticker	Beta
Atmos Energy Corp	ATO	0.75
New Jersey Resources Corp	NJR	0.85
NiSource Inc	NI	0.85
Northwest Natural Holding Company	NWN	0.80
ONE Gas Inc	OGS	0.80
Southwest Gas Holdings Inc	SWX	0.80
Spire Inc.	SR	0.80
Average		0.81

Betas from Value Line Investment Survey

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CAPM - Implied Equity Risk Premium Estimate

Year	[1] Market Value	[2] Operating Earnings	[3] Dividends	[4] Buybacks	[5] Earnings Yield	[6] Dividend Yield	[7] Buyback Yield	[8] Gross Cash Yield
2014	18,245	1,004	350	553	5.50%	1.92%	3.03%	4.95%
2015	17,900	885	382	572	4.95%	2.14%	3.20%	5.33%
2016	19,268	920	397	536	4.77%	2.06%	2.78%	4.85%
2017	22,821	1,066	420	519	4.67%	1.84%	2.28%	4.12%
2018	21,027	1,282	456	806	6.10%	2.17%	3.84%	6.01%
2019	26,760	1,305	485	729	4.88%	1.81%	2.72%	4.54%
2020	31,659	1,019	480	520	3.22%	1.52%	1.64%	3.16%
2021	40,356	1,739	511	882	4.31%	1.27%	2.18%	3.45%
2022	32,133	1,656	565	923	5.15%	1.76%	2.87%	4.63%
2023	36,870	1,790	588	795	4.85%	1.60%	2.16%	3.75%
2024	49,805	1,968	630	943	3.95%	1.26%	1.89%	3.16%

Cash Yield	4.36%	[9]
Growth Rate	6.96%	[10]
Risk-free Rate	4.89%	[11]
Current Index Value	5,817	[12]

Year	[13] 1	[14] 2	[15] 3	[16] 4	[17] 5
Expected Dividends	271	290	310	332	355
Expected Terminal Value					7446
Present Value	247	240	234	228	4869

Intrinsic Index Value	5817	[18]
Required Return on Market	9.9%	[19]
Implied Equity Risk Premium	**5.0%**	[20]

[1-4] S&P Quarterly Press Releases, data found at https://us.spindices.com/indices/equity/sp-500 (additional info tab) (all dollar figures are in $ billions)
[1] Market value of S&P 500
[5] = [2] / [1]
[6] = [3] / [1]
[7] = [4] / [1]
[8] = [6] + [7]
[9] = Average of [8]
[10] = Compund annual growth rate of [2] = (end value / beginning value)$^{1/10}$-1
[11] Risk-free rate from DJG risk-free rate exhibit
[12] 30-day average of closing index prices from DJG stock price exhibit
[13-16] Expected dividends = [9]*[12]*(1+[10])^{n} ; Present value = expected dividend / (1+[11]+[19])^{n}
[17] Expected terminal value = expected dividend * (1+[11]) / [19] ; Present value = (expected dividend + expected terminal value) / (1+[11]+[19])^{n}
[18] = Sum([13-17]) present values.
[19] = [20] + [11]
[20] Internal rate of return calculation setting [18] equal to [12] and solving for the discount rate

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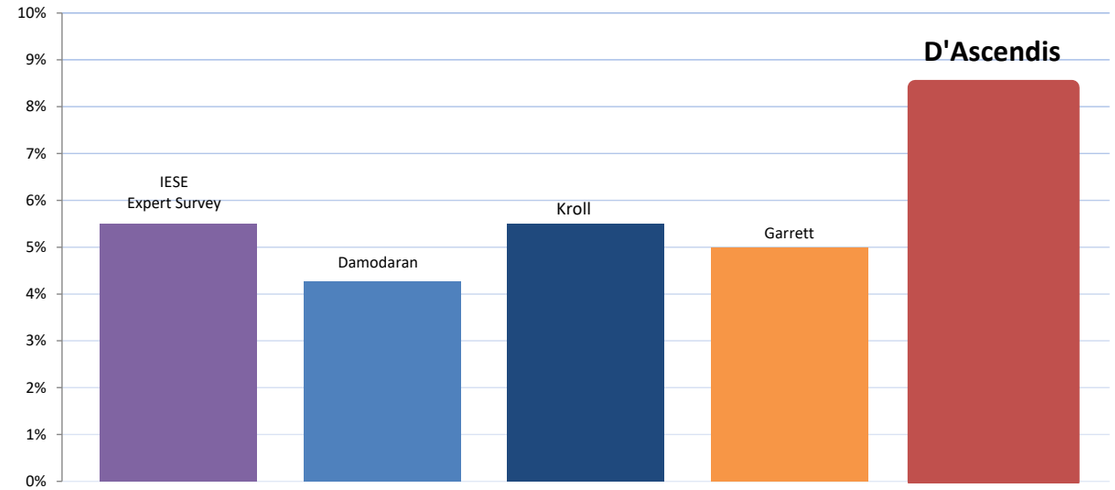
CAPM - Equity Risk Premium Results

IESE Business School Survey	5.5%	[1]
Kroll (Duff & Phelps) Report	5.5%	[2]
Damodaran (average)	4.3%	[3]
Garrett	5.0%	[4]
Average	**5.1%**	

[1] IESE Business School Survey 2025
[2] Kroll (Duff & Phelps), 6-8-2024
[3] http://pages.stern.nyu.edu/~adamodar/ , 6-1-2025
[4] ERP estimation from Exhibit DJG-9

Company ERP	8.41%



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CAPM - Final Results

Company	Ticker	[1] Beta	[2] CAPM Result
Atmos Energy Corp	ATO	0.75	8.7%
New Jersey Resources Corp	NJR	0.85	9.2%
NiSource Inc	NI	0.85	9.2%
Northwest Natural Holding Company	NWN	0.80	8.9%
ONE Gas Inc	OGS	0.80	8.9%
Southwest Gas Holdings Inc	SWX	0.80	8.9%
Spire Inc.	SR	0.80	8.9%
Average			**9.0%**
Risk-free Rate	[3]	4.9%	
Equity Risk Premium	[4]	5.1%	

[1] From Exhibit DJG-8
[2] = [3] + [1] * [4]
[3] From Exhibit DJG-7
[4] From Exhibit DJG-10

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Cost of Equity Summary

Model	Cost of Equity
CAPM (at Proxy Debt Ratio)	9.0%
Hamada CAPM (at Company-Proposed Debt Ratio)	8.6%
DCF Model (Analyst Growth)	7.8%
DCF Model (Sustainable Growth)	7.4%
Model Average	**8.2%**
Model Range	**7.4% -- 9.0%**
Recommended ROE	**9.0%**

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Exhibit DJG-13

Proxy Company Debt Ratios

Company	Ticker	Debt Ratio
Atmos Energy Corp	ATO	39%
New Jersey Resources Corp	NJR	57%
NiSource Inc	NI	54%
Northwest Natural Holding Company	NWN	55%
ONE Gas Inc	OGS	44%
Southwest Gas Holdings Inc	SWX	54%
Spire Inc.	SR	53%
Average		51%

Debt ratios from Value Line Investment Survey - 2024

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Competitive Industry Debt Ratios

Exhibit DJG-14

Industry	# Firms	Debt Ratio
Financial Svcs. (Non-bank & Insurance)	166	92%
Hotel/Gaming	65	86%
Brokerage & Investment Banking	30	80%
Retail (Automotive)	29	80%
Hospitals/Healthcare Facilities	33	76%
Air Transport	24	76%
Bank (Money Center)	15	71%
Rubber& Tires	3	67%
Recreation	50	66%
Food Wholesalers	14	66%
Transportation	21	66%
Computers/Peripherals	35	65%
Cable TV	9	65%
Advertising	54	64%
Retail (Grocery and Food)	17	64%
Retail (Special Lines)	98	64%
Telecom (Wireless)	11	63%
Power	48	62%
R.E.I.T.	192	62%
Oil/Gas Distribution	24	62%
Transportation (Railroads)	4	62%
Telecom. Services	32	62%
Chemical (Diversified)	4	61%
Auto & Truck	34	61%
Aerospace/Defense	67	60%
Broadcasting	22	60%
Packaging & Container	22	60%
Apparel	37	59%
Beverage (Soft)	29	59%
Utility (General)	14	59%
Retail (Distributors)	66	58%
Farming/Agriculture	35	57%
Green & Renewable Energy	18	57%
Information Services	16	57%
Office Equipment & Services	14	56%
Environmental & Waste Services	50	56%
Utility (Water)	15	55%
Real Estate (Development)	15	55%
Computer Services	63	54%
Household Products	101	52%
Retail (REITs)	28	52%
Drugs (Biotechnology)	535	50%
Software (Internet)	29	50%
Furn/Home Furnishings	28	50%
Total / Average	**2,216**	**63%**

http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/dbtfund.htm

Figure

Industry	# Firms	Debt Ratio
Financial Svcs. (Non-bank & Insurance)	166	92%
Hotel/Gaming	65	86%
Brokerage & Investment Banking	30	80%
Retail (Automotive)	29	80%
Hospitals/Healthcare Facilities	33	76%
Air Transport	24	76%
Bank (Money Center)	15	71%
Rubber& Tires	3	67%
Recreation	50	66%
Food Wholesalers	14	66%
Transportation	21	66%
Computers/Peripherals	35	65%
Cable TV	9	65%
Advertising	54	64%
Retail (Grocery and Food)	17	64%
Retail (Special Lines)	98	64%
Telecom (Wireless)	11	63%
Power	48	62%
R.E.I.T.	192	62%
Oil/Gas Distribution	24	62%
Transportation (Railroads)	4	62%
Telecom. Services	32	62%
Chemical (Diversified)	4	61%
Auto & Truck	34	61%
Aerospace/Defense	67	60%
Broadcasting	22	60%
Packaging & Container	22	60%
Apparel	37	59%
Beverage (Soft)	29	59%
Utility (General)	14	59%
Retail (Distributors)	66	58%
Farming/Agriculture	35	57%
Green & Renewable Energy	18	57%
Information Services	16	57%
Total / Average	**1,338**	**66%**

Figure

Source	Debt Ratio
Cable TV	65%
Power	62%
Telecom Services	62%
Proxy Group of Utilities	**51%**
Company Proposal (total debt)	**45%**

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Hamada Model Results

Unlevering Beta

Proxy Debt Ratio	51%	[1]
Proxy Equity Ratio	49%	[2]
Proxy Debt / Equity Ratio	1.0	[3]
Tax Rate	21%	[4]
Equity Risk Premium	5.1%	[5]
Risk-free Rate	4.9%	[6]
Proxy Group Beta	0.81	[7]
Unlevered Beta	0.44	[8]

Relevered Betas and Cost of Equity Estimates

[9]	[10]	[11]	[12]
Debt Ratio	D/E Ratio	Levered Beta	Cost of Equity
0%	0.0	0.44	7.1%
20%	0.3	0.53	7.6%
25%	0.3	0.56	7.7%
30%	0.4	0.59	7.9%
45%	0.8	0.73	8.6%
51%	1.0	0.81	9.0%
60%	1.5	0.97	9.8%

[1] Proxy group average debt ratio
[2] Proxy group average equity ratio
[3] = [1] / [2]
[4] Company assumed tax rate
[5] Equity risk premium from Exhibit DJG-11
[6] Risk-free rate from Exhibit DJG-11
[7] Average proxy beta from Exhibit DJG-11
[8] = [7] / (1 + (1 - [4]) * [3])
[9] Various debt ratios (Garrett proposed highlighted)
[10] = [9] / (1 - [9])
[11] = [8] * (1 + (1 - [4]) * [10])
[12] = [6] + [11] * [5]

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Final Rate of Return Recommendation

Capital Component	Proposed Ratio	Cost Rate	Weighted Cost
Long-Term Debt	47.39%	5.64%	2.67%
Short-Term Debt	3.61%	4.55%	0.16%
Common Equity	49.00%	9.00%	4.41%
Total	100.00%		7.25%

Company

Capital Component	Proposed Ratio	Cost Rate	Weighted Cost
Long-Term Debt	41.69%	5.64%	2.35%
Short-Term Debt	3.61%	4.55%	0.16%
Common Equity	54.70%	11.10%	6.07%
Total	100.0%		8.59%

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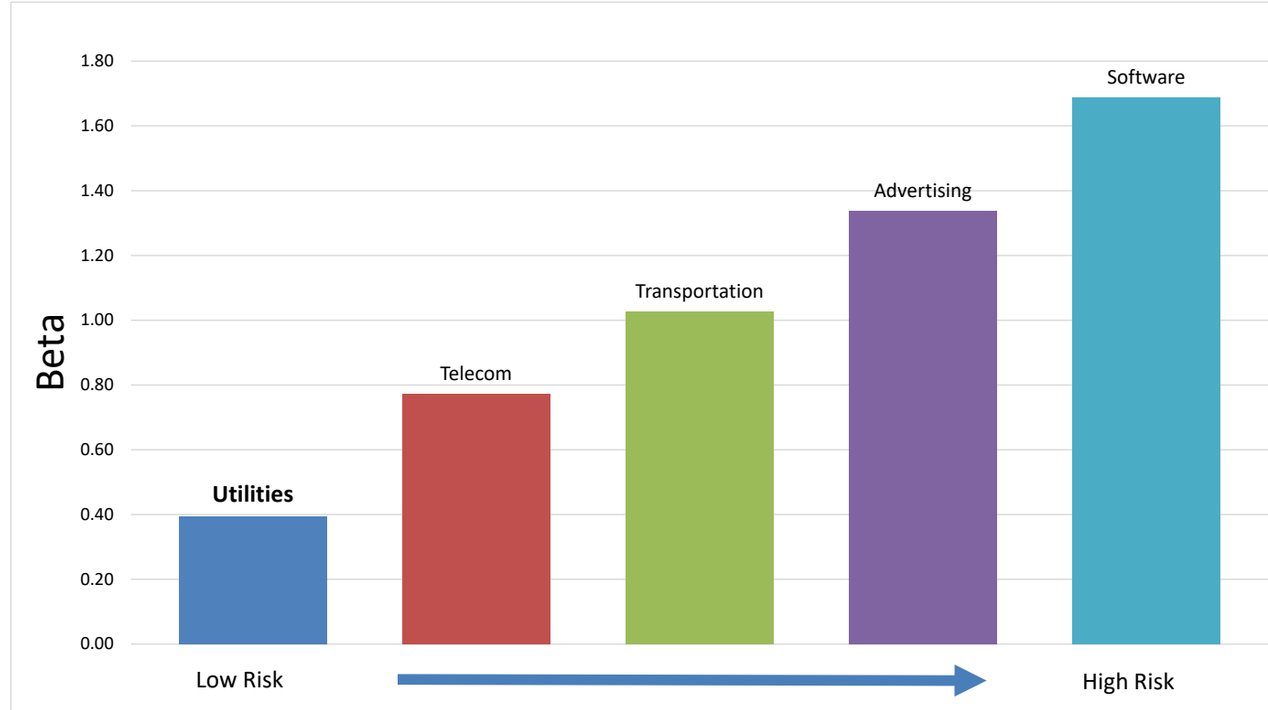
Industry	*Beta*
Utilities	0.39
Telecom	0.77
Transportation	1.03
Advertising	1.34
Software	1.69

See Betas by Sector (US) at http://pages.stern.nyu.edu/~adamodar/.



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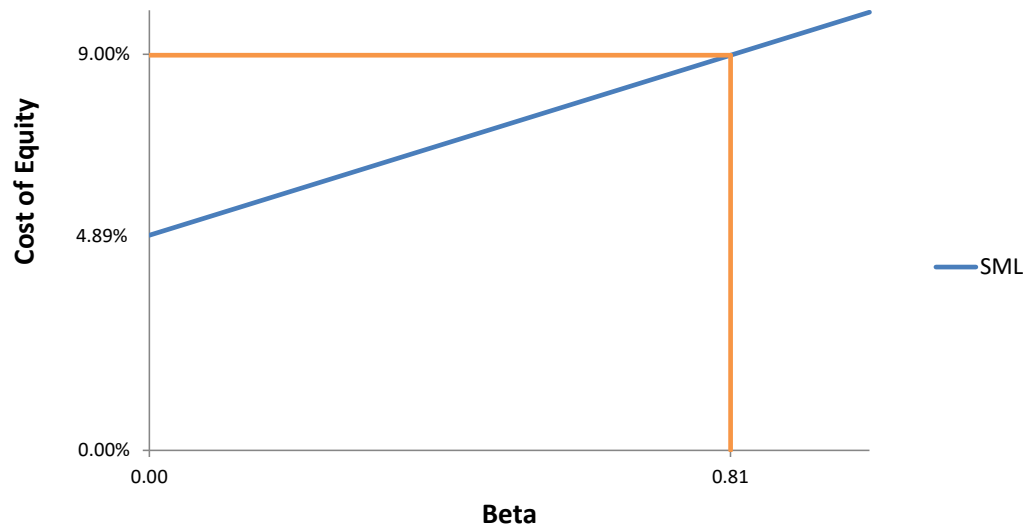
Risk-free Rate	4.89%
Equity risk premium	5.07%
Beta	0.807
CAPM Result	0.090

X	Y	ER		
0.00	0.0489	0.0898	0.8071	0.0000
0.50	0.0742	0.0898	0.8071	0.0898
0.81	0.0898	0.0898		
1.00	0.0996			

$$K = R_F + \beta(ERP)$$



		X	Y	X	Y	X	Y	X	Y
a	-0.04	0	0	20	0	60	0	100	0
b	5.5	1	5	20	1880	60	11160	100	15000
		2	22						
		3	48						
		4	85						
		5	133						
		6	189						
		7	256						
		8	332						
		9	416						
		10	510						
		11	612						
		12	723						
		13	842						
		14	968						
		15	1103						
		16	1244						
		17	1393						
		18	1549						
		19	1711						
		20	1880						
		21	2055						
		22	2236						
		23	2423						
		24	2615						
		25	2813						
		26	3015						
		27	3222						
		28	3434						
		29	3650						
		30	3870						
		31	4094						
		32	4321						
		33	4552						
		34	4786						
		35	5023						
		36	5262						
		37	5503						
		38	5747						
		39	5993						
		40	6240						
		41	6489						
		42	6738						
		43	6989						
		44	7241						
		45	7493						
		46	7745						
		47	7997						
		48	8248						
		49	8500						
		50	8750						
		51	8999						
		52	9248						
		53	9494						
		54	9739						
		55	9983						
		56	10223						
		57	10462						
		58	10698						
		59	10930						
		60	11160						
		61	11386						
		62	11609						
		63	11828						
		64	12042						
		65	12253						
		66	12458						
		67	12659						
		68	12855						
		69	13045						
		70	13230						
		71	13409						
		72	13582						
		73	13749						
		74	13909						
		75	14063						
		76	14209						
		77	14348						
		78	14480						
		79	14604						
		80	14720						
		81	14828						
		82	14927						
		83	15018						
		84	15100						
		85	15173						
		86	15236						
		87	15289						
		88	15333						
		89	15367						
		90	15390						
		91	15403						
		92	15404						
		93	15395						
		94	15375						
		95	15343						
		96	15299						
		97	15243						
		98	15174						
		99	15094						
		100	15000						
		101	14893						
		102	14774						
		103	14640						
		104	14493						
		105	14333						
		106	14157						
		107	13968						
		108	13764						
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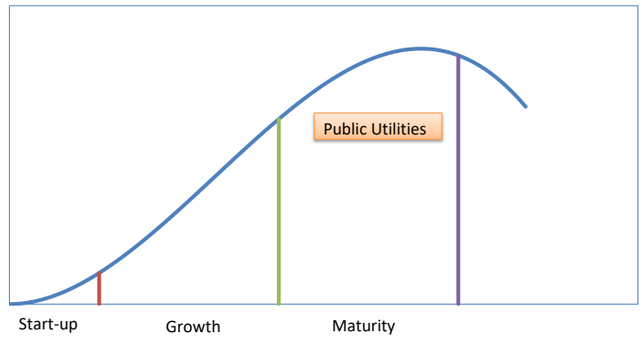
		115	11903						



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			Top Line	Mid Line	Bot. Line	Top Arrow		Bottom Arrow	
1	100	0	100	0	-40	22	10	22	-5
2	75	1	100	0	-40	22	90	22	-35
3	55	2	100	0	-40				
4	37	3	100	0	-40				
5	25	4	100	0	-40				
6	17	5	100	0	-40				
7	12	6	100	0	-40				
8	8.25	7	100	0	-40				
9	5.5	8	100	0	-40				
10	4	9	100	0	-40				
11	3.2	10	100	0	-40				
12	2.7	11	100	0	-40				
13	2.3	12	100	0	-40				
14	1.9	13	100	0	-40				
15	1.7	14	100	0	-40				
16	1.5	15	100	0	-40				
17	1.3	16	100	0	-40				
18	1.2	17	100	0	-40				
19	1.1	18	100	0	-40				
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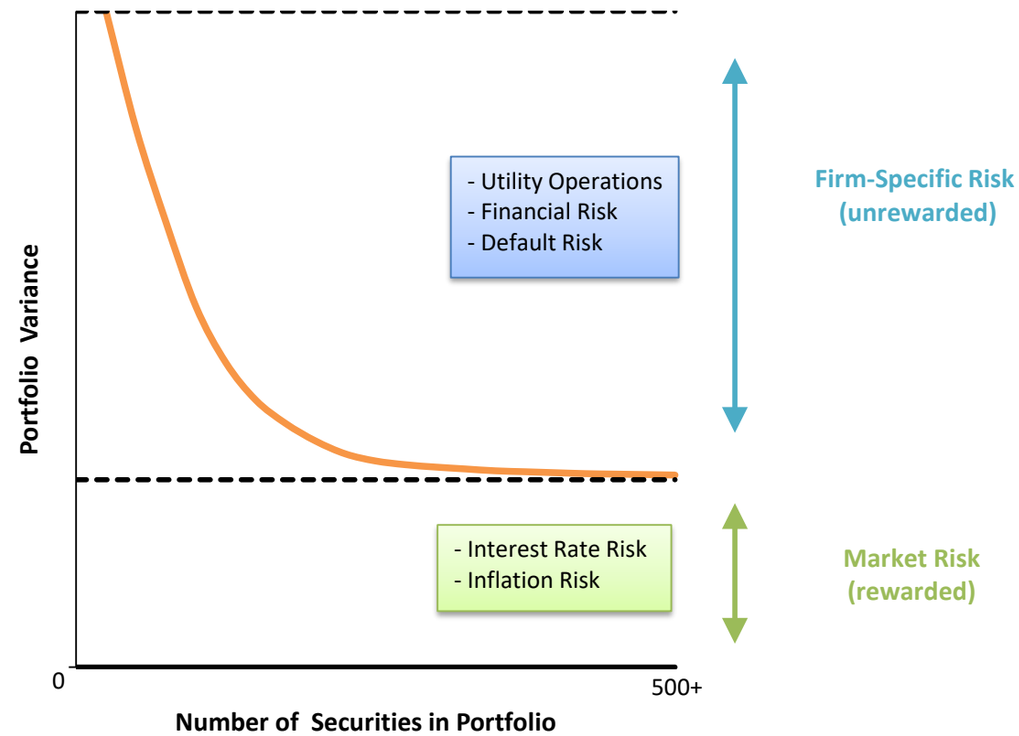
		20	100	0	-40				



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A Simplified Model for Portfolio Analysis
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A SIMPLIFIED MODEL FOR PORTFOLIO ANALYSIS*

WILLIAM F. SHARPE†

University of Washington

This paper describes the advantages of using a particular model of the relationships among securities for practical applications of the Markowitz portfolio analysis technique. A computer program has been developed to take full advantage of the model: 2,000 securities can be analyzed at an extremely low cost—as little as 2% of that associated with standard quadratic programming codes. Moreover, preliminary evidence suggests that the relatively few parameters used by the model can lead to very nearly the same results obtained with much larger sets of relationships among securities. The possibility of low-cost analysis, coupled with a likelihood that a relatively small amount of information need be sacrificed make the model an attractive candidate for initial practical applications of the Markowitz technique.

1. Introduction

Markowitz has suggested that the process of portfolio selection be approached by (1) making probabilistic estimates of the future performances of securities, (2) analyzing those estimates to determine an *efficient set* of portfolios and (3) selecting from that set the portfolios best suited to the investor's preferences [1, 2, 3]. This paper extends Markowitz' work on the second of these three stages —*portfolio analysis*. The preliminary sections state the problem in its general form and describe Markowitz' solution technique. The remainder of the paper presents a simplified model of the relationships among securities, indicates the manner in which it allows the portfolio analysis problem to be simplified, and provides evidence on the costs as well as the desirability of using the model for practical applications of the Markowitz technique.

2. The Portfolio Analysis Problem

A security analyst has provided the following predictions concerning the future returns from each of N securities:

$E_i \equiv$ the expected value of R_i (the return from security i)
C_{i1} through C_{in} ; C_{ij} represents the covariance between R_i and R_j (as usual, when $i = j$ the figure is the variance of R_i)

* Received December 1961.

† The author wishes to express his appreciation for the cooperation of the staffs of both the Western Data Processing Center at UCLA and the Pacific Northwest Research Computer Laboratory at the University of Washington where the program was tested. His greatest debt, however, is to Dr. Harry M. Markowitz of the RAND Corporation, with whom he was privileged to have a number of stimulating conversations during the past year. It is no longer possible to segregate the ideas in this paper into those which were his, those which were the author's, and those which were developed jointly. Suffice it to say that the only accomplishments which are unquestionably the property of the author are those of authorship—first of the computer program and then of this article.

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The portfolio analysis problem is as follows. Given such a set of predictions, determine the set of *efficient portfolios*; a portfolio is efficient if none other gives either (a) a higher expected return and the same variance of return or (b) a lower variance of return and the same expected return.

Let X_i represent the proportion of a portfolio invested in security i. Then the expected return (E) and variance of return (V) of any portfolio can be expressed in terms of (a) the basic data (E_i-values and C_{ij}-values) and (b) the amounts invested in various securities:

$$E = \sum_i X_i E_i$$

$$V = \sum_i \sum_j X_i X_j C_{ij} .$$

Consider an objective function of the form:

$$\begin{aligned} \phi &= \lambda E - V \\ &= \lambda \sum_i X_i E_i - \sum_i \sum_j X_i X_j C_{ij} . \end{aligned}$$

Given a set of values for the parameters (λ, E_i's and C_{ij}'s), the value of ϕ can be changed by varying the X_i values as desired, as long as two basic restrictions are observed:

1. The entire portfolio must be invested:[1]

$$\sum_i X_i = 1$$

and 2. no security may be held in negative quantities:[2]

$$X_i \geqq 0 \quad \text{for all} \quad i.$$

A portfolio is described by the proportions invested in various securities—in our notation by the values of X_i. For each set of admissable values of the X_i variables there is a corresponding predicted combination of E and V and thus of ϕ. Figure 1 illustrates this relationship for a particular value of λ. The line ϕ_1 shows the combinations of E and V which give $\phi = \phi_1$, where $\phi = \lambda_k E - V$; the other lines refer to larger values of ϕ ($\phi_3 > \phi_2 > \phi_1$). Of all possible portfolios, one will maximize the value of ϕ;[3] in figure 1 it is portfolio C. The relationship between this solution and the portfolio analysis problem is obvious. The E, V combination obtained will be on the boundary of the set of attainable combinations; moreover, the objective function will be tangent to the set at that point. Since this function is of the form

$$\phi = \lambda E - V$$

[1] Since cash can be included as one of the securities (explicitly or implicitly) this assumption need cause no lack of realism.

[2] This is the standard formulation. Cases in which short sales are allowed require a different approach.

[3] This fact is crucial to the critical line computing procedure described in the next section.

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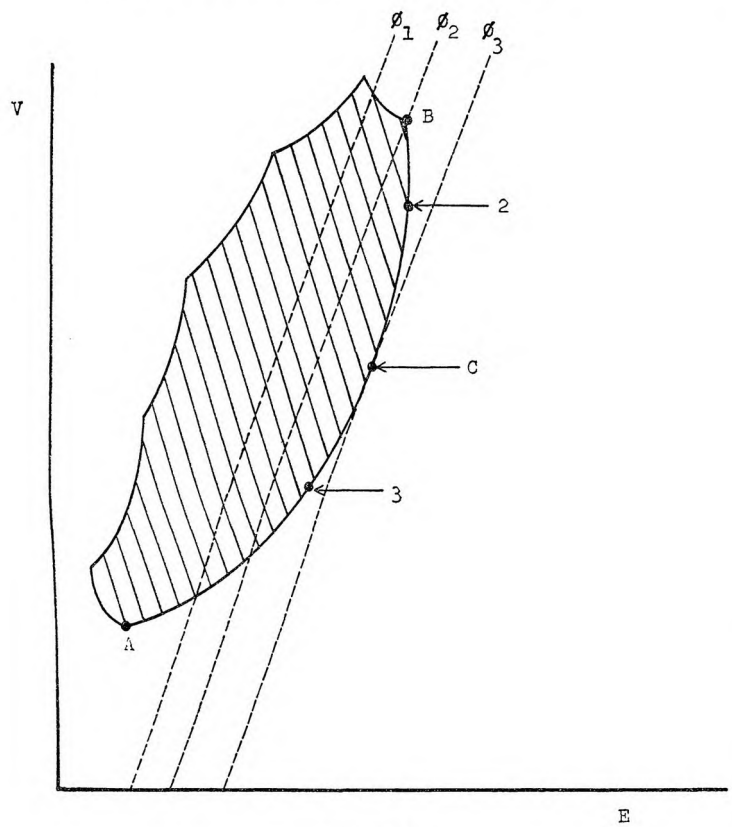

FIGURE 1

the slope of the boundary at the point must be λ; thus, by varying λ from $+\infty$ to 0, every solution of the portfolio analysis problem can be obtained.

For any given value of λ the problem described in this section requires the maximization of a quadratic function, ϕ (which is a function of X_i, X_i^2, and X_iX_j terms) subject to a linear constraint ($\sum_i X_i = 1$), with the variables restricted to non-negative values. A number of techniques have been developed to solve such *quadratic programming problems*. The critical line method, developed by Markowitz in conjunction with his work on portfolio analysis, is particularly suited to this problem and was used in the program described in this paper.

3. The Critical Line Method

Two important characteristics of the set of efficient portfolios make systematic solution of the portfolio analysis problem relatively straightforward. The first concerns the relationships among portfolios. Any set of efficient portfolios can be

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described in terms of a smaller set of *corner portfolios*. Any point on the E, V curve (other than the points associated with corner portfolios) can be obtained with a portfolio constructed by dividing the total investment between the two adjacent corner portfolios. For example, the portfolio which gives E, V combination C in Figure 1 might be some linear combination of the two corner portfolios with E, V combinations shown by points 2 and 3. This characteristic allows the analyst to restrict his attention to corner portfolios rather than the complete set of efficient portfolios; the latter can be readily derived from the former.

The second characteristic of the solution concerns the relationships among corner portfolios. Two corner portfolios which are adjacent on the E, V curve are related in the following manner: one portfolio will contain either (1) all the securities which appear in the other, plus one additional security or (2) all but one of the securities which appear in the other. Thus in moving down the E, V curve from one corner portfolio to the next, the quantities of the securities in efficient portfolios will vary until either one drops out of the portfolio or another enters. The point at which a change takes place marks a new corner portfolio.

The major steps in the critical line method for solving the portfolio analysis problem are:

1. The corner portfolio with $\lambda = \infty$ is determined. It is composed entirely of the one security with the highest expected return.[4]
2. Relationships between (a) the amounts of the various securities contained in efficient portfolios and (b) the value of λ are computed. It is possible to derive such relationships for any section of the E, V curve between adjacent corner portfolios. The relationships which apply to one section of the curve will not, however, apply to any other section.
3. Using the relationships computed in (2), each security is examined to determine the value of λ at which a change in the securities included in the portfolio would come about:
   a. securities presently in the portfolio are examined to determine the value of λ at which they would drop out, and
   b. securities not presently in the portfolio are examined to determine the value of λ at which they would enter the portfolio.
4. The next largest value of λ at which a security either enters or drops out of the portfolio is determined. This indicates the location of the next corner portfolio.
5. The composition of the new corner portfolio is computed, using the relationships derived in (2). However, since these relationships held only for the section of the curve between this corner portfolio and the preceding one, the solution process can only continue if new relationships are derived. The method thus returns to step (2) unless $\lambda = 0$, in which case the analysis is complete.

The amount of computation required to complete a portfolio analysis using

[4] In the event that two or more of the securities have the same (highest) expected return, the first efficient portfolio is the combination of such securities with the lowest variance.

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this method is related to the following factors:

1. The number of securities analyzed
   This will affect the extent of the computation in step (2) and the number of computations in step (3).
2. The number of corner portfolios
   Steps (2) through (5) must be repeated once to find each corner portfolio.
3. The complexity of the variance-covariance matrix
   Step (2) requires a matrix be inverted and must be repeated once for each corner portfolio.

The amount of computer memory space required to perform a portfolio analysis will depend primarily on the size of the variance-covariance matrix. In the standard case, if N securities are analyzed this matrix will have $\frac{1}{2}(N^2 + N)$ elements.

4. The Diagonal Model

Portfolio analysis requires a large number of comparisons; obviously the practical application of the technique can be greatly facilitated by a set of assumptions which reduces the computational task involved in such comparisons. One such set of assumptions (to be called the diagonal model) is described in this article. This model has two virtues: it is one of the simplest which can be constructed without assuming away the existence of interrelationships among securities and there is considerable evidence that it can capture a large part of such interrelationships.

The major characteristic of the diagonal model is the assumption that the returns of various securities are related only through common relationships with some basic underlying factor. The return from any security is determined solely by random factors and this single outside element; more explicitly:

$$R_i = A_i + B_i I + C_i$$

where A_i and B_i are parameters, C_i is a random variable with an expected value of zero and variance Q_i, and I is the level of some index. The index, I, may be the level of the stock market as a whole, the Gross National Product, some price index or any other factor thought to be the most important single influence on the returns from securities. The future level of I is determined in part by random factors:

$$I = A_{n+1} + C_{n+1}$$

where A_{n+1} is a parameter and C_{n+1} is a random variable with an expected value of zero and a variance of Q_{n+1}. It is assumed that the covariance between C_i and C_j is zero for all values of i and $j\,(i \neq j)$.

Figure 2 provides a graphical representation of the model. A_i and B_i serve to locate the line which relates the expected value of R_i to the level of I. Q_i indicates the variance of R_i around the expected relationship (this variance is assumed to

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be the same at each point along the line). Finally, A_{n+1} indicates the expected value of I and Q_{n+1} the variance around that expected value.

The diagonal model requires the following predictions from a security analyst:

1) values of A_i, B_i and Q_i for each of N securities
2) values of A_{n+1} and Q_{n+1} for the index I.

The number of estimates required from the analyst is thus greatly reduced: from 5,150 to 302 for an analysis of 100 securities and from 2,003,000 to 6,002 for an analysis of 2,000 securities.

Once the parameters of the diagonal model have been specified all the inputs required for the standard portfolio analysis problem can be derived. The relationships are:

$$E_i = A_i + B_i(A_{n+1})$$
$$V_i = (B_i)^2(Q_{n+1}) + Q_i$$
$$C = (B_i)(B_j)(Q_{n+1})$$

A portfolio analysis could be performed by obtaining the values required by the diagonal model, calculating from them the full set of data required for the standard portfolio analysis problem and then performing the analysis with the derived values. However, additional advantages can be obtained if the portfolio analysis problem is restated directly in terms of the parameters of the diagonal model. The following section describes the manner in which such a restatement can be performed.

5. The Analogue

The return from a portfolio is the weighted average of the returns from its component securities:

$$R_p = \sum_{i=1}^{N} X_i R_i$$

The contribution of each security to the total return of a portfolio is simply $X_i R_i$ or, under the assumptions of the diagonal model:

$$X_i(A_i + B_i I + C_i).$$

The total contribution of a security to the return of the portfolio can be broken into two components: (1) an investment in the "basic characteristics" of the security in question and (2) an "investment" in the index:

$$X_i(A_i + B_i I + C_i) = X_i(A_i + C_i) \tag{1}$$
$$+ X_i B_i I \tag{2}$$

The return of a portfolio can be considered to be the result of (1) a series of investments in N "basic securities" and (2) an investment in the index:

$$R_p = \sum_{i=1}^{N} X_i(A_i + C_i) + \left[\sum_{i=1}^{N} X_i B_i\right] I$$

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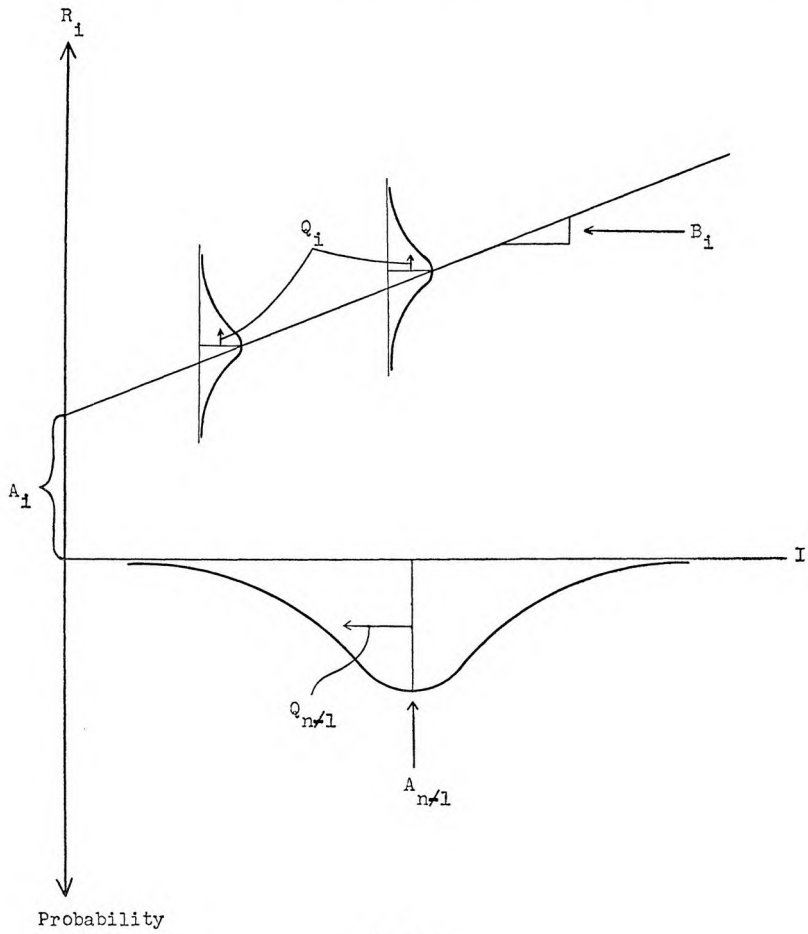

FIGURE 2

Defining X_{n+1} as the weighted average responsiveness of R_p to the level of I:

$$X_{n+1} \equiv \sum_{i=1}^{N} X_i B_i$$

and substituting this variable and the formula for the determinants of I, we obtain:

$$\begin{aligned} R_p &= \sum_{i=1}^{N} X_i(A_i + C_i) + X_{n+1}(A_{n+1} + C_{n+1}) \\ &= \sum_{i=1}^{N+1} X_i(A_i + C_i). \end{aligned}$$

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The expected return of a portfolio is thus:

$$E = \sum_{i=1}^{N+1} X_i A_i$$

while the variance is:[5]

$$V = \sum_{i=1}^{N+1} X_i^2 Q_i$$

This formulation indicates the reason for the use of the parameters A_{n+1} and Q_{n+1} to describe the expected value and variance of the future value of I. It also indicates the reason for calling this the "diagonal model". The variance-covariance matrix, which is full when N securities are considered, can be expressed as a matrix with non-zero elements only along the diagonal by including an $(n + 1)$st security defined as indicated. This vastly reduces the number of computations required to solve the portfolio analysis problem (primarily in step 2 of the critical line method, when the variance-covariance matrix must be inverted) and allows the problem to be stated directly in terms of the basic parameters of the diagonal model:

$$\text{Maximize:} \quad \lambda E - V$$

$$\text{Where:} \quad E = \sum_{i=1}^{N+1} X_i A_i$$

$$V = \sum_{i=1}^{N+1} X_i^2 Q_i$$

$$\text{Subject to:} \quad X_i \geqq 0 \text{ for all } i \text{ from 1 to } N$$

$$\sum_{i=1}^{N} X_i = 1$$

$$\sum_{i=1}^{N} X_i B_i = X_{n+1} .$$

6. The Diagonal Model Portfolio Analysis Code

As indicated in the previous section, if the portfolio analysis problem is expressed in terms of the basic parameters of the diagonal model, computing time and memory space required for solution can be greatly reduced. This section describes a machine code, written in the FØRTRAN language, which takes full advantage of the characteristics of the diagonal model. It uses the critical line method to solve the problem stated in the previous section.

The computing time required by the diagonal code is considerably smaller than that required by standard quadratic programming codes. The RAND QP

[5] Recall that the diagonal model assumes $\text{cov}(C_i, C_j) = 0$ for all i and j $(i \neq j)$.

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code[6] required 33 minutes to solve a 100-security example on an IBM 7090 computer; the same problem was solved in 30 seconds with the diagonal code. Moreover, the reduced storage requirements allow many more securities to be analyzed: with the IBM 709 or 7090 the RAND QP code can be used for no more than 249 securities, while the diagonal code can analyze up to 2,000 securities.

Although the diagonal code allows the total computing time to be greatly reduced, the cost of a large analysis is still far from insignificant. Thus there is every incentive to limit the computations to those essential for the final selection of a portfolio. By taking into account the possibilities of borrowing and lending money, the diagonal code restricts the computations to those absolutely necessary for determination of the final set of efficient portfolios. The importance of these alternatives, their effect on the portfolio analysis problem and the manner in which they are taken into account in the diagonal code are described in the remainder of this section.

A. The "lending portfolio"

There is some interest rate (r_l) at which money can be lent with virtual assurance that both principal and interest will be returned; at the least, money can be buried in the ground ($r_l = 0$). Such an alternative could be included as one possible security ($A_i = 1 + r_l$, $B_i = 0$, $Q_i = 0$) but this would necessitate some needless computation.[7] In order to minimize computing time, lending at some pure interest rate is taken into account explicitly in the diagonal code.

The relationship between lending and efficient portfolios can best be seen in terms of an E, σ curve showing the combinations of expected return and standard deviation of return ($= \sqrt{V}$) associated with efficient portfolios. Such a curve is shown in Figure 3 (FBCG); point A indicates the E, σ combination attained if all funds are lent. The relationship between lending money and purchasing portfolios can be illustrated with the portfolio which has the E, σ combination shown by point Z. Consider a portfolio with X_z invested in portfolio Z and the remainder $(1 - X_z)$ lent at the rate r_l. The expected return from such a portfolio would be:

$$E = X_z E_z + (1 - X_z)(1 + r_l)$$

and the variance of return would be:

$$V = X_z^2 V_z + (1 - X_z)^2 V_l + 2X_z(1 - X_z)(\mathrm{cov}_{zl})$$

[6] The program is described in [4]. Several alternative quadratic programming codes are available. A recent code, developed by IBM, which uses the critical line method is likely to prove considerably more efficient for the portfolio analysis problem. The RAND code is used for comparison since it is the only standard program with which the author has had experience.

[7] Actually, the diagonal code cannot accept non-positive values of Q_i; thus if the lending alternative is to be included as simply another security, it must be assigned a very small value of Q_i. This procedure will give virtually the correct solution but is inefficient.

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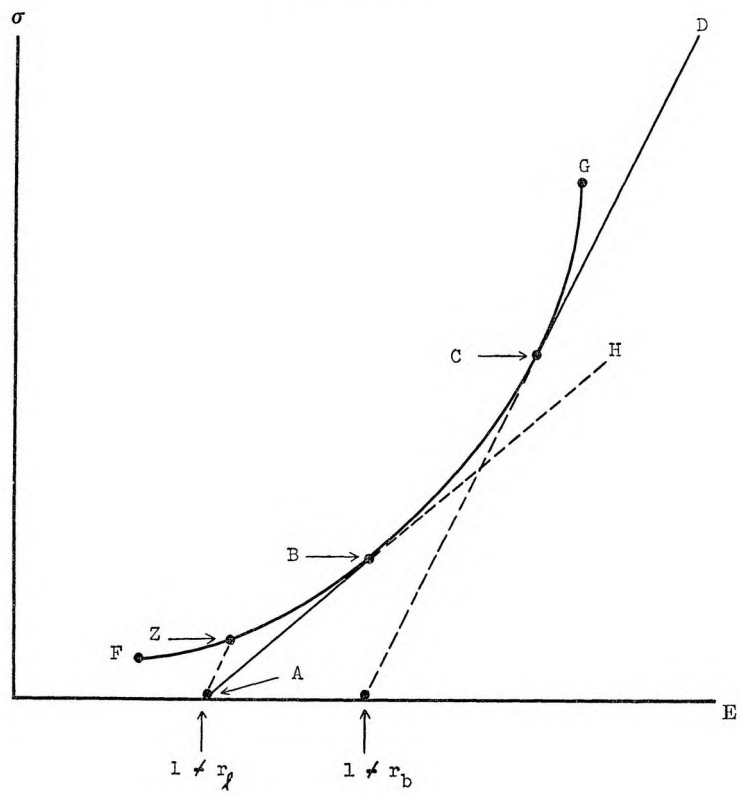

FIGURE 3

But, since V_l and cov_{zl} are both zero:

$$V = X_z^2 V_z$$

and the standard deviation of return is:

$$\sigma = X_z \sigma_z .$$

Since both E and σ are linear functions of X_z, the E, σ combinations of all portfolios made up of portfolio Z plus lending must lie on a straight line connecting points Z and A. In general, by splitting his investment between a portfolio and lending, an investor can attain any E, σ combination on the line connecting the E, σ combinations of the two components.

Many portfolios which are efficient in the absence of the lending alternative becomes inefficient when it is introduced. In Figure 3, for example, the possibility of attaining E, σ combinations along the line AB makes all portfolios along the original E, σ curve from point F to point B inefficient. For any desired level of

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E below that associated with portfolio B, the most efficient portfolio will be some combination of portfolio B and lending. Portfolio B can be termed the "lending portfolio" since it is the appropriate portfolio whenever some of the investor's funds are to be lent at the rate r_l. This portfolio can be found readily once the E, σ curve is known. It lies at the point on the curve at which a ray from $(E = 1 + r_l, \sigma = 0)$ is tangent to the curve. If the E, σ curve is not known in its entirety it is still possible to determine whether or not a particular portfolio is the lending portfolio by computing the rate of interest which *would* make the portfolio in question the lending portfolio. For example, the rate of interest associated in this manner with portfolio C is r_b, found by extending a tangent to the curve down to the E-axis. The diagonal code computes such a rate of interest for each corner portfolio as the analysis proceeds; when it falls below the previously stated lending rate the code computes the composition of the lending portfolio and terminates the analysis.

B. The "borrowing portfolio"

In some cases an investor may be able to borrow funds in order to purchase even greater amounts of a portfolio than his own funds will allow. If the appropriate rate for such borrowing were r_b, illustrated in figure 3, the E, σ combinations attainable by purchasing portfolio C with both the investor's funds and with borrowed funds would lie along the line CD, depending on the amount borrowed. Inclusion of the borrowing alternative makes certain portfolios inefficient which are efficient in the absence of the alternative; in this case the affected portfolios are those with E, σ combinations along the segment of the original E, σ curve from C to G. Just as there is a single appropriate portfolio if any lending is contemplated, there is a single appropriate portfolio if borrowing is contemplated. This "borrowing portfolio" is related to the rate of interest at which funds can be borrowed in exactly the same manner as the "lending portfolio" is related to the rate at which funds can be lent.

The diagonal code does not take account of the borrowing alternative in the manner used for the lending alternative since it is necessary to compute all previous corner portfolios in order to derive the portion of the E, σ curve below the borrowing portfolio. For this reason all computations required to derive the full E, σ curve above the lending portfolio must be made. However, the code does allow the user to specify the rate of interest at which funds can be borrowed. If this alternative is chosen, none of the corner portfolios which will be inefficient when borrowing is considered will be printed. Since as much as 65% of the total computer time can be spent recording (on tape) the results of the analysis this is not an insignificant saving.

7. The Cost of Portfolio Analysis with the Diagonal Code

The total time (and thus cost) required to perform a portfolio analysis with the diagonal code will depend upon the number of securities analyzed, the number of corner portfolios and, to some extent, the composition of the corner portfolios. A formula which gives quite an accurate estimate of the time required

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to perform an analysis on an IBM 709 computer was obtained by analyzing a series of runs during which the time required to complete each major segment of the program was recorded. The approximate time required for the analysis will be:[8]

Number of seconds = .6
+ .114 × number of securities analyzed
+ .54 × number of corner portfolios
+ .0024 × number of securities analyzed × number of corner portfolios.

Unfortunately only the number of securities analyzed is known before the analysis is begun. In order to estimate the cost of portfolio analysis before it is performed, some relationship between the number of corner portfolios and the number of securities analyzed must be assumed. Since no theoretical relationship can be derived and since the total number of corner portfolios could be several times the number of securities analysed, it seemed desirable to obtain some crude notion of the typical relationship when "reasonable" inputs are used. To accomplish this, a series of portfolio analyses was performed using inputs generated by a Monte Carlo model.

Data were gathered on the annual returns during the period 1940–1951 for 96 industrial common stocks chosen randomly from the New York Stock Exchange. The returns of each security were then related to the level of a stock market index and estimates of the parameters of the diagonal model obtained. These parameters were assumed to be samples from a population of A_i, B_i and Q_i triplets related as follows:

$$A_i = \bar{A} + r_1$$
$$B_i = \bar{B} + \psi A_i + r_2$$
$$Q_i = \bar{Q} + \theta A_i + \gamma B_i + r_3$$

where r_1, r_2 and r_3 are random variables with zero means. Estimates for the parameters of these three equations were obtained by regression analysis and estimates of the variances of the random variables determined.[9] With this information the characteristics of any desired number of securities could be generated. A random number generator was used to select a value for A_i; this value, together with an additional random number determined the value of B_i; the value of Q_i was then determined with a third random number and the previously obtained values of A_i and B_i.

Figure 4 shows the relationship between the number of securities analyzed

[8] The computations in this section are based on the assumption that no corner portfolios prior to the lending portfolio are printed. If the analyst chooses to print all preceding portfolios, the estimates given in this section should be multiplied by 2.9; intermediate cases can be estimated by interpolation.

[9] The random variables were considered normally distributed; in one case, to better approximate the data, two variances were used for the distribution—one for the portion above the mean and another for the portion below the mean.

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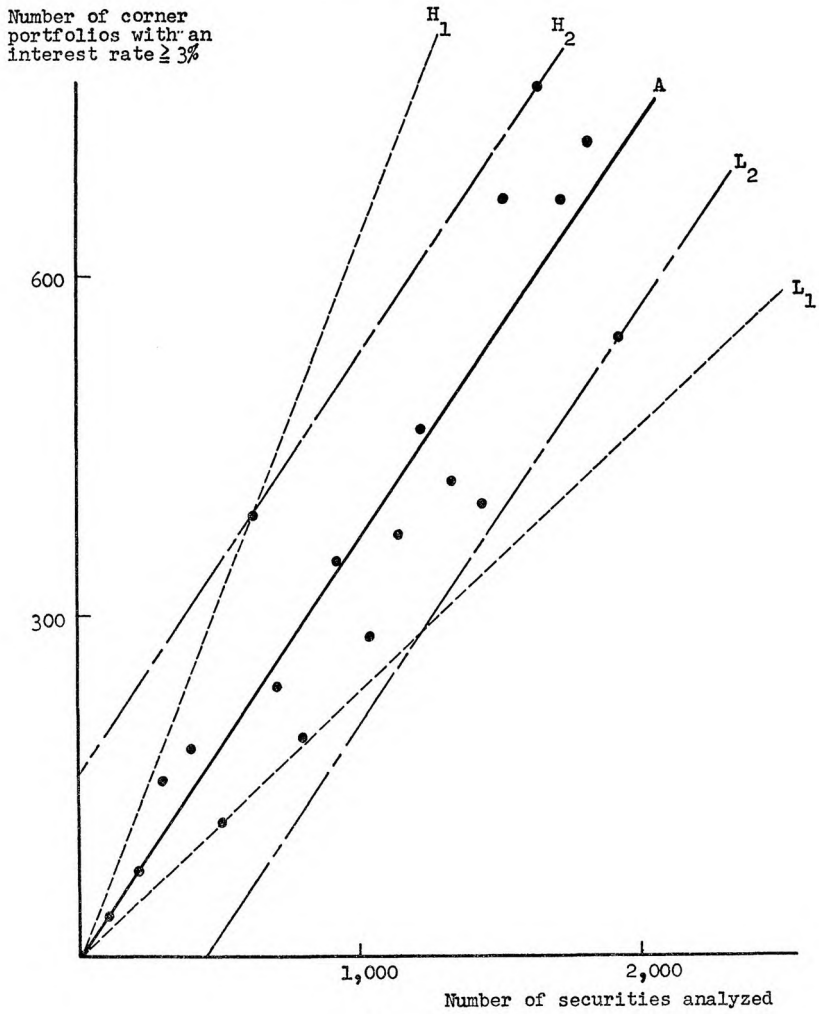

FIGURE 4

and the number of corner portfolios with interest rates greater than 3% (an approximation to the "lending rate"). Rather than perform a sophisticated analysis of these data, several lines have been used to bracket the results in various ways. These will be used subsequently as extreme cases, on the presumption that most practical cases will lie within these extremes (but with no presumption that these limits will never be exceeded). Curve A indicates the average relationship between the number of portfolios and the number of securities:

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average $(N_p/N_s) = .37$. Curve H_1 indicates the highest such relationship: maximum $(N_p/N_s) = .63$; the line L_1 indicates the lowest: minimum $(N_p/N_s) = .24$. The other two curves, H_2 and L_2, indicate respectively the maximum deviation above (155) and below (173) the number of corner portfolios indicated by the average relationship $N_p = .37\ N_s$.

In Figure 5 the total time required for a portfolio analysis is related to the number of securities analyzed under various assumptions about the relationship

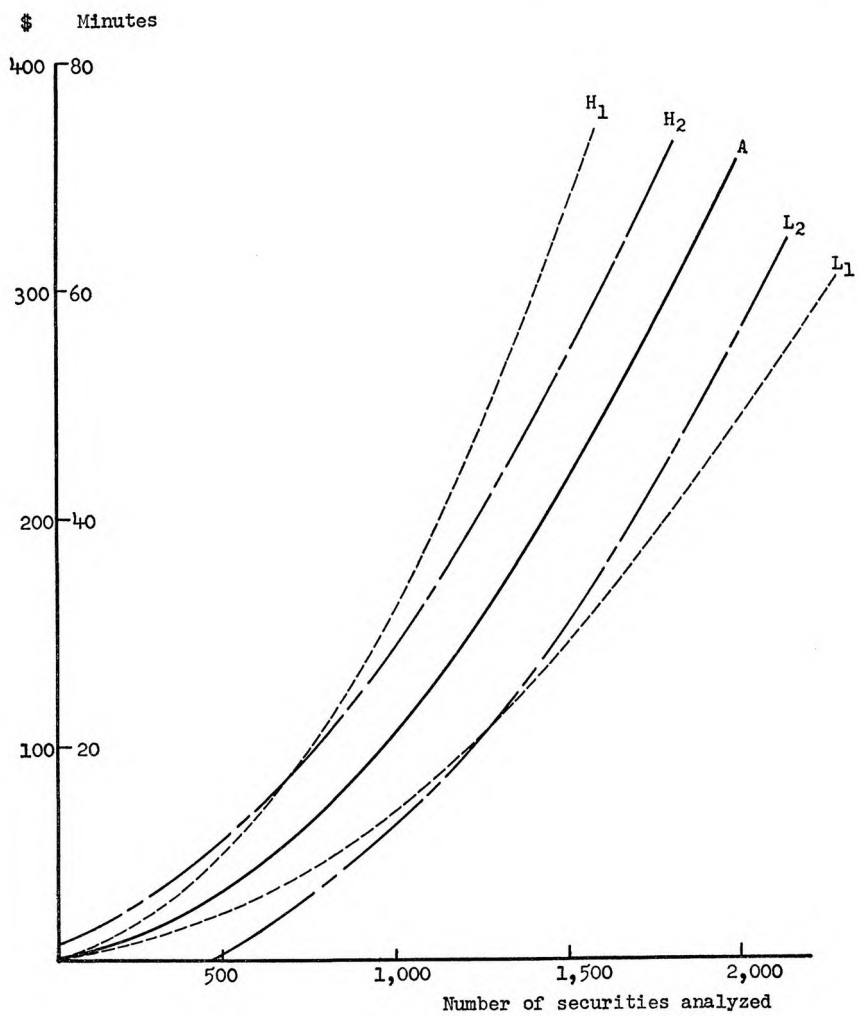

FIGURE 5

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between the number of corner portfolios and the number of securities analyzed. Each of the curves shown in Figure 5 is based on the corresponding curve in Figure 4; for example, curve A in Figure 5 indicates the relationship between total time and number of securities analyzed on the assumption that the relationship between the number of corner portfolios and the number of securities is that shown by curve A in Figure 4. For convenience a second scale has been provided in Figure 5, showing the total cost of the analysis on the assumption that an IBM 709 computer can be obtained at a cost of $300 per hour.

8. The Value of Portfolio Analysis Based on the Diagonal Model

The assumptions of the diagonal model lie near one end of the spectrum of possible assumptions about the relationships among securities. The model's extreme simplicity enables the investigator to perform a portfolio analysis at a very small cost, as we have shown. However, it is entirely possible that this simplicity so restricts the security analyst in making his predictions that the value of the resulting portfolio analysis is also very small.

In order to estimate the ability of the diagonal model to summarize information concerning the performance of securities a simple test was performed. Twenty securities were chosen randomly from the New York Stock Exchange and their performance during the period 1940–1951 used to obtain two sets of

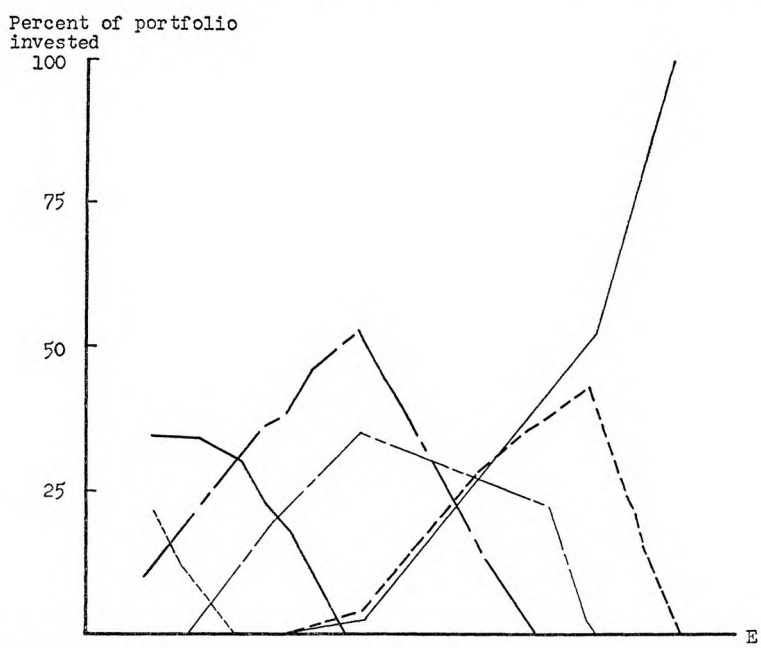

FIG. 6a. Composition of efficient portfolios derived from the analysis of the parameters of the diagonal model.

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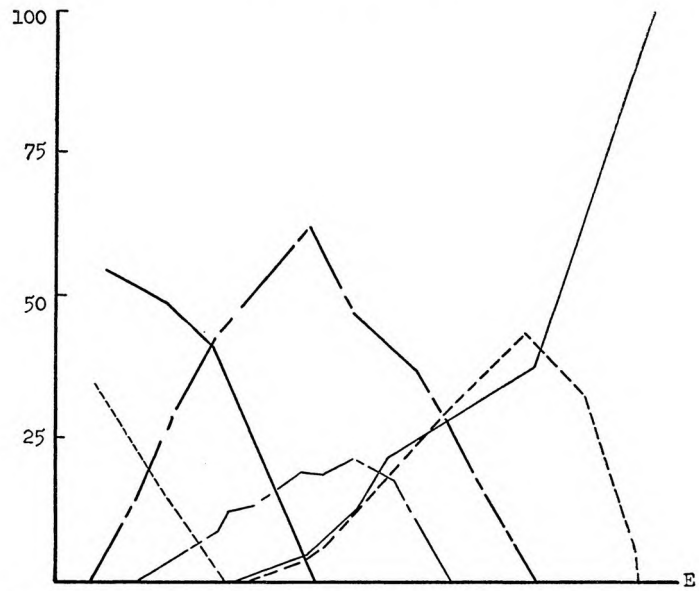

FIG. 6b. Composition of efficient portfolios derived from the analysis of historical data

data: (1) the actual mean returns, variances of returns and covariances of returns during the period and (2) the parameters of the diagonal model, estimated by regression techniques from the performance of the securities during the period. A portfolio analysis was then performed on each set of data. The results are summarized in Figures 6a and 6b. Each security which entered any of the efficient portfolios in significant amounts is represented by a particular type of line; the height of each line above any given value of E indicates the percentage of the efficient portfolio with that particular E composed of the security in question. The two figures thus indicate the compositions of all the efficient portfolios chosen from the analysis of the historical data (Figure 6b) and the compositions of all the portfolios chosen from the analysis of the parameters of the diagonal model (Figure 6a). The similarity of the two figures indicates that the 62 parameters of the diagonal model were able to capture a great deal of the information contained in the complete set of 230 historical relationships. An additional test, using a second set of 20 securities, gave similar results.

These results are, of course, far too fragmentary to be considered conclusive but they do suggest that the diagonal model may be able to represent the relationships among securities rather well and thus that the value of portfolio analyses based on the model will exceed their rather nominal cost. For these reasons it appears to be an excellent choice for the initial practical applications of the Markowitz technique.

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In finance, the Beta of a security (or portfolio) is used as an indicator of its historical volatility in regards to a benchmark, generally the New York Stock Exchange (NYSE) Composite Index or the S&P 500 Index. At Value Line, we derive the Beta coefficient from a regression analysis of the relationship between weekly percentage changes in the price of a stock and weekly percentage changes in the NYSE Composite Index over a period of five years. In the case of shorter price histories, a shorter time period is used, but two years is the minimum. Value Line then adjusts these Betas to account for their long-term tendency to converge toward 1.00. (Though the scope of this convergence is beyond our purposes here, readers can refer to M. Blume, "On the Assessment of Risk," Journal of Finance, March 1971 for further details.)

Now that we have our Beta number, what does it mean? If an equity mirrors the benchmark, then it carries a Beta of 1.00. If Stock X has a Beta of 2.00, it is expected to rise (or fall) twice as much as the movement of the benchmark. For example, if the NYSE Composite Index rises (falls) 10%, Stock X will likely rise (fall) 20%. (For a more detailed overview, see **Understanding Beta**). Beta can also be negative (infrequent but possible), which would mean that the equity's return tends to move in the opposite direction from the market's move. Moreover, there is no upper or lower bound to Beta, although it typically does not stray too far from 1.00. Finally, a Beta of zero does not mean the asset is risk-free, just that the correlation of that asset's return to the market's return is zero.

Now that we know what Beta is and its implications, how can we use it? If we were able to predict the movements of the overall market, we would simply buy high Beta stocks while the market rises, and low Beta stocks while the market is falling. However, no one is capable of timing the market over the long term. So, what should we do?

If we define a high risk asset in terms of the movement of its price, we can look towards Beta as one indicator of this riskiness. Though Beta by itself does not give a perfect indication of volatility, it does imply the direction and magnitude of movements. Using Beta as a measure of risk, we can relate this to a basic tenet of finance theory, which states that investors demand a return in exchange for assuming risk. Therefore, high-risk (or high-Beta) investments should provide a higher payout, and conversely, low-risk (or low-Beta) investments should provide a lower payout. This proposition seems reasonable and intuitive, but it may not always hold.

In a paper entitled "Re-Thinking Risk: What the Beta Puzzle Tells Us about Investing," written by David Cowan and Sam Wilderman of GMO LLC, they show just the opposite. For the paper, Beta was measured using 250-day returns of a universe of 1,000 stocks, regressed against 250-day returns of that universe. Low- and high-Beta Portfolios were then formed monthly and weighted by market capitalization, with the universe used as the benchmark. Their results present data starting in December, 1969 and show that high-Beta stocks have significantly underperformed the market (average annualized return of 7.2% vs. 10.6% for low-Beta and 9.8% for the universe), and done so with substantially higher annualized volatility (24.5% vs. 12.5% and 16.0%, respectively) and larger drawdown (-84.4% vs. -39.5% and -50.3%, respectively).

Though low-Beta may trump high-Beta over longer periods, there are some problems with solely relying on the Beta coefficient. It is a backward looking metric, and therefore may not be an accurate predictor of the future. The markets change all the time and just because a relationship held in the past does not mean it is certain to continue into the future. Also, since it is solely a statistical measure, it fails to consider underlying business fundamentals or economic developments. Consider **Altria Group** (**MO**). This stock has a Beta of 0.55 and the company primarily sells cigarettes. Due to the low Beta, we may say this is a low-risk stock. However, if for some reason cigarettes were deemed illegal to sell, this company would probably not stick around very long and any investment in the stock will likely become worthless. Solely looking at a stock's Beta will not uncover this risk.

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So, back to our question posed earlier; what should we do? We propose Beta should be used as one factor in the equity analysis framework. Investors should also look at our Safety rank and Price Stability score when making investment decisions. Considered in conjunction with Value Line's fundamental research and valuation ratios, we believe investors can create a portfolio that may provide superior risk-adjusted returns over the long haul.

At the time of this article's writing, the author did not have positions in any of the companies mentioned.

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Time-Series Processes of Utility Betas: Implications for Forecasting Systematic Risk

Michael J. Gombola and Douglas R. Kahl

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■ Brigham and Crum [5] describe difficulties with the Capital Asset Pricing Model (CAPM) in estimating utility cost of capital. This controversial article elicited six comments [7, 15, 17, 21, 22, 24], a reply [6], and one extension [11]. Examining the dividend omission by Consolidated Edison (Con Ed), Brigham and Crum note that this information release could confound estimation of Con Ed's beta. Although the Ordinary Least Squares (OLS) beta estimate decreased concurrent with the dividend omission, Brigham and Crum contend that Con Ed's risk had not decreased.

An OLS estimate of beta requires an estimation period during which the relationship between stock return and market return is stable. Without this stability, the forecaster needs alternatives for forecasting a time-varying relationship, such as the general Bayesian adjustment process [25] or its specific variations employed by Merrill Lynch [18]. The appropriateness of a given procedure depends on the particular time-series properties of the beta being forecast.

Information on the time-series properties of utility betas, including the variability of beta and the tendency of utility betas to auto-regress toward an underlying mean, is presented here. The degree of difficulty in forecasting beta depends on both of these properties. Since the basis of Bayesian adjustment lies in beta's tendency to return to an underlying mean, if betas follow a random walk process then Bayesian adjustment will be fruitless.

Collins, Ledolter, and Rayburn [10] explain that random variation in beta leads to severe forecasting difficulties, unlike variability due to auto-regression in beta. To the extent that beta instability is auto-correlated, an unstable beta can be forecasted accurately. Estimating that about 25% of beta variability in their sample is due to auto-correlated beta changes, Collins,

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Ledolter, and Rayburn suggest that recognition of auto-correlation can improve forecasting accuracy by 15%.

Auto-correlated beta changes allow use of beta adjustment models to improve beta forecasts. A general Bayesian adjustment model would adjust the short-term (transient) beta estimate towards a long-term underlying mean. An example of such an application is the Merrill Lynch [18] adjustment process:

$$B_t = 0.65(B_{t-1}) + 0.35(1.0)\,. \qquad (1)$$

Here, the transient beta estimate obtained by OLS is presumed to return to an underlying mean of 1.0 slowly, since more weight is placed on the transient beta than on the underlying mean.

Studying the time-series properties of utility betas—including their tendency to return to an underlying mean, the speed of this return, and the underlying mean itself—should prove helpful in formulating Bayesian adjustments of beta forecasts. Carleton [7] suggests that Bayesian-adjusted beta forecasts have been applied, often inappropriately, to beta forecasts in regulatory proceedings. This study strives to determine whether such Bayesian adjustment processes are appropriate at all.

I. Beta Coefficient Instability and the Rate-Setting Process

Cooley [12] points out the widespread, albeit controversial, use of the Capital Asset Pricing Model in estimating required return for utility equity. Exchanges published by two journals dealing with the CAPM for rate setting ([7, 15, 17, 21, 22, 24] and [4, 19, 20]) center not on the validity of the theory but on the reliability and usefulness of beta estimates.

Concern over empirical estimates of systematic risk is based on a substantial body of empirical literature pointing to beta instability. From the early descriptive work of Blume [2] through later tests by Fabozzi and Francis [13] and Collins, Ledolter, and Rayburn [10], the evidence supports instability in security betas. Studying specifically the behavior of utility betas, Bey [1], Chen [8], and Pettway [23] all demonstrate instability.

Although the size of beta instability has been extensively investigated, comparatively little attention has been focused on the form of that instability, particularly for utilities. Beta instability does not necessarily preclude application of the CAPM unless combined with a random walk process for beta.

The simplest case, a constant coefficient process for beta, may be expressed as:

$$B_{it} = B_{i,t-1} = B_i^m \text{ for all } t\,. \qquad (2)$$

In Equation (2), the beta at any point in time remains equal to the previous beta and also to a constant underlying mean beta, B_i^m. This constant coefficient process is assumed in OLS estimation of a beta and serves as the null hypothesis in tests of beta variability [3, 13].

When the transient beta for a particular company (B_{it}) is distributed around an underlying mean beta for that company B_i^m, the resulting time-series process may be described as:

$$B_{it} = B_i^m + u_{it}\,. \qquad (3)$$

Equation (3) describes the random coefficient model tested by Fabozzi and Francis [13] and assumed in a beta forecasting model by Chen and Keown [9]. Since the deviations of beta from its underlying mean (u_{it}) are limited to a single period and are serially uncorrelated, the transient beta (B_{it}) tends to return quickly to the underlying mean.

If the transient beta takes more than one period to return to its underlying mean, then an auto-regressive process describes the time-series behavior of beta:

$$B_{it} = a_i B_{i,t-1} + (1 - a_i)B_i^m + u_{it}\,. \qquad (4)$$

This process is very similar to the random coefficient process, except for the strength of the tendency for mean-reversion. A value of 0.9 for $1 - a_i$ would cause the process to be classified as auto-regressive, whereas a value of 1.0 would label it random coefficient. Otherwise, there is little difference.

The auto-regressive model described in Equation (4) is the same one studied by Bos and Newbold [3] and Collins, Ledolter, and Rayburn [10]. The process considers a tendency to return to an underlying mean beta, where the tendency is measured by $1 - a_i$. The Merrill Lynch adjustment process [18] describes a special case in which the underlying mean beta (B_i^m) is 1.0 and the adjustment factor to the mean, also called the regression rate ($1 - a_i$), is 0.35. Vasicek's adjustment model [25] is a less restrictive case in which the underlying mean beta is unity and no restriction is made on the adjustment rate toward the underlying mean.

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If all beta variation is random, then there will be no tendency for beta to return to an underlying mean, resulting in a random walk process:

$$B_{it} = B_{i,t-1} + u_{it}. \tag{5}$$

This model has been suggested as a time-varying model for beta in a stability test described by Garbade and Rentzler [14]. Since there are no bounds on the value that beta can assume, the process is difficult to forecast, especially in the long run. If beta follows a random walk process then the best long-term forecast is the short-term beta, and a Bayesian adjustment process will not improve the forecast. Notably, Brigham and Crum's [6] original criticism of the CAPM was based on unadjusted OLS estimates of Con Ed's beta, which implicitly assumes that an unstable beta follows a random walk.

II. The Beta Coefficient as an Auto-Regressive Variable

Any of the four beta-generating processes can be represented as a special case of a general auto-regressive process. The general model has a measurement equation,

$$R_{it} = B_{it} R_{mt} + e_{it}, \tag{6}$$

and state equation,

$$B_{it} = a_i B_{i,t-1} + (1 - a_i) B_i^m + u_{it}, \tag{6'}$$

where R_{it} is the excess return on the ith security during time t, R_{mt} is the return on the market index during time t, B_i^m is the underlying mean beta for the ith stock, and B_{it} is the transient beta for the ith stock at time t.

Equation (6') specifies a first-order auto-regressive process for beta. If the value for $1 - a_i$ is 0.0, then (6') reverts to the random walk process described in Equation (5). If the value for $1 - a_i$ is 1.0, then (6') reverts to the random coefficient process described in Equation (3). If the residual variance is 0.0, then $1 - a_i$ becomes 0.0 and the underlying mean and error terms in Equation (6') drop out, leaving the constant beta process in Equation (2).

III. Estimating Parameters of the Model

The parameters of the model in Equations (6) and (6') were estimated using monthly stock return data from the Compustat PDE file for 109 utility companies, 61 electric and 48 electric and gas. The 15-year sample period is from January 1967–December 1981. The period contains both the dividend omission by Consolidated Edison [5] and the Three Mile Island incident.

The model in Equations (6) can be expressed in matrix format as:

$$R_{it} = \underline{h}_t \underline{B}_{mt} + \underline{e}_{it}, \tag{7}$$

$$\underline{B}_{it} = \underline{A}_i \underline{B}_{i,t-1} + \underline{U}_{it}, \tag{7'}$$

where

$\underline{h}_t = (R_{mt}, 0)$;
$\underline{B}'_{it} = (B_{it}, B_i^m)$;
$\underline{U}'_{it} = (u_{it}, 0)$ and is distributed as $N(0, W_i S_t^2)$,

$$\underline{W} = \begin{bmatrix} w_i & 0 \\ 0 & 0 \end{bmatrix}, \tag{8}$$

$$\underline{A} = \begin{bmatrix} a_i & 1 - a_i \\ 0 & 1 \end{bmatrix}. \tag{9}$$

The recursive Kalman filtering approach described by Kahl and Ledolter [16] is used to estimate simultaneously the three parameters of the market model in Equations (6). These parameters are: the underlying mean beta (B_i^m), the regression rate toward the underlying mean ($1 - a_i$), and the variance of beta over time.

Simultaneous estimation of three parameters requires considerable data and computer resources which might explain why studies using broad samples and large numbers of stocks formulate the problem somewhat differently. Bos and Newbold estimated a Kalman filtering model with a two-pass process. Decreasing the number of parameters from three to two reduces the computation time to only a fraction of that required for a full model. Collins, Ledolter, and Rayburn [10] suggest that the procedure followed by Bos and Newbold [3] creates a downward bias in the estimate of beta's regression rate. They were able to eliminate the estimate of the underlying mean beta in the model and focus on beta regression tendencies.

The model used in this study produces independent variance estimates like the model used by Collins, Ledolter, and Rayburn. In addition, this model estimates the underlying mean beta. Maximum likelihood estimates of elements in the transition matrix (a_i), the variance ratio (w_i), and the variance of the measurement equa-

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Exhibit 1. Maximum Likelihood Estimates of Model Parameters

Regression Rate	Standard Deviation of Beta 0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.0			2[a]	3[a]	4[a]	6[a]	12[a]	5[a]	3[a]		
0.1				1	2	5	1				
0.2					1	7	2	5	2		
0.3				1	1	2	5	1	3		
0.4				1	2	1	3	1			
0.5											
0.6						1					
0.7						1					
0.8											
0.9		1	1								
1.0	6[b]	17[c]									

[a]These firms display characteristics of firms whose betas follow a random coefficient process.
[b]These firms display characteristics of firms whose betas are constant.
[c]These firms display characteristics of firms whose betas follow a random walk process.

tion (S_i^2), were all concurrently estimated using a grid search procedure.

IV. Results

The particular time-series process followed by a beta can be indicated by two parameters: the standard deviation of this beta over time, u_{it} in Equation (6'); and its adjustment rate to the mean, $(1 - a_i)$ in Equation (6'). Consequently, the cross-tabulation of these two parameters in Exhibit 1 is also a tabulation of the process followed by the beta. The most common process shown in Exhibit 1 is the auto-regressive process. Nearly half of the companies in the sample, 51 out of 109, show a nonzero standard deviation of beta together with a value for the regression rate between zero and unity.

The next most common process is the random coefficient process, indicated by a nonzero value for the standard deviation of beta together with an estimate of 1.0 for $1 - a_i$. These estimates are shown by 35 of the sample companies. The firms with auto-regressive betas and those with very similar random coefficient betas jointly comprise 86 of the 109 sample firms.

A nonzero estimate of the standard deviation of beta combined with a regression rate of zero indicates a beta following a random walk process. Parameter estimates consistent with a random walk process are shown for only 17 companies.

The least common process indicated by companies in the sample is the constant coefficient process, shown by only 6 companies. A constant beta coefficient is indicated by a zero estimate for the standard deviation of beta.

Since the estimation period covers 15 years (180 months), many companies could not maintain a constant beta coefficient. The long estimation period allows management, regulators, and the markets to react to any exogenous changes affecting systematic risk so as to bring risk back to reasonable levels. Such reaction is consistent with a beta that follows an auto-regressive process. Consequently, the preponderance of companies with auto-regressive betas in Exhibit 1 conforms to expected long-term behavior of management and markets.

Internal consistency of parameter estimates in Exhibit 1 is just as important as reasonableness. All companies having a zero estimate for the standard deviation of beta also show a value of 0.0 for the adjustment rate estimate. Any other estimate would be ambiguous for classifying the process. A positive association between the estimate of the standard deviation of beta and the estimate of $1 - a_i$ further points to the lack of ambiguity and helps in interpreting the process for all of the sample companies.

The positive association between beta variability and the regression rate is also consistent with boundaries upon beta values. Companies with high beta variability tend to have betas that return quickly to an underlying mean. Companies with low or zero return rates have low beta variability. High variability to-

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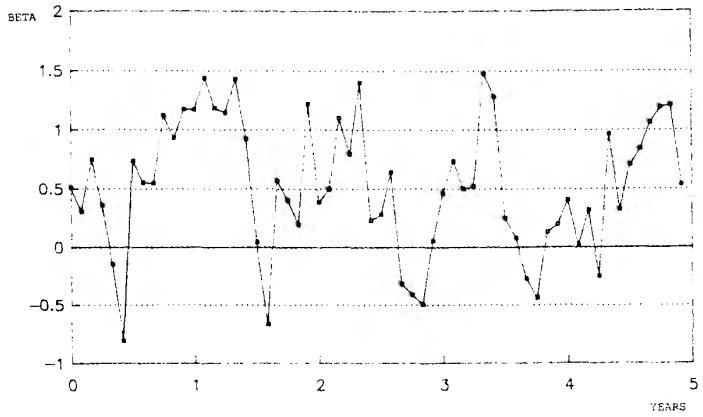
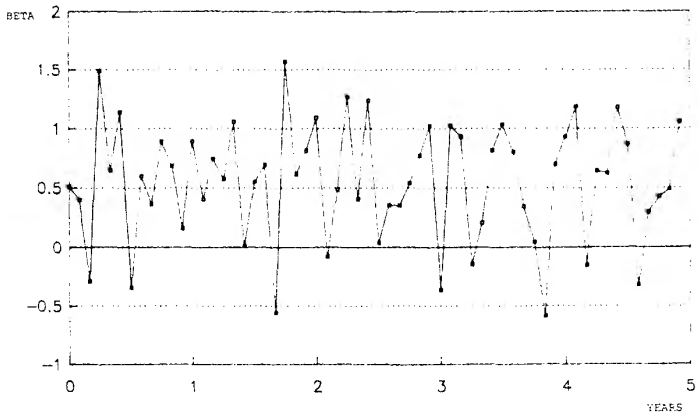
Exhibit 2. Three Time-Series Processes for Beta

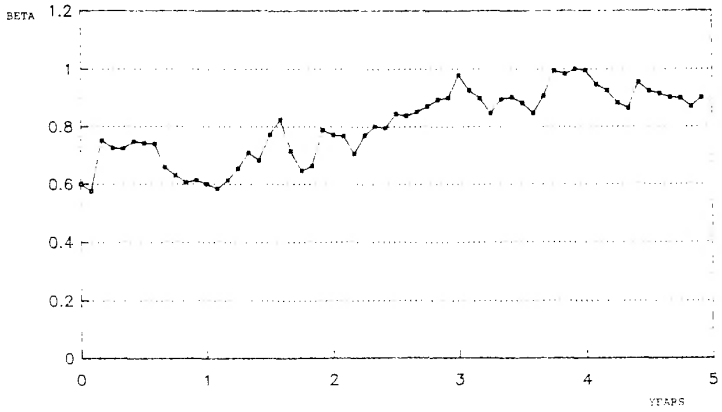
Auto Regressive



Random Coefficient



Random Walk



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gether with a low or zero return rate would lead to extreme beta instability and preclude application of the CAPM. The results show no evidence of this type of beta instability.

A. Behavior of Transient Betas

To illustrate the implications of different processes and parameters, plots of betas following an auto-regressive process, a random coefficient process, and a random walk process are presented in Exhibit 2. Each of these processes behaves according to average coefficient values of companies with that process in Exhibit 1. For the auto-regressive process, the coefficients are an underlying mean of 0.51, a standard deviation of transient beta of 0.50, and a return rate toward the underlying mean of 0.52. For the random coefficient process, the underlying mean is 0.52 and its standard deviation is 0.53. For the random walk process the standard deviation of beta is 0.05.

The auto-regressive beta depicted in Exhibit 2 shows considerable variability and ranges between a minimum value of -0.8 and a maximum value of 1.50. Although the variability in the short run is rather large, the beta at no time takes longer than 9 months to return to its underlying mean, usually returning in three or four months. However, upon returning to its underlying mean it often strays on the opposite side, requiring several additional months to return.

Over the 60-month period shown for the auto-regressive process in Exhibit 2, only 36 of the transient beta values fall between a low of 0.0 and a high of 1.0. These bounds might be considered reasonable for a utility. Nine of the 60 beta observations lie below 0.0. The presence of such outliers might frustrate, but not obviate, application of OLS techniques for beta estimation. Although Exhibit 2 indicates that extreme beta values, such as those discussed by Brigham and Crum [5], might be common in the short run, the forecaster should not be deterred by the presence of short-run instability. In the long run, beta will return to its mean.

The similarity between the auto-regressive process and the random coefficient process, also shown in Exhibit 2, is obvious. Even if rather extreme values are encountered, the random coefficient beta reverts back to the mean within the next two observations. The upper and lower bounds on beta as well as the proportion of betas less than zero are very similar for the two processes.

Exhibit 2 also contains a plot of the time-series behavior of a beta following a random walk process. Although the beta behavior for the random walk process seems more stable than the auto-regressive or random coefficient process, such apparent short-run stability is misleading. Over the 60 months depicted in Exhibit 2, the beta wanders from a value of 0.6 to a value of about 0.9. Over the next 60 months, the beta could potentially rise by another 0.3, fall back to 0.6, or be anywhere in between. In the longer run, the beta becomes even more difficult to forecast, due to the lack of any tendency to revert to an underlying mean.

B. Focusing on the Consolidated Edison Dividend Omission

A plot during the period from January 1970–December 1984 of the behavior of the transient beta for Consolidated Edison is presented in Exhibit 3. The transient beta behaves much like the typical beta for any utility with an auto-regressive beta, except for the period immediately following the dividend omission. During this period, the transient beta becomes very erratic for about 9 months. Once it settles down, it continues to behave like any other utility with a typical auto-regressive beta. The plot of the transient beta for Con Ed over the last 60 months, if placed on the same scale as Exhibit 2, would be visually indistinguishable from the auto-regressive process depicted in that exhibit.

The plot of Con Ed's transient beta shown in Exhibit 3 depicts the transitory effect of economic disturbances on beta estimates. Even in this dramatic case of a dividend omission, the relationship between the stock and the market returned to normal within less than one year. This strong tendency to return to the mean beta gives empirical support to forecaster-supplied prior values in Bayesian adjustment models that place more weight on the underlying mean beta and less weight on the transient beta than the Merrill Lynch model would imply.

Some additional information on the behavior of Con Ed's beta is presented in Exhibit 4. During the overall period, which extends from January 1970–June 1984, its OLS beta estimate was 0.61 and the estimate of its underlying mean beta was 0.58. Since this overall period contains the dividend omission, a null hypothesis of a constant coefficient process for beta can be easily rejected. The regression rate of 0.70 toward the underlying mean indicates a strong mean-reversion tendency.

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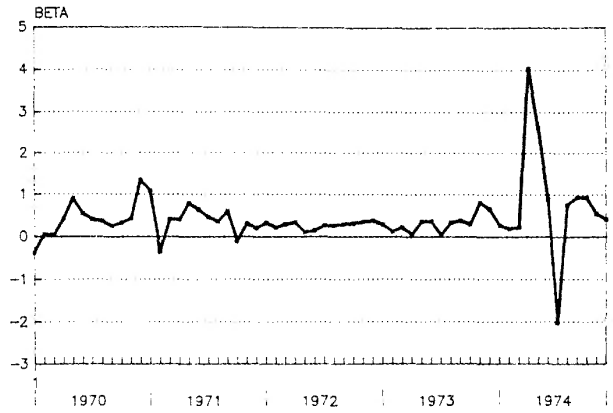
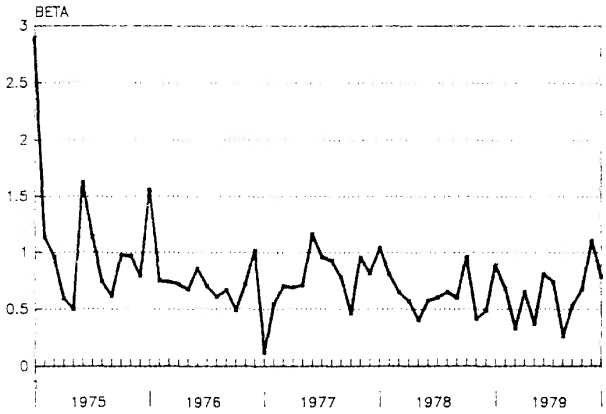
Exhibit 3. Transient Beta for Consolidated Edison, 1970–1984

1970–1974



1975–1979



1980–1984

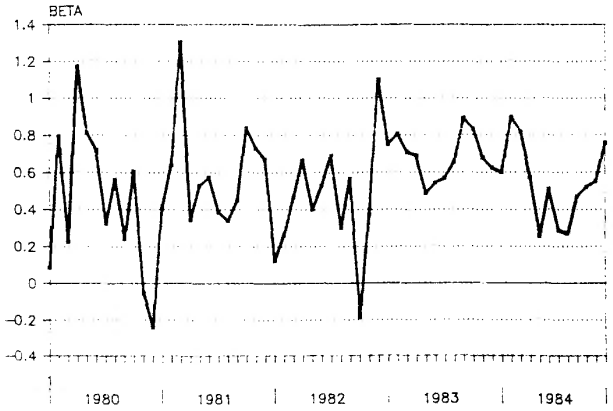


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Exhibit 4. Parameter Estimates for Consolidated Edison Beta

Parameter	Overall Period 1970–1984	Before Dividend Omission 1970–1973	After Dividend Omission 1978–1981
Ordinary Least Squares Beta	0.61	0.39	0.62
Standard Error of OLS Beta	0.08	0.04	0.05
$K-F$ Underlying Mean Beta	0.58	0.34	0.47
$K-F$ Regression Rate to Mean	0.70	1.00	1.00
$K-F$ Standard Deviation of Beta	0.74	0.62	0.78
$K-F$ Residual Error in Market Model	0.05	0.03	0.04
$K-F$ Beta Stability Test	58.80*	20.30*	7.00*

*Significant at the 0.05 level.

Exhibit 4 also contains Kalman filtering and OLS estimates of beta for both a four-year period prior to the divided omission and a four-year period after the dividend omission. Forty-eight monthly observations is not sufficient to estimate reliably the underlying mean beta, since by nature this parameter reveals itself only over the long run. Likewise, the estimate of $1 - a_i$ may also be unreliable when estimated by only a few observations over a short time period. However, the subperiods do depict the variability that is characteristic of short-term estimates, whether those estimates are obtained by OLS or by Kalman filtering.

Although these short-term estimates should be approached with caution, some effects of the dividend omission on Con Ed's risk might be inferred. First, estimates for the long-term period or either of the short-term periods do not appear contaminated by the dividend omission but appear quite reasonable for a utility. Second, no indication of a decline in the beta estimate due to inclusion of the dividend omission period is evident. The indication is to the contrary. The estimate of the underlying mean beta for the overall period is higher than either the four- year period prior to the omission or the four years following the omission.

V. Implications for Beta Forecasting and Rate Setting

A partial resolution to the beta measurement problem is outlined by Peseau and Zepp [22], who show that the effect of the dividend omission was transitory and could be diagnosed from examination of OLS statistics. Although the dividend omission produces beta estimation problems for Consolidated Edison, subsequent estimates using data after the omission become much more reasonable.

The primary difference between the Brigham and Crum [5] forecast using an OLS beta and the Peseau and Zepp comment lies in the assumption of the time-series process followed by beta. The OLS estimate for five years of return data is only a good beta forecast if beta follows a constant coefficient process. This assumption is untenable for an estimation period containing a major information release.

When beta is time-varying, a short-term unadjusted OLS estimate may not be the best estimate of beta. Instead, the forecaster, taking advantage of auto-regressive properties of beta, should adjust that short-term estimate toward an underlying mean beta. When beta is unstable but reverts to an underlying mean, beta instability would not preclude application of the CAPM, but might preclude use of an OLS beta.

Reliance on a short-term beta forecast, whether from an OLS estimate or the transient beta estimate in the Kalman filtering model, is appropriate only if the firm's beta follows a random walk process. This research shows little evidence suggesting the typical utility beta follows a random walk and no evidence that, specifically, Con Ed's beta follows a random walk.

Due to the preponderance of auto-regressive or random coefficient betas, the results of this study strongly support the use of Bayesian-type adjustment processes such as the one employed by Merrill Lynch. The results also suggest that the behavior of utility betas may differ from the behavior of large diversified samples of stocks. For example, since Blume [2] finds an underlying mean beta of 1.0 for a large sample of stocks, many Bayesian models will adjust the OLS beta estimate toward 1.0. The results of this study, however, indicate that 1.0 is too high an underlying mean for most utilities. Instead, they should be adjusted toward a value that is less than

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one. For Consolidated Edison, an underlying mean of 0.7 would be more appropriate.

VI. Conclusions

Understanding beta behavior requires more information than whether or not betas are stable. Development of statistical procedures admitting a continuously time-varying beta now allows forecasters to understand how beta may behave over the short run and how that short-run behavior can differ from long-run behavior. Measuring continuously time-varying betas also frees the forecaster from the limitations imposed by assuming a constant coefficient beta. Instead, like most economic variables, beta can be modeled as a coefficient that is always changing. From the time series process followed by betas, the forecaster also gains an understanding of the difficult problem of forecasting beta. The beta for the majority of utility companies in this sample follows either an auto-regressive process or a constant coefficient process. Very few appear to follow a random walk process, which would produce betas that are not only unstable but very difficult to forecast. On the other hand, with an auto-regressive process, a patient forecaster using relatively simple diagnostic procedures should be able to obtain a reasonable long-run estimate of systematic risk. A reasonable forecast of beta then admits application of the CAPM for utilities even if beta is time varying.

The strong evidence of auto-regressive tendencies in utility betas lends support to the application of adjustment procedures such as the Bayesian adjustment procedure presented by Vasicek [25]. This procedure depends upon beta following an auto-regressive process. In addition, the Kalman filtering methodology also provides objective prior estimates of the underlying mean beta and the adjustment rate toward that underlying mean.

Typical adjustment models use a prior estimate of about 0.35 for the adjustment rate toward the underlying mean and a prior estimate of 1.0 as the underlying mean. The results of this study indicate that an underlying mean of 1.0 is too high for most utilities and an adjustment rate of 0.35 is too low.

Although considerable variability in adjustment rates and underlying mean betas can be observed in the sample, it may not be necessary for a forecaster to apply the Kalman filtering approach in order to obtain these estimates. A reasonable estimate of the underlying mean may be obtained by OLS if applied to a very long time period. The prior estimate of the adjustment rate toward the mean can be obtained by considering the positive relationship between the adjustment rate and beta variability. Estimates of the prior adjustments in the Bayesian adjustment models could be applied without relying blindly on large-sample estimates that may not be applicable to utilities.

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ON THE ASSESSMENT OF RISK

MARSHALL E. BLUME*

INTRODUCTION

THE CONCEPT OF RISK has so permeated the financial community that no one needs to be convinced of the necessity of including risk in investment analysis. Still of controversy is what constitutes risk and how it should be measured. This paper examines the statistical properties of one measure of risk which has had wide acceptance in the academic community: namely the coefficient of non-diversifiable risk or more simply the beta coefficient in the market model.

The next section defines this beta coefficient and presents a brief non-rigorous justification of its use as a measure of risk. After discussing the sample and its basic properties in Section III, Section IV examines the stationarity of this beta coefficient over time and proposes a method of obtaining improved assessments of this measure of risk.

II. THE RATIONALE OF BETA AS A MEASURE OF RISK

The interpretation of the beta coefficient as a measure of risk rests upon the empirical validity of the market model. This model asserts that the return from time (t-1) to t on asset i, $\tilde{R}_{it}$,[1] is a linear function of a market factor common to all assets $\tilde{M}_t$, and independent factors unique to asset i, $\tilde{\varepsilon}_{it}$.

Symbolically, this relationship takes the form

$$\tilde{R}_{it} = \alpha_i + \beta_i \tilde{M}_t + \tilde{\varepsilon}_{it}, \tag{1}$$

where the tilde indicates a random variable, α_i is a parameter whose value is such that the expected value of $\tilde{\varepsilon}_{it}$ is zero, and β_i is a parameter appropriate to asset i.[2] That the random variables $\tilde{\varepsilon}_{it}$ are assumed to be independent and

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1. In this paper, return will be measured as the ratio of the value of the investment at time t with dividends reinvested to the value of the investment at time (t-1). Dividends are assumed reinvested at time t.

2. The parameter β_i is defined as Cov $(\tilde{R}_i, \tilde{M})$/Var $(\tilde{M})$.

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unique to asset i implies that Cov $(\tilde{\varepsilon}_{it}, \tilde{M}_t)$ is zero and that Cov $(\tilde{\varepsilon}_{it}, \tilde{\varepsilon}_{jt})$, $i \neq j$, are zero. This last conclusion is tantamount to assuming the absence of industry effects.

The empirical validity of the market model as it applies to common stocks listed on the NYSE has been examined extensively in the literature.[3] The principal conclusions are: (1) The linearity assumption of the model is adequate.[4] (2) The variables $\tilde{\varepsilon}_{it}$ cannot be assumed independent between securities because of the existence of industry effects. However, these industry effects, as documented by King,[5] probably account for only about ten percent of the variation in returns, so that as a first approximation they can be ignored. (3) The unique factors $\tilde{\varepsilon}_{it}$ correspond more closely to non-normal stable variates than to normal ones. This conclusion means that variances and covariances of the unique factors do not exist. Nonetheless, this paper will make the more common assumption of the existence of these statistics in justifying the beta coefficient as a measure of risk since Fama[6] and Jensen[7] have shown that this coefficient can still be interpreted as a measure of risk under the assumption that the $\tilde{\varepsilon}_{it}$'s are non-normal stable variates.

That the beta coefficient, β_i, in the market model can be interpreted as a measure of risk will be justified in two different ways: the portfolio approach and the equilibrium approach.

A. *The Portfolio Approach*

The important assumption underlying the portfolio approach is that individuals evaluate the risk of a portfolio as a whole rather than the risk of each asset individually. An example will illustrate the meaning of this statement. Consider two assets, each of which by itself is extremely risky. If, however, it is always the case that when one of the assets has a high return, the other has a low return, the return on a combination of these two assets in a portfolio may be constant. Thus, the return on the portfolio may be risk free whereas each of the assets has a highly uncertain return. The discussion of such an

3. See Marshall E. Blume, "Portfolio Theory: A Step Towards Its Practical Application," forthcoming *Journal of Business;* Eugene F. Fama, "The Behavior of Stock Market Prices," *Journal of Business* (1965), 34-105; Eugene F. Fama, Lawrence Fisher, Michael Jensen, and Richard Roll, "The Adjustment of Stock Prices to New Information," *International Economic Review* (1969), 1-21; Michael Jensen, "Risk, the Pricing of Capital Assets, and the Evaluation of Investment Portfolios," *Journal of Business* (1969), 167-247; Benjamin F. King, "Market and Industry Factors in Stock Price Behavior," *Journal of Business* (1966), 139-90; and William F. Sharpe, "Mutual Fund Performance," *Journal of Business* (1966), 119-38.

4. The linearity assumption of the model should not be confused with the equilibrium requirement of William F. Sharpe, "Capital Asset Prices: A Theory of Market Equilibrium Under Conditions of Risk," *Journal of Finance* (1964), 425-42, which states that $\alpha_i = (1 - \beta_i)\ R_F$, where R_F is the risk free rate. It is quite possible that this equality does not hold and at the same time that the market model is linear.

5. King, *op. cit.*

6. Eugene F. Fama, "Risk, Return, and Equilibrium" (Report No. 6831, University of Chicago, Center for Mathematical Studies in Business and Economics, June, 1968).

7. Jensen, *op. cit.*

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obvious point may seem unwarranted, but there is very little empirical work which indicates that people do in fact behave according to it.

Now if an individual is willing to judge the risk inherent in a portfolio solely in terms of the variance of the future aggregate returns, the risk of a portfolio of n securities with an equal amount invested in each, according to the market model, will be given by

$$\mathrm{Var}\,(\tilde{W}_t) = \left(\sum_{i=1}^{n} \frac{1}{n}\beta_i\right)^2 \mathrm{Var}\,(\tilde{M}_t) + \sum_{i=1}^{n}\left(\frac{1}{n}\right)^2 \mathrm{Var}\,(\tilde{\varepsilon}_{it}) \qquad (2)$$

where $\tilde{W}_t$ is the return on the portfolio. Equation (2) can be rewritten as

$$\mathrm{Var}\,(\tilde{W}_t) = \bar{\beta}^2\,\mathrm{Var}\,(\tilde{M}_t) + \frac{\overline{\mathrm{Var}\,(\tilde{\varepsilon})}}{n} \qquad (3)$$

where the bar indicates an average. As one diversifies by increasing the number of securities n, the last term in equation (3) will decrease. Evans and Archer[8] have shown empirically that this process of diversification proceeds quite rapidly, and with ten or more securities most of the effect of diversification has taken place. For a well diversified portfolio, Var $(\tilde{W}_t)$ will approximate $\bar{\beta}^2$ Var $(\tilde{M}_t)$. Since Var $(\tilde{M}_t)$ is the same for all securities, $\bar{\beta}$ becomes a measure of risk for a portfolio and thus β_i, as it contributes to the value of $\bar{\beta}$, is a measure of risk for a security. The larger the value of β_i, the more risk the security will contribute to a portfolio.[9]

B. *The Equilibrium Approach*

Using the market model, Sharpe[10] and Lintner,[11] as clarified by Fama,[12] have developed a theory of equilibrium in the capital markets. This theory relates the risk premium for an individual security, $E(\tilde{R}_{it}) - R_F$, where R_F is the risk free rate, to the risk premium of the market, $E(\tilde{M}_t) - R_F$, by the formula

$$E(\tilde{R}_{it}) - R_F = \beta_i[E(\tilde{M}_t) - R_F]. \qquad (4)$$

The risk premium for an individual security is proportional to the risk premium for the market. The constant of proportionality β_i can therefore be interpreted as a measure of risk for individual securities.

8. John L. Evans and Stephan H. Archer, "Diversification and the Reduction of Dispersion: An Empirical Analysis," *Journal of Finance* (1968), 761-68.

9. This argument has been extended to a non-Gaussian, symmetric stable world by E. F. Fama, "Portfolio Analysis in a Stable Paretian Market," *Management Science* (1965), 404-19; and P. A. Samuelson, "Efficient Portfolio Selection for Pareto-Levy Investments," *Journal of Financial and Quantitative Analysis* (1967), 107-22.

10. Sharpe, "Capital Asset Prices," *op. cit.*

11. John Lintner, "The Valuation of Risk Assets and the Selection of Risky Investments in Stock Portfolios and Capital Budgets," *Review of Economics and Statistics* (1965), 13-37.

12. Eugene F. Fama, "Risk, Return, and Equilibrium: Some Clarifying Comments," *Journal of Finance* (1968), 29-40.

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This theory of equilibrium, although theoretically sound, is based upon numerous assumptions which obviously do not hold in the real world. A theoretical model, however, should not be judged by the accuracy of its assumptions but rather by the accuracy of its predictions. The empirical work of Friend and Blume[13] suggests that the predictions of this model are seriously biased and that this bias is primarily attributable to the inaccuracy of one key assumption, namely that the borrowing and lending rates are equal and the same for all investors. Therefore, although Sharpe's and Lintner's theory of equilibrium can be used as a justification for β_i as measure of risk, it is a weaker and considerably less robust justification than that provided by the portfolio approach.

III. The Sample and Its Properties

The sample was taken from the updated Price Relative File of the Center for Research in Security Prices at the Graduate School of Business, University of Chicago. This file contains the monthly investment relatives, adjusted for dividends and capital changes of all common stocks listed on the New York Stock Exchange during any part of the period from January 1926 through June 1968, for the months in which they were listed. Six equal time periods beginning in July 1926 and ending in June 1968 were examined. Table 1 lists these six periods and the number of companies in each for which there was a complete history of monthly return data. This number ranged from 415 to 890.

The investment relatives for a particular security and a particular period were regressed[14] upon the corresponding combination market link relatives, which were originally prepared by Fisher[15] as a measure of the market factor. This process was repeated for each security and each period, yielding, for instance, in the July 1926 through June 1933 period, 415 separate regressions. The average coefficient of determination of these 415 regressions was 0.51. The corresponding average coefficients of determination for the next five periods were, respectively, 0.49, 0.36, 0.32, 0.25, and 0.28. These figures are consistent with King's findings[16] in that the proportion of the variance of returns explained by the market declined steadily until 1960 when his sample terminated. Since 1960, the importance of the market factor has increased slightly according to these figures.

Table 1, besides giving the number of companies analyzed, summarizes the distributions of the estimated beta coefficients in terms of the means, standard deviations, and various fractiles of these distributions. In addition, the number of estimated betas which were less than zero is given. In three of the periods,

13. Irwin Friend and Marshall Blume, "Measurement of Portfolio Performance Under Uncertainty," *American Economic Review* (1970), 561-75.

14. John Wise, "Linear Estimators for Linear Regression Systems Having Infinite Variances," (Berkeley-Stanford Mathematics-Economics Seminar, October, 1963) has given some justification for the use of least squares in estimating coefficients of regressions in which the disturbances are non-normal symmetric stable variates.

15. Lawrence Fisher, "Some New Stock-Market Indexes," *Journal of Business* (1966), 191-225.

16. King, *op. cit.*

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TABLE 1
DESCRIPTIVE SUMMARY OF ESTIMATED BETA COEFFICIENTS

Period	Number of Companies	Mean	Standard Deviation	Number of BETAS less than Zero	Fractiles .10	.25	.50	.75	.90
7/26-6/33	415	1.051	0.462	1	0.498	0.711	1.023	1.352	1.616
7/33-6/40	604	1.036	0.474	0	0.436	0.701	1.015	1.349	1.581
7/40-6/47	731	0.990	0.504	0	0.500	0.643	0.872	1.186	1.606
7/47-6/54	870	1.010	0.409	2	0.473	0.727	0.996	1.263	1.565
7/54-6/61	890	0.998	0.423	0	0.458	0.678	0.984	1.250	1.558
7/61-6/68	847	0.962	0.390	4	0.475	0.681	0.934	1.199	1.491

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none of the estimated betas was negative. Of the 4357 betas estimated in all six periods, only seven or 0.16 per cent were negative. This means that although the inclusion of a stock which moves counter to the market can reduce the risk of a portfolio substantially, there are virtually no opportunities to do this. Nearly every stock appears to move with the market.[17]

IV. The Stationarity of Beta over Time

No economic variable including the beta coefficient is constant over time. Yet for some purposes, an individual might be willing to act *as if* the values of beta for individual securities were constant or stationary over time. For example, a person who wishes to assess the future risk of a well diversified portfolio is really interested in the behavior of averages of the β_i's over time and not directly in the values for individual securities. For the purposes of evaluating a portfolio, it may be sufficient that the historical values of β_i be unbiased estimates of the future values for an individual to act *as if* the values of the β_i's for individual securities are stationary over time. This is because the errors in the assessment of an average will tend to be less than those of the components of the average providing that the errors in the assessments of the components are independent of each other.[18] Yet, a statistician or a person who wishes to assess the risk of an individual security may have completely different standards in determining whether he would act as if the β_i's are constant over time. The remainder of the paper examines the stationarity of the β_i's from the point of view of a person who wishes to analyze a portfolio.

A. *Correlations*

To examine the empirical behavior of the risk measures for portfolios over time, arbitrary portfolios of n securities were selected as follows: The estimates of β_i were derived using data from the first period, July 1926 through June 1933, and were then ranked in ascending order.[19] The first portfolio of n securities consisted of those securities with the n smallest estimates of β_i. The second portfolio consisted of those securities with the next n smallest estimates of β_i, and so on until the number of securities remaining was less than n. The number of securities n was allowed to vary over 1, 2, 4, 7, 10, 20, 35, 50, 75, and 100. This process was repeated for each of the next four periods.

Table 2 presents the product moment and rank order correlation coefficients between the risk measures for portfolios of n securities assuming an equal investment in each security estimated in one period and the corresponding risk

17. The use of considerably less than seven years of monthly data such as two or three years to estimate the beta coefficient results in a larger proportion of negative estimates. This larger proportion is probably due to sampling errors which, as documented in Richard Roll, "The Efficient Market Model Applied to U. S. Treasury Bill Rates," (Unpublished Ph.D. thesis, Graduate School of Business, University of Chicago, 1968) may be quite large for models with non-normal symmetric stable disturbances.

18. This property of averages does not hold for all distributions (*cf.* Eugene F. Fama, "Portfolio Analysis in a Stable Paretian Market"), but for the distributions associated with stock market returns it almost certainly holds.

19. Only securities which also had complete data in the next seven year period were included in this ranking.

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measure for the same portfolio estimated in the next period.[20] The risk measure calculated using the earlier data might be regarded as an individual's assessment of the future risk, and the measure calculated using the later data can be regarded as the realized risk. Thus, these correlation coefficients can be interpreted as a measure of the accuracy of one's assessments, which in this case are simple extrapolations of historical data.

TABLE 2

PRODUCT MOMENT AND RANK ORDER CORRELATION COEFFICIENTS OF BETAS FOR PORTFOLIOS OF N SECURITIES

Number of Securities per Portfolio	7/26-6/33 and 7/33-6/40		7/33-6/40 and 7/40-6/47		7/40-6/47 and 7/47-6/54		7/47-6/54 and 7/54-6/61		7/54-6/61 and 7/61-6/68	
	P.M.	Rank	P.M.	Rank	P.M.	Rank	P.M.	Rank	P.M.	Rank
1	0.63	0.69	0.62	0.73	0.59	0.65	0.65	0.67	0.60	0.62
2	0.71	0.75	0.76	0.83	0.72	0.79	0.76	0.76	0.73	0.74
4	0.80	0.84	0.85	0.90	0.81	0.89	0.84	0.84	0.84	0.85
7	0.86	0.90	0.91	0.93	0.88	0.93	0.87	0.88	0.88	0.89
10	0.89	0.93	0.94	0.95	0.90	0.95	0.92	0.93	0.92	0.93
20	0.93	0.99	0.97	0.98	0.95	0.98	0.95	0.96	0.97	0.98
35	0.96	1.00	0.98	0.99	0.95	0.99	0.97	0.98	0.97	0.97
50	0.98	1.00	0.99	0.98	0.98	0.99	0.98	0.98	0.98	0.97

The values of these correlation coefficients are striking. For the assessments based upon the data from July 1926 through June 1933 and evaluated using data from July 1933 through June 1940, the product moment correlations varied from 0.63 for single securities to 0.98 for portfolios of 50 securities. The high value of the latter coefficient indicates that substantially all of the variation in the risk among portfolios of 50 securities can be explained by assessments based upon previous data. The former correlation suggests that assessments for individual securities derived from historical data can explain roughly 36 per cent of the variation in the future estimated values, leaving about 64 per cent unexplained.[21]

These results, which are typical of the other periods, suggest that at least as measured by the correlation coefficients, naively extrapolated assessments of future risk for larger portfolios are remarkably accurate, whereas extrapolated assessments of future risk for individual securities and smaller portfolios are of some, but limited value in forecasting the future.

B. *A Closer Examination*

Table 3 presents the actual estimates of the risk parameters for portfolios of 100 securities for successive periods. For all five different sets of portfolios, the rank order correlations between the successive estimates are one, but there is obviously some tendency for the estimated values of the risk parameter to

20. Because of the small number of portfolios of 100 securities, correlations are not presented in Table 2 for these portfolios.

21. This large magnitude of unexplained variation may make the beta coefficient an inadequate measure of risk for analyzing the cost of equity for an individual firm although it may be adequate for cross-section analyses of cost of equity.

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TABLE 3

ESTIMATED BETA COEFFICIENTS FOR PORTFOLIOS OF 100 SECURITIES IN TWO SUCCESSIVE PERIODS

Portfolio	7/26-6/33	7/33-6/40	7/33-6/40	7/40-6/47	7/40-6/47	7/47-6/54	7/47-6/54	7/54-6/61	7/54-6/61	7/61-6/68
1	0.528	0.610	0.394	0.573	0.442	0.593	0.385	0.553	0.393	0.620
2	0.898	1.004	0.708	0.784	0.615	0.776	0.654	0.748	0.612	0.707
3	1.225	1.296	0.925	0.902	0.746	0.887	0.832	0.971	0.810	0.861
4			1.177	1.145	0.876	1.008	0.967	1.010	0.987	0.914
5			1.403	1.354	1.037	1.124	1.093	1.095	1.138	0.995
6					1.282	1.251	1.245	1.243	1.337	1.169

change gradually over time. This tendency is most pronounced in the lowest risk portfolios, for which the estimated risk in the second period is invariably higher than that estimated in the first period. There is some tendency for the high risk portfolios to have lower estimated risk coefficients in the second period than in those estimated in the first. Therefore, the estimated values of the risk coefficients in one period are biased assessments of the future values, and furthermore the values of the risk coefficients as measured by the estimates of β_i tend to regress towards the means with this tendency stronger for the lower risk portfolios than the higher risk portfolios.

C. *A Method of Correction*

In so far as the rate of regression towards the mean is stationary over time, one can in principle correct for this tendency in forming one's assessments. An obvious method is to regress the estimated values of β_i in one period on the values estimated in a previous period and to use this estimated relationship to modify one's assessments of the future.

Table 4 presents these regressions for five successive periods of time for individual securities.[22] The slope coefficients are all less than one in agreement with the regression tendency, observed above. The coefficients themselves do change over time, so that the use of the historical rate of regression to correct

TABLE 4

MEASUREMENT OF REGRESSION TENDENCY OF ESTIMATED BETA COEFFICIENTS FOR INDIVIDUAL SECURITIES

Regression Tendency Implied Between Periods	$\beta_2 = a + b\beta_1$
7/33-6/40 and 7/26-6/33	$\beta_2 = 0.320 + 0.714\beta_1$
7/40-6/47 and 7/33-6/40	$\beta_2 = 0.265 + 0.750\beta_1$
7/47-6/54 and 7/40-6/47	$\beta_2 = 0.526 + 0.489\beta_1$
7/54-6/61 and 7/47-6/54	$\beta_2 = 0.343 + 0.677\beta_1$
7/61-6/68 and 7/54-6/61	$\beta_2 = 0.399 + 0.546\beta_1$

22. The reader should not think of these regressions as a test of the stationarity of the risk of securities over time but rather merely as a test of the accuracy of the assessments of future risk which happen to be derived as historical estimates. In this test of accuracy, the independent variable in these regressions is measured without error, so that the estimated coefficients are unbiased. In the test of the stationarity of the risk measures over time, the independent variable would be measured with error, so that the coefficients in Table 4 would be biased.

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for the future rate will not perfectly adjust the assessments and may even overcorrect by introducing larger errors into the assessments than were present in the unadjusted data.

To examine the efficacy of using historical rates of regression to correct one's assessments, the estimated risk coefficients for the individual securities for the period from July 1933 through June 1940 were modified using the first equation in Table 4 to obtain adjusted risk coefficients under the assumption that the future rate of regression will be the same as the past. This process was repeated for each of the next three periods using respectively the next three equations in Table 4 to estimate the rate of regression.

Table 5 compares these adjusted assessments with the unadjusted assessments which were used in Tables 2 and 3. For the portfolios selected previously using the data from July 1933 through June 1940, both the unadjusted

TABLE 5
MEAN SQUARE ERRORS BETWEEN ASSESSMENTS AND FUTURE ESTIMATED VALUES

Number of Sec./ Port.	Assessments Based Upon							
	7/33-6/40		7/40-6/47		7/47-6/54		7/54-6/61	
	unadjusted	adjusted	unadjusted	adjusted	unadjusted	adjusted	unadjusted	adjusted
1	0.1929	0.1808	0.1747	0.1261	0.1203	0.1087	0.1305	0.1013
2	0.0915	0.0813	0.1218	0.0736	0.0729	0.0614	0.0827	0.0535
4	0.0538	0.0453	0.0958	0.0483	0.0495	0.0381	0.0587	0.0296
7	0.0323	0.0247	0.0631	0.0276	0.0387	0.0281	0.0523	0.0231
10	0.0243	0.0174	0.0535	0.0220	0.0305	0.0189	0.0430	0.0169
20	0.0160	0.0090	0.0328	0.0106	0.0258	0.0139	0.0291	0.0089
35	0.0120	0.0055	0.0266	0.0080	0.0197	0.0101	0.0302	0.0089
50	0.0096	0.0046	0.0192	0.0046	0.0122	0.0097	0.0237	0.0064
75	0.0081	0.0035	0.0269	0.0067	0.0112	0.0078	0.0193	0.0056
100	0.0084	0.0020	0.0157	0.0035	0.0114	0.0084	0.0195	0.0056

and adjusted assessments of future risk were obtained. The accuracy of these two alternative methods of assessment were compared through the mean squared errors of the assessments versus the estimated risk coefficients in the next period, July 1940 through June 1947.[23] This process was repeated for each of the next three periods.

For individual securities as well as portfolios of two or more securities, the assessments adjusted for the historical rate of regression are more accurate than the unadjusted or naive assessments. Thus, an improvement in the accuracy of one's assessments of risk can be obtained by adjusting for the historical rate of regression even though the rate of regression over time is not strictly stationary.

23. The mean square error was calculated by $\frac{\Sigma(\beta_1 - \beta_2)^2}{n}$ where β_1 is the assessed value of the future risk, β_2 is the estimated value of the risk, and n is the number of portfolios. In using an estimate of beta rather than the actual value, the mean square error will be biased upwards, but the effect of this bias will be the same for both the adjusted and unadjusted assessments.

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V. Conclusion

This paper examined the empirical behavior of one measure of risk over time. There was some tendency for the estimated values of these risk measures to regress towards the mean over time. Correcting for this regression tendency resulted in considerably more accurate assessments of the future values of risk.

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A NOTE ON USING CROSS-SECTIONAL INFORMATION IN BAYESIAN ESTIMATION OF SECURITY BETAS

OLDRICH A. VASICEK*

BAYESIAN DECISION THEORY provides formal procedures which utilize information available prior to sampling, together with the sample information, to construct estimates which are optimal with respect to the minimization of the expected loss. This paper presents a method for generating Bayesian estimates of the regression coefficient of rates of return of a security against those of a market index. The distribution of the regression coefficients across securities is used as the prior distribution in the analysis. Explicit formulas are given for the estimates. The Bayesian approach is discussed in comparison with the current practice of sampling-theory procedures.

I. INTRODUCTION

The Capital Asset Pricing Model of Treynor [7], Sharpe [6], and Lintner [4] states that the expected rate of return on a security in excess of the risk-free rate is proportional to the slope coefficient of the regression of that security's rates of return on a market index. The slope coefficient, or beta, is for this reason one of the basic concepts of modern capital market theory, and considerable attention has been devoted to its measurement.

Customarily, beta is estimated from past data by least-squares regression procedures. The least-squares technique consists of fitting a linear relationship between the rates of return on a security and the rates of return on a market index so that the sum of squared differences between the security's actual returns and those implied by the relationship is minimized.

If y_t, $t = 1,2, \ldots, T$ and x_t, $t = 1,2, \ldots, T$ are the series of rates of return on a security and on a market index, respectively, the least-squares estimates of the parameters β, α, σ^2 in the simple linear regression process

$$y_t = \alpha + \beta x_t + e_t, \quad t = 1,2,\ldots,T \tag{1}$$

$$Ee_t = 0, \quad Ee_te_s = 0 \quad \text{for} \quad t \neq s, \quad Ee_t^2 = \sigma^2$$

are given as

$$b = \Sigma(y_t - \bar{y})(x_t - \bar{x})/\Sigma(x_t - \bar{x})^2 \tag{2}$$

$$a = \bar{y} - b\bar{x} \tag{3}$$

$$s^2 = \frac{1}{T-2}\Sigma(y_t - a - bx_t)^2, \tag{4}$$

respectively, and the variance of b is estimated as

* Wells Fargo Bank, N.A. This paper is a minor revision of the author's unpublished memorandum "Bayesian Estimates of Beta," Wells Fargo Bank, August 1971.

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$$s_b^2 = s^2/\Sigma(x_t - \bar{x})^2. \tag{5}$$

These are the best unbiased estimates of the parameters in the sense that the expected value of each of the estimates is equal to the corresponding parameter and the expected quadratic error attains the minimal value. In particular, when the beta coefficient of a stock is estimated by b, the following holds:

$$E(b|\beta) = \beta. \tag{6}$$

$$\mathrm{Var}(b|\beta) = \text{minimum over all estimates of } \beta \text{ satisfying (6).} \tag{7}$$

For these reasons, the sampling-theory estimation procedures are commonly applied to the estimation of the beta of a security. Yet, the criteria as represented by Equations (6) and (7) do not satisfactorily reflect the desired properties of a beta estimator. Equation (6) describes an aspect of the distribution of the estimate assuming that the true value of the parameter is given. The actual situation is just the reverse: it is the sample coefficient that is known, and on the basis of this (and any prior or additional) information we want to infer about the distribution of the parameter.

To illustrate this point, assume that the estimated beta of a stock traded on the New York Stock Exchange is b = .2. In the absence of any additional information, this value is taken by sampling theory as being the best estimate of the true beta *because* any given true beta is equally likely to be overestimated as underestimated by the sample b. This, however, does not imply that given the sample estimate b, the true parameter is equally likely to be below or above the value .2. In fact, it is known from previous measurements that betas of stocks traded on the New York Stock Exchange are concentrated around unity, and most of them range in value between .5 and 1.5. Thus, an observed beta as low as 0.2 is more likely to be a result of underestimation than overestimation. The question of whether the estimate b is equally likely to lie below or above the true beta is irrelevant, since the true beta is not known. What is desired is an estimate such that given the sample information (which is available), the true beta will with equal probability lie below or above it.

To pursue this example further, assume that there are 1000 stocks under consideration, the betas of which are known to be distributed approximately normally around 1.0 with standard deviation of .5. Each of these true betas is equally likely to be underestimated or overestimated by b. Therefore, there are 500 stocks with true beta higher than the observed estimate, and 500 with true beta lower than the estimate. If an estimate of b = .2 is observed, the stock might be any of the approximately 500 × .945 = 473 stocks with β larger than .2 and underestimated, or any of the approximately 500 × .055 = 27 stocks with β smaller than .2 and overestimated. Apparently, given the sample and our prior knowledge of beta distribution, the former is much more likely, and thus, it is not correct to take .2 for an unbiased estimate.

This has been recognized before in the special situation where portfolios were formed by ranking of sample estimates (cf. Wagner and Vasicek [8]). The knowledge of the cross-sectional distribution of betas, however, can be

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used as a prior information whenever a beta of a security is estimated. Also, as a referee pointed out to the author, a similar problem has been recently addressed by Bogue [1]. Following is a Bayesian analysis of the simple normal regression process with the cross-sectional prior information. For information about the principles and techniques of Bayesian statistical theory, the reader is referred to Raiffa and Schlaifer [5].

II. Bayesian Estimates

For computational convenience, reparametrize the regression process (1) as follows:

$$y_t = \eta + \beta(x_t - \bar{x}) + e_t, \quad t = 1,2,\ldots,T \tag{8}$$

where

$$\eta = \alpha + \beta\bar{x}.$$

Assuming normal distribution of the disturbances, the kernel $k(b,\bar{y},s|v,\beta,\eta,\sigma)$ of the likelihood is proportional to (see [5], p. 335)

$$\sigma^{-T}\exp[-(T-2)s^2/(2\sigma^2)].\exp\left[-\frac{1}{2\sigma^2}(T(\bar{y}-\eta)^2 + v(b-\beta)^2)\right] \tag{9}$$

where b, s^2 is given by Equations (2), (4),

$$\bar{y} = \frac{1}{T}\Sigma y_t,$$

and

$$v = \Sigma(x_t - \bar{x})^2.$$

Let the information available prior to sampling consist of knowledge of the cross-sectional distribution of betas. Assuming that the distribution is approximately normal with parameters b', s'_b, the marginal prior density of β is

$$f'(\beta) \propto \exp[-(\beta - b')^2/(2s'^2_b)]. \tag{10}$$

(In accordance with practice, the prior distributions and parameters are denoted by primed letters, the posterior by letters with double primes, and the sample information without superscripts.)

Unless some prior information is available on η, σ, it is assumed that the prior density of these parameters is assessed as

$$f'(\eta, \sigma) \propto \sigma^{-1} \tag{11}$$

and independent of $f'(\beta)$. The density (11) is an improper density function corresponding to the limiting case where the prior information on η, σ is totally negligible. The joint prior density of the parameters β, η, σ is then

$$f'(\beta, \eta, \sigma) \propto \sigma^{-1}.\exp[-(\beta - b')^2/(2s'^2_b)]. \tag{12}$$

Note that the prior distribution (12) is not of the natural conjugate form (the bivariate normal-gamma distribution for the simple normal regression

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process). The reason why the natural conjugate density is not suitable here is that the conjugate prior expresses prior information in the form as if it were results of previous sampling from the same process, and it is not rich enough to give a good representation of the case when the prior information involves a cross-sectional relationship among several regression processes.

Given the prior density (12), the posterior density f″ of the parameters β, η, σ is evaluated using Bayes' theorem:

$$f''(\beta, \eta, \sigma | v, b, \bar{y}, s) \tag{13}$$
$$= f'(\beta, \eta, \sigma) k(b, \bar{y}, s | v, \beta, \eta, \sigma) N(b, \bar{y}, s)$$

where

$$N^{-1}(b, \bar{y}, s) = \int f'(\beta, \eta, \sigma) k(b, \bar{y}, s | v, \beta, \eta, \sigma) d\beta \, d\eta \, d\sigma.$$

The marginal posterior density of β is evaluated as

$$f''(\beta | v, b, \bar{y}, s) = \int f''(\beta, \eta, \sigma | v, b, \bar{y}, s) d\eta \, d\sigma.$$

After substitution, this yields

$$f''(\beta | v, b, \bar{y}, s) \propto \exp[-(\beta - b')^2/(2s'^2_b)] . \left[T - 2 + \frac{v(\beta - b)^2}{s^2} \right]^{-\frac{1}{2}(T-1)} . \tag{14}$$

When T is larger than 20, the posterior distribution of β is approximately normal with mean b″ and variance s''^2_b, where

$$b'' = \frac{b'/s'^2_b + b/s_b^2}{1/s'^2_b + 1/s_b^2} \tag{15}$$

$$s''^2_b = \frac{1}{1/s'^2_b + 1/s_b^2}. \tag{16}$$

Here

$$s_b^2 = s^2/v$$

is the estimated variance of b as given by Equation (5). (In sampling-theory terminology, s_b is usually called the standard error of the estimate b.)

The marginal posterior density of β describes the knowledge about the distribution of the estimated parameter, given the information from the sample and the prior information. The choice of a point estimate of β depends on this posterior distribution as well as the utility function on the space of decisions (estimates). Under a quadratic terminal loss function (which is a Bayesian analogue to the sampling-theory concept of minimum variance estimates) the optimal estimate of β is the mean of the posterior distribution (14). For $T > 20$, the error of approximating the posterior mean by b″ does not exceed .01 and decreases approximately linearly with 1/T. Since this error is small in comparison with the dispersion s''_b of the posterior distribution, no material

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loss is incurred when b'' is taken for the estimate that minimizes the expected quadratic opportunity loss.

III. Discussion and Conclusions

The Bayesian estimate b'' as given by Equation (15) can be interpreted as an adjustment of the sample estimate b toward the best prior estimate b', the degree of adjustment being proportionate to the precision $h = 1/s_b^2$, $h' = 1/s'^2_b$ of the sample estimate and the prior distribution, respectively. Equation (16) can be interpreted as stating that the precision $h'' = 1/s''^2_b$ of the posterior distribution is the sum of the precision of b and that of the prior distribution.

The choice of the parameters b', s'_b of the prior density $f'(\beta)$ depends on the prior information available. If nothing is known about a stock prior to sampling except that it comes from a certain population of stocks (for instance, from the population of all stocks traded on the New York Stock Exchange), an appropriate choice of the prior density is the cross-sectional distribution of betas observed for that population. For the New York Stock Exchange population, the prior parameters might be approximately $b' = 1$, $s'_b = .5$. In this case, the regression coefficient estimated from the sample is linearly adjusted toward unity, the degree of the adjustment depending upon the standard error s_b of the estimate.

A somewhat similar procedure is used in the Security Risk Evaluation service by Merrill Lynch, Pierce, Fenner & Smith, Inc. Their simplified method utilizes a formula of the form

$$b'' = 1 + k(b - 1) \tag{17}$$

where k is a constant common for all stocks. This constant can be interpreted as the slope of the cross-sectional regression of beta estimates on those obtained over a prior non-overlapping period. Comparison of Equation (17) with Equation (15) shows that this method assumes that the variance s_b^2 of the sample regression coefficient is the same for all securities. The effect of this procedure is thus to overadjust more accurate estimates and underadjust the less accurate ones.

In some cases, more can be known about a stock than that it comes from a certain population. Assume, for instance, that a stock is selected on the basis of an instrumental variable, which may be related to the true betas but not to the estimation error of the sample estimates b. In this case, a proper choice of the prior distribution is the distribution of betas implied by the knowledge of the instrumental variable. Thus, if a utility stock is considered, and t is known from previous measurements that betas of utilities are centered around .8 with a dispersion of .3, the estimate b is adjusted toward .8 by the formula (15) with $b' = .8$, $s'_b = .3$. In general, the degree and direction of the adjustment depend on the prior distribution $f'(\beta)$ as characterizing the information pertaining to β that is contained in the instrumental variable.

When estimating beta of a portfolio composed of N stocks, the sample estimate b is again adjusted through the formula (15). In this case, however, the value used for s'_b is the cross-sectional dispersion of betas of portfolios of size N.

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In most instances, a good approximation for this dispersion is obtained by assuming cross-sectional independence of the regression residuals (as in the diagonal model) and consequently using the cross-sectional dispersion of individual securities' betas reduces by the factor of $1/\sqrt{N}$.

In some cases, the prior information may contain information of another sample from the same process (as, regression results over a previous period) but the two samples cannot be pooled. This situation arises, for example, when a portfolio is formed by ranking securities on the basis of their estimated betas and then the portfolio's beta is estimated over the next period. In such cases, the estimation proceeds in two steps. First, the posterior distribution based on the first sample and the cross-sectional prior is obtained. Next, this posterior distribution is used as the prior density to utilize the information of the second sample. Thus, the sample estimate from the second sample is adjusted toward the adjusted first sample estimate.

In summary, the estimate of a security's beta that minimizes the expected squared estimation error is given by Equation (15), where the parameters b', s'_b of the prior distribution are chosen to reflect *all* the information on beta available prior to sampling. The mean squared estimation error s''^2_b is given by Equation (16).

The relative merit of this Bayesian estimation method as contrasted to procedures of sampling theory will now be briefly discussed. The main objection to the Bayesian estimation method is that the estimate b'' is not an unbiased estimate of β (in the sampling-theory sense), while b is unbiased,

$$E(b''|\beta) \neq \beta,$$

$$E(b|\beta) = \beta. \tag{18}$$

To discuss this objection, it is useful to ask why unbiasedness in the sense of Equation (18) is desirable. One can identify two reasons, the first of which is that, in virtue of the law of large numbers, an unbiased estimate converges in probability to the estimated parameter as the sample size increases,

$$\operatorname*{Plim}_{T\to\infty} b = \beta.$$

The same, however, is true for the estimate b'',

$$\operatorname*{Plim}_{T\to\infty} b'' = \beta,$$

since with increasing sample size $s_b^2 \to 0$ and the degree of the adjustment decreases.

The second reason for requiring an unbiased estimate is that the mean quadratic error

$$E((\hat{\beta} - \beta)^2|\beta) \tag{19}$$

is minimized in a class of estimates $\hat{\beta}$ of the same variance by an unbiased estimate. The expected value (19) is taken with respect to the conditional likelihood (9) of the sample. This, however, is not justified. Rather than minimizing the squared *sampling* error, what should be done is to minimize the squared *estimation* error. That is, minimize

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$$E''(\hat{\beta} - \beta)^2, \tag{20}$$

the expectation being taken with respect to the posterior distribution of β. The estimate b'', not b, is the estimate $\hat{\beta}$ to minimize (20).

This is more than a mere philosophical point. If two persons, one using the estimate b and the other b'', were penalized proportionally to the squared difference of their respective estimates from the true parameter value β (or, for that matter, from the next-period sample estimate), the former would go broke first.

In conclusion, Bayesian estimates (15) are preferred to the classical sampling-theory estimates (2) for the following reasons: First, Bayesian procedures provide estimates that minimize the loss due to misestimation, while sampling-theory estimates minimize the error of sampling. This is because Bayesian theory deals with the distribution of the parameters given the available information, while sampling theory deals with the properties of sample statistics given the true value of the parameters. Secondly, Bayesian theory weights the expected losses by a prior distribution of the parameters, thus incorporating knowledge which is available in addition to the sample information. This is particularly important in the case of estimating betas of stocks, where the prior information is usually sizeable.

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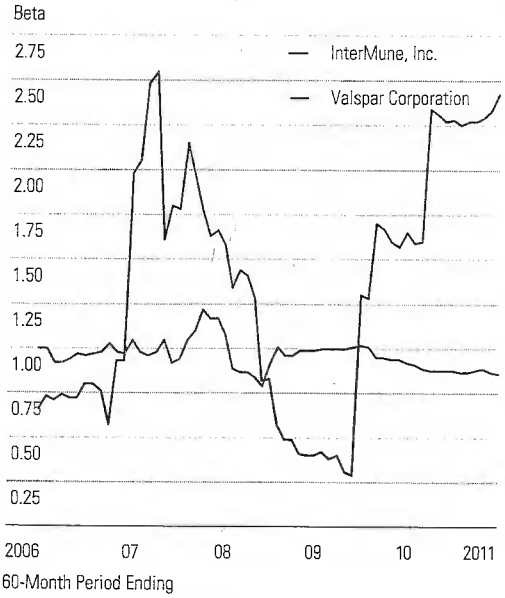
with a high standard error. An example of two companies is presented in Graph 6-3. The current beta of 0.86 for Valspar Corp. has a low standard error of 0.13. On the other hand, InterMune, Inc. has a current beta of 2.42 with a high standard error of 1.00. The chart shows the beta of each company on a rolling 60-month basis, meaning that the beta is calculated over the 60-month period October 31, 2001 through September 30, 2006, then the calculation is carried forward for each consecutive 60-month period through September 30, 2011. The betas of the company with the low standard error, Valspar Corp., exhibit remarkable stability when calculated over different time periods. On the other hand, the betas of the company with the high standard error, InterMune, Inc., display considerable variation depending on the period of the regression.

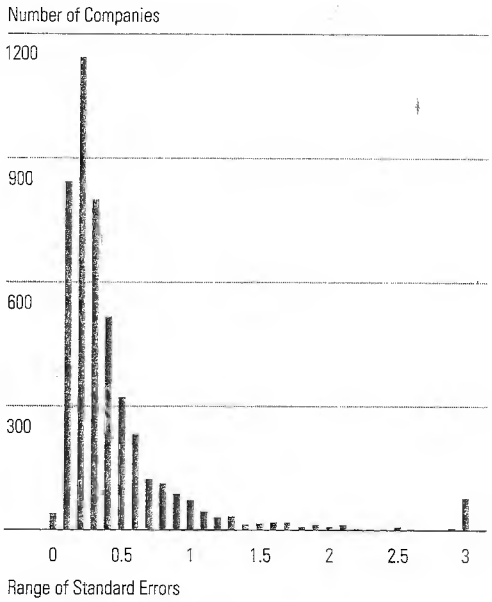
Graph 6-3: 60-Month Rolling Betas with High versus Low Standard Error



Data from October 2001–September 2011.
*Betas calculated using five years of monthly excess return data.

The standard error provides another statistical clue to help determine the reliability of the beta produced by the regression. To better illustrate the typical range of standard errors with respect to beta estimation, Graph 6-4 shows the distribution of standard error statistics across the population of companies in the *Ibbotson® Company Beta Reports.*

Graph 6-4: Standard Error Distribution



Data from October 2006–September 2011.

Beta Adjustment Methodologies

In calculating beta estimates for cost of capital projections, we are seeking a forward-looking or prospective beta. What we have measured using historical data in the beta regression is a historical beta. In this section we will examine two of the most common techniques used to adjust betas from historical to prospective or forward-looking.

Blume

One of the first academics to study whether historical betas are reliable estimates of future systematic risk was Marshall Blume.[2] What Blume found is that betas tend to revert toward their mean value, or the market beta of one. This means that high historical betas (those in excess of one) tend to over-estimate betas in future time periods, and low historical betas (those under one) tend to underestimate betas in future time periods.

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Blume's analysis regressed estimates of beta in one period against estimates in the previous period. By performing this analysis over different time periods, Blume was able to develop a convergence tendency that could be measured by the following formula:

$$\beta_1 = 0.371 + 0.635\beta_0$$

where:
β_1 = prospective beta; and
β_0 = historical beta.

The formula tells us that the forecast of next year's beta is equal to 0.635 times this year's historical beta plus 0.371.

Stated another way, betas will trend toward the market average of one (the market beta) times 0.371 plus 0.635 times the historical beta.

What are the practical implications of Blume's analysis? The Blume equation has the impact of lowering high historical betas and increasing low historical betas. A historical beta of 1.40 becomes an adjusted beta of 1.26 under the Blume methodology. Similarly, a historical beta of 0.80 becomes an adjusted beta of 0.88.

In short, Blume suggests that all betas using historical regression techniques should be adjusted in this fashion. The closer a historical beta is to 1.0, the less the magnitude of the adjustment. The Blume equation is often referred to as the 1/3 + 2/3 adjustment. When simplified, the adjustment procedure takes 1/3 plus 2/3(β_0). Use of this type of adjustment procedure is common and will be discussed further in the commercial beta section.

Vasicek

Vasicek has proposed another beta adjustment technique that considers the statistical accuracy of the beta calculation.[3] The Vasicek adjustment seeks to overcome one weakness of the Blume model by not applying the same adjustment to every security; rather, a security-specific adjustment is made depending on the statistical quality of the regression.

The Vasicek adjustment process focuses on the standard error of the beta estimate—the higher the standard error, the lower the statistical significance of the beta estimate. Therefore, a company beta with a high standard error should have a greater adjustment than a company beta with a low standard error. The Vasicek formula is as follows:

$$\beta_{s1} = \frac{\sigma^2_{\beta s0}}{\sigma^2_{\beta 0} + \sigma^2_{\beta s0}}\beta_0 + \frac{\sigma^2_{\beta 0}}{\sigma^2_{\beta 0} + \sigma^2_{\beta s0}}\beta_{s0}$$

where:
β_{s1} = the Vasicek adjusted beta for security **s**;
β_{s0} = the historical beta for security **s**;
β_0 = the beta of the market, industry, or peer group;
$\sigma^2_{\beta 0}$ = the variance of betas in the market, industry, or peer group; and
$\sigma^2_{\beta s0}$ = the square of the standard error of the historical beta for security **s**.

While the Vasicek formula looks intimidating, it is really quite simple. The adjusted beta for a company is a weighted average of the company's historical beta and the beta of the market, industry, or peer group. How much weight is given to the company and historical beta depends on the statistical significance of the company beta statistic. If a company beta has a low standard error, then it will have higher weighting in the Vasicek formula. If a company beta has a high standard error, then it will have lower weighting in the Vasicek formula. In all cases, the Vasicek weights will sum to one.

An advantage of this adjustment methodology is that it does not force an adjustment to the market as a whole. Instead, the adjustment can be toward an industry or some other peer group. This is most useful in looking at companies in industries that on average have high or low betas. If evaluating the beta for a company in the petroleum refining industry, which traditionally has had betas below one, it may be more desirable to adjust the beta of that company toward the industry average rather than toward the market average of one.

Because this method varies by company and allows for adjustment toward industry averages, we have selected the Vasicek adjustment technique for our beta calculations.

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Triumph of the Optimists

101 YEARS OF GLOBAL INVESTMENT RETURNS

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countries, over the whole of the 101-year period from 1900–2000. We also have century-long evidence on the small-firm and value/growth phenomena. We have put significant effort into compiling complete financial market histories, so that we can present consistent and comparable records for different countries. But *Triumph of the Optimists* is about much more than just data, since it has description and analysis at its core.

There is an obvious need for a reliable and truly international dataset for the investment industry as it continues relentlessly toward full market globalization. One of the many changes taking place in the investment business is the increasing demand for locally sourced research placed in a global context. Another innovation is the growing number of truly global mandates being given to fund managers. Globalization may be a cliché, but for portfolio managers it is fast becoming a reality. Access to a properly constituted and rigorously maintained international database is a sine qua non for the start of any investment process.

The period since spring 2000 has come as a shock to those who had become used to the bull market conditions of previous years. The bursting of the technology bubble, the rapid decline in economic growth rates, especially in the United States, and the advent of international terrorism raised questions about what we can expect for the future. We assert in this book that the single most important variable for making investment decisions is the equity risk premium, and we argue that high long-term returns on equities, relative to bonds, are unlikely to persist. Even after the setbacks of 2000–01, it is necessary to justify the relatively high rating of today's stock markets in terms of a historically low forward-looking equity risk premium. For the investment strategist this raises the most fundamental question of all: Do investors realize that returns are likely to revert to more normal levels, or do current valuations embody exaggerated expectations based on an imperfect understanding of history?

Good data is the key to understanding history. With this as our guiding principle, assembling the data for this book was a major task. For the United Kingdom, ABN AMRO supported us in compiling an authoritative record of UK equity market performance over the last 101 years. We did this because we were not satisfied with the data that previously existed, and there was anyway no comprehensive record of equity returns extending back to 1900. To construct our UK indexes, we devoted intensive efforts to financial archaeology. This involved transcribing original source data from dusty newspaper archives and ancient reference books into our database. A resulting benefit is that we have not simply assembled an index, but we also have the underlying stock-by-stock data, so we can now study the performance of segments of the market, such as industry sectors and market-capitalization bands. We also compiled a series of UK government bond indexes especially for this study.

For the other fifteen countries covered in this book, we have linked together the best quality indexes and returns data available from previous studies and other sources, a number of which are previously unpublished, and some of which are still work in progress. In addition to the United Kingdom, we cover two North American markets, the United States and Canada; ten other European markets, namely, Belgium, Denmark, France, Germany, Ireland, Italy, The Netherlands, Spain, Sweden and Switzerland; two Asia-Pacific markets, Australia

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Chapter 3 Measuring long-term returns

Good measures of long-run returns should accurately reflect the outcome of an implementable investment strategy. The strategy should be one that could have been set up in advance, and followed in real life, and which is representative of the asset class and country in question. It is only too easy for researchers to fail to meet these criteria.

This chapter begins in section 3.1 by setting out the principles that need to be followed in constructing long-run return indexes. These provide a benchmark for assessing previous studies, and have been the guiding framework for this book. Given that our data goes back to the beginning of the last century and covers sixteen countries, we have not always been able to adhere to every principle, especially in the earliest years. Nevertheless, these standards have guided our choices, and we indicate where compromises have been necessary.

Next, in section 3.2 we take a closer look at equity index construction and at a bias that has afflicted some previous studies. When an index is compiled retrospectively, a crucial issue is how to avoid tilting its composition toward companies that, with hindsight, are known to have survived and/or to have been successful. In section 3.3, we review other issues that arise in index design, such as dividend reinvestment, index coverage, and index weighting.

In section 3.4 we consider how best to assemble a sample of international indexes. We show that reliance on data that is easy to acquire, such as indexes that start after the end of a war, tends to result in overstated performance. Both success bias and easy-data bias arise from a focus on assets that have survived or prospered over a particular period, and both can lead to overestimates of index returns and risk premia.

In section 3.5, we focus on the special problems that can arise when measuring inflation rates, as well as long-term returns on bonds, bills and currencies. We conclude in section 3.6 with a summary of the chapter.

3.1 Good indexes and bad

There are five guiding principles that underpin our measures of long-term performance. They are to avoid bias in index construction, to focus on total returns, to ensure the widest possible coverage within each market, to apply appropriate methods of weighting and averaging, and to maximize the extent to which comparisons can be made across national boundaries.

First, equity indexes should avoid bias. Good indexes follow an investment strategy that could be followed in real life. Apart from dealing costs, an investor should in principle have been able to replicate index performance. Indexes, especially when they are constructed retrospectively, must therefore be free of any look-ahead bias. They must be constructed solely from information that would have been available at the time of investment. Serious bias can arise if index constituents are tilted toward companies that subsequently survived or

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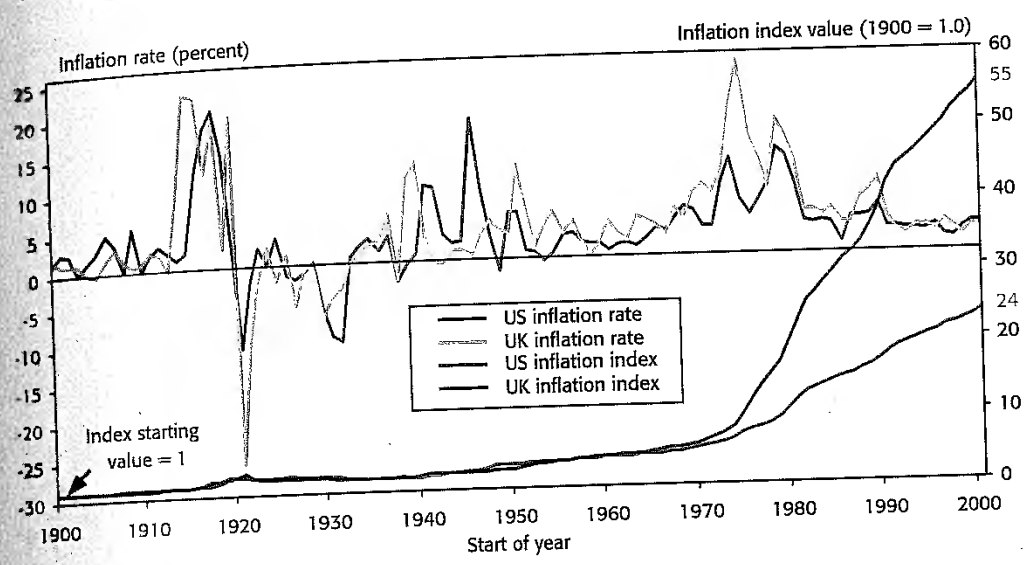
Figure 5-2: US and UK annual inflation rates and cumulative inflation, 1900–2000



much higher than in the United States, peaking at 25 percent in 1975. The cumulative impact of these higher rates can be seen by comparing the two inflation indexes, which are plotted against the right-hand axis in Figure 5-2. The red line for the United Kingdom and the blue line for the United States are virtually coincident until the mid-1960s. From that point onward, the UK index rises to a value of fifty-five by end-2000, compared with twenty-four for the United States. From 1900–2000, UK consumer prices thus rose 55-fold, a factor of 2.3 times more than in the United States, with the difference almost entirely attributable to the last thirty-five years. Over the full 101-year period, the average annualized UK inflation rate was 4.1 percent per year, versus 3.2 percent for the United States.

5.2 Inflation around the world

While inflation was fairly similar in the United States and the United Kingdom, a number of other countries had quite different experiences. Table 5-1 provides international inflation rate comparisons across all sixteen countries covered in this book, showing the mean inflation rates from 1900–2000. Clearly, there were large differences between countries. At the same time, the standard deviations for each country show that there was also considerable variation in inflation rates over time. Taking the full 101-year period as a whole, there have been four high inflation rate countries, France, Germany, Italy, and Japan; two runner-ups, Belgium and Spain; and one low inflation country, Switzerland. The other countries fall in between, with inflation rates in the region of 3–4 percent per year. Note that the true 101-year means and standard deviations for inflation in Germany are much higher than shown in Table 5-1 since the statistics in the table omit the hyper-inflationary years of 1922–23.

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and some of the studies span periods as brief as five years. These differences in research periods, methodologies, and definitions of "smallness" mean that the premia shown in Figure 9-5 are not directly comparable. In particular, it would be unwise to make inferences about the magnitudes or significance of any apparent size premium differences between countries.

In spite of this caveat, Figure 9-5 paints a very clear picture, namely, that the size premium was not restricted to the United States but was present in almost every country studied by the researchers. The sole exception was Korea, where a negative premium was reported, although this study used just five years of data. Furthermore, in most countries, researchers also looked at risk differences. They concluded, like Banz (1981), that the size premium could not be explained away by risk.

The pervasiveness and magnitude of the size effect, and the striking outperformance of smaller companies in most countries around the world, meant that the size effect rapidly became recognized as the premier stock market anomaly.

9.4 The reversal of the size premium

The "discovery" of the size effect in the United States by Banz (1981) and Reinganum (1981), and the publication and dissemination of their research, led to considerable interest in small-caps among investors in the United States. This spurred the launch of significant new small-cap investment vehicles led by Dimensional Fund Advisors, who raised several billion dollars within a couple of years of their 1981 launch. This honeymoon period lasted for approximately two years, until the end of 1983, and during this period, US small-caps continued to outperform. But subsequently, and over much of the period since, US small-caps have underperformed.

The UK experience was remarkably similar. When the HGSC was launched in 1987, its back-history showed that smaller companies had outperformed the UK market by 5.2 percent per year. This dramatic outperformance attracted substantial media attention, and there were over two hundred follow-up articles in the UK press. By the end of 1988, at least thirty open- and closed-end funds had been launched to exploit the perceived outperformance of small-caps, and numerous investment institutions developed a strategy of investing in smaller companies as a distinct asset class. Again, the honeymoon lasted just two years. In the decade that followed, smaller companies were to underperform by a large margin.

This reversal in the fortunes of US and UK small-cap stocks led us to write an article in 1999 entitled "Murphy's Law and Market Anomalies." Murphy's Law is often summarized as "bread always falls with the buttered side down." Figure 9-6 shows the performance record of US and UK small-caps at the time of our article, and shows why this appeared like a classic case of Murphy's Law. The left-hand side of Figure 9-6 shows the historical small- and micro-cap premia for the United States and the United Kingdom from the start date of the original research studies until the end of the post publication honeymoon period (i.e., 1926–

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Our subsequent research has shown that the small-cap reversal extended beyond the United Kingdom and United States, and was a worldwide phenomenon. The line of investigation we followed here was to revisit all of the research studies that have been conducted into the size effect in different countries, and to estimate the size premium over the years since the research was published. These studies were discussed earlier in section 9.3 and their findings were summarized in Figure 9-5. We found that they showed evidence of a significant size premium in every country examined, with the sole exception of Korea, where the research covered just a five-year period. Most of these research studies were published in the 1980s.

To update these studies, we estimated the size premium in each country over the period since each study was published. For consistency, we again measured the size premium as the difference between the average monthly returns on the smallest and the largest stocks. For the United States, we use the CRSP NYSE Decile 10 and Decile 1 returns as our respective measures of small and large stock returns, as this most closely approximates Banz's (1981) earlier research, and gives results close to his over his earlier period. Similarly, for the United Kingdom we adopt the same definition as was used in Figure 9-5, namely, the difference between HGSC returns and overall UK equity returns.

For all other countries, we use the size-based indexes published by either Independence International Associates (IIA) or by FTSE International. IIA publish large- and small-cap indexes for a number of countries starting in 1975. They define small as the bottom 30 percent by capitalization of their universe, and large as the top 70 percent. FTSE publish a similar set of large and medium-small-cap indexes for a larger population of countries, but only from 1987, with some countries starting even later. FTSE define medium/small-cap as the bottom 25 percent by capitalization, and large-cap as the balancing 75 percent. For countries where we had a choice between both IIA and FTSE Indexes, we have used the IIA series since they provide a longer time series and generally have somewhat wider coverage.

The results of our research are shown in Figure 9-7. Countries are listed in alphabetical order, and for each country, the size premium reported by the original research studies and plotted earlier in Figure 9-5 in shown in green. Alongside this, the yellow bar shows the size premium calculated over the period since the original research was published, that is, over the period starting at the beginning of the year immediately following publication and ending at New Year 2001. No size-based indexes were available for Korea or Taiwan, so we omitted these countries. We have, however, included the four countries covered in this book, but which did not feature in Figure 9-5 due to the absence of any research study on the size premium. For these countries, we have omitted the "initial research" bars in Figure 9-7, while the "subsequent period" bars show the size premium over the period from 1990–2000.

It is clear from Figure 9-7 that there was a global reversal of the size effect in virtually every country, with the size premium not just disappearing but going into reverse. Researchers around the world universally fell victim to Murphy's Law, with the very effect they were documenting—and inventing explanations for—promptly reversing itself shortly after their studies were published. The only country experiencing a size premium, as opposed to a size discount, in the period subsequent to the original research was Switzerland. However, the Swiss size premium was statistically insignificant, and its magnitude was just 0.05 percent.

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Table 12-2: Worldwide equity risk premia relative to long bond returns, 1900–2000

	Annual equity risk premium relative to long-term bonds						Ten year risk premium		
Country	Geometric mean	Arithmetic mean	Standard error	Standard deviation	Minimum premium	Maximum premium	Geometric mean	Arithmetic mean	Standard deviation
Australia	6.3	8.0	1.9	18.9	-30.6	66.3	6.3	6.4	4.6
Belgium	2.9	4.8	2.1	20.7	-35.1	76.6	3.0	3.2	5.1
Canada	4.5	6.0	1.8	17.8	-36.8	54.7	4.6	4.7	5.4
Denmark	2.0	3.3	1.7	16.9	-35.9	74.9	1.8	1.9	4.1
France	4.9	7.0	2.1	21.6	-32.7	83.7	4.9	5.1	6.8
Germany*	6.7	9.9	2.9	28.4	-38.6	117.6	8.2	8.5	9.1
Ireland	3.2	4.6	1.7	17.4	-37.0	73.3	3.0	3.2	4.8
Italy	5.0	8.4	3.0	30.0	-39.6	152.2	5.0	5.4	9.2
Japan	6.2	10.3	3.3	33.2	-43.3	193.0	6.7	7.2	11.5
The Netherlands	4.7	6.7	2.1	21.4	-43.9	107.6	4.3	4.5	6.5
South Africa	5.4	7.1	2.0	19.7	-29.2	70.9	6.2	6.3	5.0
Spain	2.3	4.2	2.0	20.3	-34.0	69.1	2.2	2.3	5.5
Sweden	5.2	7.4	2.2	22.1	-38.3	87.8	4.8	5.0	7.7
Switzerland†	2.7	4.2	1.9	17.9	-34.4	52.2	2.0	2.1	5.1
United Kingdom	4.4	5.6	1.7	16.7	-38.0	80.8	4.8	4.9	4.5
United States	5.0	7.0	2.0	20.0	-40.8	57.7	4.9	5.0	5.2
World	4.6	5.6	1.4	14.5	-31.2	37.4	4.6	4.7	4.8

* All statistics for Germany exclude 1922–23. † Premia for Switzerland are from 1911.

In this table, the first six columns give summary statistics for the annual premia, while the last three columns relate to rolling ten-year premia. The first column shows the geometric means that were plotted as bars in Figure 12-6. The fourth column shows the standard deviations. The 20.0 percent figure for the United States is close to the 19.6 percent standard deviation for the premia relative to bills shown earlier in Table 12-1. For some countries, however, the distribution of premia relative to bonds is narrower than relative to bills. For the United Kingdom, for example, the standard deviation is 16.7 percent, compared with 19.9 percent relative to bills. This is because, in the United Kingdom, there was a fairly high correlation between annual equity returns and long bond returns (0.56), while the correlation between equities and bills was lower (0.29). This propensity for good bond years to coincide with good equity years, and vice versa, has tended to lower the annual difference between equity and bond returns in the United Kingdom. This was particularly marked in the best and worst years on record for UK equities, namely, 1975 and 1974 respectively.

12.5 Summary

In this chapter, we have used 101 years of stock market history for sixteen different countries and for the world index to take a fresh look at the equity risk premium. In the past, the historical evidence for the US market, and to a lesser extent for the United Kingdom, has heavily influenced views about the magnitude of the risk premium. For the United States, the most widely cited source is Ibbotson Associates (2000), who estimate a geometric risk premium of

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The chapter addresses four questions: Which historical equity risk premium should one use as the starting point? Why has it typically been so high? What is a good forward-looking predictor for the future? How can one use variables such as the dividend yield to improve forecasts of the risk premium?

We stress the central role in finance of the equity premium. The historical premium is often summarized in the form of an annualized rate of return. This is a geometric mean. It provides information on past performance. For the future, what is required is the arithmetic mean of the distribution of equity premia, which is larger than the geometric mean. For markets that have been particularly volatile, the arithmetic mean of past equity premia may exceed the geometric mean premium by several percentage points. We adjust the arithmetic mean for (i) the differences between the variability of the stock market over the last 101 years, and the variability that we might anticipate today, and (ii) the impact of unanticipated cash flows and of declines in the required risk premium. The result is a forward-looking, *geometric* mean risk premium for the United States, United Kingdom and world of around 2½ to 4 percent and an *arithmetic* mean risk premium for US, UK, and world equities that falls within a range from a little below 4 to a little above 5 percent.

These equity risk premia are lower than those cited in surveys of finance academics. They are also lower than frequently quoted historical averages, such as those from Ibbotson Associates, which cover a somewhat briefer interval. We show that the historical risk premium, even if it embraces countries that have been less successful than the United States, is supported by two factors. Over the second half of the last century, equity cash flows almost certainly exceeded expectations, and the required rate of return doubtless fell as investment risk declined and the scope for diversification increased. Stock markets rose, in both the United States and other countries, for reasons that are unlikely to be repeated. Even after the setbacks of 2001, the prospective risk premium is markedly lower than the historical risk premium.

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CAPITAL EQUIPMENT ANALYSIS: THE REQUIRED RATE OF PROFIT

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The interest in capital equipment analysis that has been evident in the business literature of the past five years is the product of numerous social, economic, and business developments of the postwar period. No conclusive listing of these developments can be attempted here. However, four should be mentioned which are of particular importance in this search for a more systematic method for discovering, evaluating, and selecting investment opportunities. These are: (1) the high level of capital outlays (in absolute terms); (2) the growth in the size of business firms; (3) the delegation of responsibility for initiating recommendations from top management to the profit center, which has been part of the general movement toward decentralization; and (4) the growing use of "scientific management" in the operations of the business firm.

These developments have motivated the current attempt to develop objective criteria whereby the executive committee in a decentralized firm can arrive at a capital budget. Since each of its profit centers submits capital proposals, the executive committee must screen these and establish an allocation and a level of capital outlays that is consistent with top management's criteria for rationing the firm's funds. Capital budgeting affords the promise that this screening process can be made amenable to some established criteria that are understandable to all the component parts of the firm. Consequently, capital budgeting appeals to top management, for, in the first place, each plant manager can see his proposal in the light of all competing proposals for the funds of the enterprise. This may not completely eliminate irritation among the various parts of the firm, but a rational capital budgeting program can go a long way toward maintaining initiative on the part of a plant manager, even though the executive committee may veto one or all of his proposals. In the second place, the use of a capital budgeting program serves to satisfy top management that each accepted proposal meets adequate predetermined standards and that the budget as a whole is part of a sound, long-run plan for the firm.

What specifically does a capital budgeting program entail? The focal points of capital budgeting are: (1) ascertaining the profit abilities of the array of capital outlay alternatives, and (2) determining the least profitability required to make an investment, i.e., a cut-off point. Capital budgeting also involves administrative procedures and organization designed to discover investment opportunities, process information, and carry out the budget; however, these latter aspects of the subject have been discussed in detail by means of case studies that have appeared in publications of the American Management Association and the

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National Industrial Conference Board and in periodicals such as the *N.A.C.A. Bulletin*.[1] Hence, we will not concern ourselves with them here.

There are at least four methods for establishing an order-preference array of the capital expenditure suggestions. They are: (1) the still popular "payoff period"; (2) the average investment formula; (3) the present value formula with the rate of interest given; and (4) the present value formula used to find the rate of profit. It is not our intention in this paper to discuss these various methods specifically, since critical analyses of these alternatives are to be found in papers by Dean, by Lorie and Savage, and by Gordon in a recent issue of the *Journal of Business*,[2] which is devoted exclusively to the subject of capital budgeting.

However, it is of interest to note that in each of these methods the future revenue streams generated by the proposed outlays must be amenable to measurement if the method is to be operational. However, improvements in quality, more pleasant working conditions, strategic advantages of integration, and other types of benefits from a capital outlay are still recognized only in qualitative terms, and there is a considerable hiatus in the literature of capital budgeting with respect to the solution of this problem. Hence, in the absence of satisfactory methods for quantifying these types of benefits, the evaluation of alternative proposals is still characterized by intuitive judgments on the part of management, and a general quantitative solution to the capital budgeting problem is not now feasible. It appears to us that this problem affords one of the most promising opportunities for the application of the methods of management science. In fact, we anticipate that techniques for the quantification of the more important factors now treated qualitatively will soon be found.

Given the rate of profit on each capital outlay proposal, the size of the budget and its allocation are automatically determined with the establishment of the rate of profit required for the inclusion of a proposal in the budget. In the balance of this paper, a method for determining this quantity is proposed and its use in capital budgeting is analyzed.

II

We state that the objective of a firm is the maximization of the value of the stockholders' equity. While there may be legitimate differences of opinion as to whether this is the sole motivation of management, we certainly feel that there can be no quarrel with the statement that it is a dominant variable in manage-

[1] American Management Association, *Tested Approaches to Capital Equipment Replacement*, Special Report No. 1, 1954; American Management Association, *Capital Equipment Replacement; AMA Special Conference*, May 3–4, 1954 (New York, 1954, American Management Association, 105 pp.); J. H. Watson, III, National Industrial Conference Board, *Controlling Capital Expenditures*, Studies in Business Policy, No. 62, April, 1953; C. I. Fellers, "Problems of Capital Expenditure Budgeting", *N.A.C.A. Bulletin*, 26 (May, 1955), 918–24; E. N. Martin, "Equipment Replacement Policy and Application", *N.A.C.A. Bulletin*, 35 (February, 1954), 715–30.

[2] *Journal of Business*, Vol. XXVIII, No. 3 (October, 1955).

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ment's decisions. It has been shown by Lutz and Lutz in their *Theory of the Investment of the Firm*[3] and by others[4] that this objective is realized in capital budgeting when the budget is set so as to equate the marginal return on investment with the rate of return at which the corporation's stock is selling in the market. The logic and operation of this criterion will be discussed later. Now, we only wish to note the role assigned in capital budgeting to the rate of profit that is required by the market.

At the present time, the dividend yield (the current dividend divided by the price) and the earnings yield (the current income per share divided by the price) are used to measure the rate of profit at which a share is selling. However, both these yields fail to recognize that a share's payments can be expected to grow, and the earnings yield fails to recognize that the corporation's earnings per share are not the payments made to the stockholder.

The practical significance of these failures is evidenced by the qualifications with which these two rate-of-profit measures are used by investment analysts. In the comparative analysis of common stocks for the purpose of arriving at buy or sell recommendations, the conclusions indicated by the dividend and/or the earnings yield are invariably qualified by the presence or absence of the prospect of growth. If it is necessary to qualify a share's yield as a measure of the rate of profit one might expect to earn by buying the share, then it must follow that current yield, whether income or dividend, is inadequate for the purposes of capital budgeting, which is also concerned with the future. In short, it appears to us that the prospective growth in a share's revenue stream should be reflected in a measure of the rate of profit at which the share is selling. Otherwise, its usefulness as the required rate of profit in capital budgeting is questionable.

In his *Theory of Investment Value*[5], a classic on the subject, J. B. Williams tackled this problem of growth. However, the models he developed were arbitrary and complicated so that the problem of growth remained among the phenomena dealt with qualitatively. It is our belief that the following proposal for a definition of the rate of profit that takes cognizance of prospective growth has merit.

The accepted definition of the rate of profit on an asset is the rate of discount that equates the asset's expected future payments with its price. Let P_0 = a share's price at $t = 0$, let D_t = the dividend expected at time t, and let k = the rate of profit. Then, the rate of profit on a share of stock is the value of k that satisfies

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k)^t}. \tag{1}$$

[3] Friedrich and Vera Lutz, *The Theory of Investment of the Firm* (Princeton, N. J., 1951, Princeton University Press, 253 pp.), 41–43.

[4] Joel Dean, *Capital Budgeting: Top Management Policy on Plant, Equipment, and Product Development* (New York, 1951, Columbia University Press, 174 pp.); Roland P. Soule, "Trends in the Cost of Capital", *Harvard Business Review*, 31 (March, April, 1953), 33–47.

[5] J. B. Williams, *The Theory of Investment Value*, (Cambridge, Massachusetts, 1938, Harvard University Press), 87–96.

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It is mathematically convenient to assume that the dividend is paid and discounted continuously at the annual rates D_t and k, in which case

$$P_0 = \int_0^\infty D_t e^{-kt}\, dt. \tag{2}$$

Since P_0 is known, estimating the rate of profit at which a share of stock is selling requires the determination of D_t, $t = 1, 2, \cdots, \infty$.

At the outset it should be made clear that our objective is not to find the rate of profit that *will actually be earned* by buying a share of stock. This requires knowledge of the dividends that will be paid in the future, the price at which the share will be sold, and when it will be sold. Unfortunately, such information is not available to us. The rate of profit of interest here is a relation between the present known price and the *expected future dividends*. The latter will vary among individuals with the information they have on a host of variables and with their personality. Therefore, by expected future dividends we mean an estimate that (1) is derivable from known data in an objective manner, (2) is derived by methods that appear reasonable, i.e., not in conflict with common sense knowledge of corporation financial behavior, and (3) can be used to arrive at a manageable measure of the rate of profit implicit in the expectation.

We arrive at D_t by means of two assumptions. One, a corporation is expected to retain a fraction b of its income after taxes; and two, a corporation is expected to earn a return of r on the book value of its common equity. Let Y_t equal a corporation's income per share of common after taxes at time t. Then the expected dividend at time t is

$$D_t = (1 - b)Y_t \tag{3}$$

The income per share at time t is the income at $(t - 1)$ plus r percent of the income at $(t - 1)$ retained, or

$$Y_t = Y_{t-1} + rbY_{t-1} \tag{4}$$

Equation (4) is simply a compound interest expression so that, if Y_t grows continuously at the rate $g = br$,

$$Y_t = Y_0 e^{gt}. \tag{5}$$

From Equations (3) and (5)

$$D_t = D_0 e^{gt}. \tag{6}$$

Substituting this expression for D_t in Equation (2) and integrating, yields

$$\begin{aligned} P_0 &= \int_0^\infty D_0 e^{gt} e^{-kt}\, dt \\ &= D_0 \int_0^\infty e^{-t(k-g)}\, dt \\ &= \frac{D_0}{k - g}. \end{aligned} \tag{7}$$

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The condition for a solution is $k > g$, a condition that is easily satisfied, for otherwise, P_0 would be infinite or negative.

Solving Equation (7) for k we find that

$$k = \frac{D_0}{P_0} + g. \tag{8}$$

Translated, this means that the rate of profit at which a share of common stock is selling is equal to the current dividend, divided by the current price (the dividend yield), plus the rate at which the dividend is expected to grow. Since there are other possible empirical definitions of the market rate of profit on a share of stock, we will refer to k as the growth rate of profit.

III

Let us now review and evaluate the rationale of the model we have just established. Estimating the rate of profit on a share of stock involves estimating the future dividend stream that it provides, and the fundamental difference between this model and the dividend yield is the assumption of growth. The latter, as can be seen, assumes that the dividend will remain constant. Since growth is generally recognized as a factor in the value of a share and since it is used to explain differences in dividend yield among shares, its explicit recognition appears desirable. Future dividends are uncertain, but the problem cannot be avoided by ignoring it. To assume a constant rate of growth and estimate it to be equal to the current rate appears to be a better alternative.

Under this model the dividend will grow at the rate br, which is the product of the fraction of income retained and the rate of return earned on net worth. It is mathematically true that the dividend will grow at this rate if the corporation retains b and earns r. While we can be most certain that the dividend will not grow uniformly and continuously at some rate, unless we believe that an alternative method for estimating the future dividend stream is superior, the restriction of the model to the assumption that it will grow uniformly at some rate is no handicap. Furthermore, the future is discounted; hence, an error in the estimated dividend for a year in the distant future results in a considerably smaller error in k than an error in estimating the dividend in a near year.

It should be noted that this measure of the rate of profit is suspect, when *both* income and dividend are zero, and it may also be questioned when either falls to very low (or negative) values. In such cases, the model yields a lower rate of profit than one might believe that the market requires on a corporation in such difficulties. It is evident that the dividend and the income yields are even more suspect under these conditions and, hence, are subject to the same limitations.

There are other approaches to the estimation of future dividends than the extrapolation of the current dividend on the basis of the growth rate implicit in b and r. In particular, one can arrive at g directly by taking some average of the past rate of growth in a corporation's dividend. Whether or not this or some other measure of the expected future dividends is superior to the one presented earlier will depend on their relative usefulness in such purposes as the analysis

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of variation in prices among shares and the preferences of those who want an objective measure of a share's rate of profit.

So far, we have compared the growth rate of profit with the income and dividend yields on theoretical grounds. Let us now consider how they differ in practice, using the same measurement rules for the variables in each case. The numerical difference between the growth rate of profit and the dividend yield is simply the growth rate. However, the income yield, which is the measure of the rate of profit commonly recommended for capital budgeting, differs from the growth rate of profit in a more complex manner, and to establish this difference we first note that

$$b = \frac{Y - D}{Y} \text{ and } r = \frac{Y}{B} \tag{9}$$

where B = the net worth or book value per share. The growth rate of profit, therefore, may be written as

$$k = \frac{D}{P} + br = \frac{D}{P} + \frac{Y - D}{B}. \tag{10}$$

Next, the income yield can be decomposed as follows:

$$y = \frac{Y}{P} = \frac{D}{P} + \frac{Y - D}{P}. \tag{11}$$

We see then that y and k will be equal when book and market values are equal. It can be argued that the income yield overstates a share's payment stream by assuming that each payment is equal to the income per share and understates the payment stream by assuming that it will not grow. Hence, in this special case where book and market values are equal, the two errors exactly compensate each other.

Commonly market and book values differ, and y will be above k when market is below book, and it will be below k when market is above book. Hence, a share of IBM, for example, that is priced far above book had had an earnings yield of two to three percent in 1955. We know that the market requires a higher rate of profit on a common stock, even on IBM, and its growth rate of profit, k, is more in accord with the value suggested by common sense. Conversely, when U. S. Steel was selling at one-half of book value in 1950, the high income yield grossly overstated the rate of profit that the market was, in fact, requiring on the stock.

Furthermore, the growth rate of profit will fluctuate in a narrower range than the earnings yield. For instance, during the last few years, income, dividends, and book value have gone up more or less together, but market price has gone up at a considerably higher rate. Consequently, the growth rate of profit, dependent in part on book value, has fallen less than the earnings yield. Conversely, in a declining market k would rise less rapidly than y.

There is a widespread feeling that many accounting figures, particularly book value per share, are insensitive to the realities of the world, and some may feel

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that the comparative stability of k is merely a consequence of the limitations of accounting data. This is not true! The behavior of k is not a consequence of the supposed lack of realism in accounting data. Rather, book value appears in the model because it, and not market value, is used to measure the rate of return the corporation earns on investment, which, we have seen, is the rate of return that enters into the determination of the rate at which the dividend will grow. The comparative stability of k follows from the simple fact that, when a revenue stream is expected to grow, a change in the required rate of profit will give rise to a more than proportional change in the asset's price. Conversely, a change in the price reflects a less than proportional change in the rate of profit.

IV

Given the rate of profit expected on each item in the schedule of available investment opportunities and given the rate of profit at which the corporation's stock is selling, what should the capital budget be? As stated earlier, the accepted theory is that the budget should be set so as to equate the marginal return on investment with the rate of profit at which the stock is selling. The reasoning is, if the market requires, let us say, a 10 percent return on investment in the corporation's stock, and if the corporation can earn 15 percent on additional investment, obtaining the funds and making the investment will increase the earnings per share. As the earnings and the dividend per share increase or as the market becomes persuaded that they will increase, the price of the stock will rise. The objective, it will be recalled, is the maximization of the value of the stockholder's equity.

The conclusion drawn implicitly assumes that the corporation can sell additional shares at or above the prevailing market, or if a new issue depresses the market, the fall will be slight, and the price will soon rise above the previous level. However, some other consideration may argue against a new stock issue; for example, the management may be concerned with dilution of control, or the costs of floating a new issue may be very high, or a new issue may be expected to depress the price severely and indefinitely for reasons not recognized in the theory. Hence, it does not automatically follow that a new issue should be floated when a firm's demand for funds exceeds, according to the above criterion, those that are internally available.

In determining whether the required rate of profit is above or below r', the marginal return on investment, one can use y, the earnings yield, or k, the growth rate of profit as the required rate of profit. If y and k differ and if the reasoning in support of k presented earlier is valid, using y to estimate the direction in which a new issue will change the price of the stock may result in a wrong conclusion.

In arriving at the optimum size of a stock issue, the objective is to equate r' and y or k, depending on which is used. Internal data may be used to estimate the marginal efficiency of capital schedule. If the required rate of profit is considered a constant, its definition, $y = Y/P$ or $k = D/P + br$, provides its value. However, the required rate of profit may vary with the size of the stock issue or with the variables that may change as a consequence of the issue. In this event,

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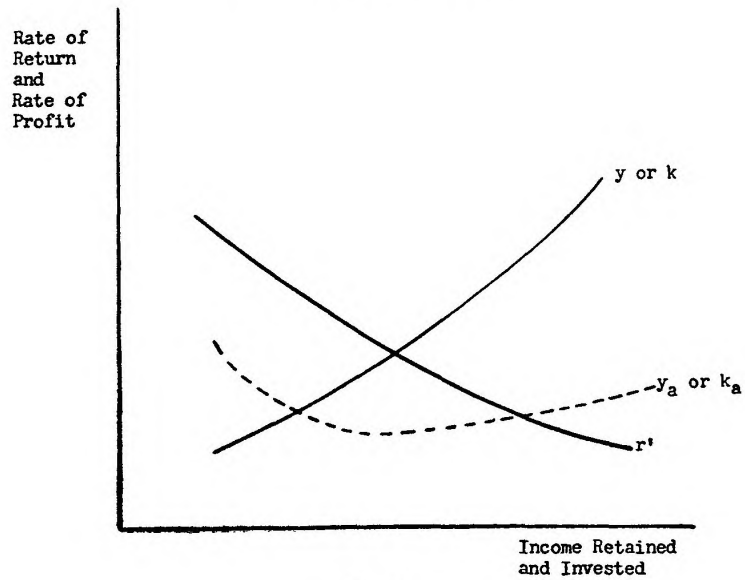

FIG. 1

finding the optimum size of a stock issue requires a model that predicts the variation in the required rate of profit with the relevant variables.

Borrowing is an alternative source of funds for investment. However, an analysis of this alternative requires the measurement of both (1) the variation in risk with debt, and (2) the difference between the rate of profit and the rate of interest needed to cover a given increase in risk. This has not been done as yet, which may explain the widespread practice of arbitrarily establishing a "satisfactory" financial structure and only borrowing to the extent allowed by it.

It has been stated by Dean[6] and Terborgh[7] that the long-term ceiling on a firm's capital outlays is the amount of its internally available funds. However, the share of its income a corporation retains is not beyond the control of its management; and, among the things we want from a capital budgeting model is guidance on whether the share of a corporation's income that is retained for investment should be raised or lowered.

Proceeding along traditional lines, the problem may be posed as follows. A firm estimates its earnings and depreciation allowances for the coming year and deducts the planned dividend to arrive at a preliminary figure for the capital budget. The marginal rate of return on investment in excess of this amount may be above or below the required rate of profit. We infer from theory that the two rates should be equated by (1) raising the budget and reducing the dividend

[6] Dean, *op. cit.*, 53–55.

[7] George Willard Terborgh, *Dynamic Equipment Policy* (New York, 1949, McGraw-Hill, 290 pp.), 228–29.

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when the marginal return on investment is above the required rate of return, and (2) raising the dividend and reducing the budget when the reverse holds. The conditions under which this process yields an equilibrium are illustrated in Figure 1. The marginal return on investment, r', should fall as the budget is increased, and the required rate of profit, y or k, should increase or it should fall at a lower rate than r'. The latter case is illustrated by the line y_a or k_a.

Changing the dividend so as to equate r' and say y should maximize the price of the stock. For instance, if r' is above y, the company can earn a higher return on investment than stockholders require, and a dollar used this way is worth more to the stockholders than the dollar distributed in dividends. In other words, the price should go up by more than the income retained.

There are, of course, a number of problems connected with the use of this model for arriving at the optimum dividend rate. First, there is the question whether y or k should be used to measure the required rate of profit. Second, there is no question that the required rate of profit varies with the dividend rate. Hence, the current rate of profit given by the definition does not tell what profit rate will be required with a different dividend rate. This requires a model which predicts the variation in y or k with the dividend rate and other variables. Third, there is a very nasty problem of the short and the long run. It is widely believed, though the evidence has limitations, that the price of a share of stock varies with the dividend rate, in which case a corporation should distribute all of its income. However, it is quite possible that a change in the dividend gives rise to the expectation that earnings and future dividends are changing in the same direction. Further, in the short run, the market is not likely to be informed on a firm's marginal efficiency of capital schedule. For these and other reasons, it is likely that the dividend rate should not be made to vary with short-run changes in the marginal efficiency of capital, and more sophisticated methods than those now in use are needed to establish the variation in price or required rate of profit with the dividend rate.

V

The major points developed in this paper may be summarized as follows. We presented a definition of the rate of profit required by the market on a share of common stock, and we noted some of its advantages. It is theoretically superior to the income and dividend yields because it recognizes that the revenue stream provided by a share can be expected to grow. Furthermore, its empirical characteristics are also superior to those of the income and dividend yields since its value is generally in closer agreement with common sense notions concerning the prevailing rate of profit on a share of stock and since its value fluctuates in a narrower range over time. We next examined some of the problems involved in using this definition of the rate of profit and the earnings yield in capital budgeting models. Finally, we saw that, before capital budgeting theory can be made a reliable guide to action, we must improve our techniques for estimating the future revenue on a capital outlay proposal, and we must learn a good deal more about how the rate of profit the market requires on a share of stock varies with the dividend, the growth rate, and other variables that may influence it.

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FIFTH EDITION

Cost of Capital

APPLICATIONS AND EXAMPLES

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following the discrete projection period. Many analysts assume capital expenditures to equal depreciation when estimating the terminal value, which results in overestimation of expected net cash flow and overvaluation, where real growth in excess of inflation is expected.[8]

USING AN UNATTAINABLE GROWTH RATE IN CALCULATING THE TERMINAL VALUE

The growth rate assumed in calculating the terminal value is a compound growth rate *in perpetuity*, which is a very long time. At a growth rate of 20% compounded annually, the company's revenues would soon exceed the gross domestic product (GDP) of the United States and eventually that of the world. Long-term growth rates exceeding the real growth in GDP plus inflation are generally not sustainable. Most analysts use more conservative growth rates in calculating the terminal value. Generally, the long-term growth rate only applies to the existing enterprise or core business net cash flows, consistent with the net cash flow projections in the discounted cash flow method (see discussion in Chapter 34).

Using Market Multiples without Adjusting for Differences in Growth

Some practitioners use a market multiple, such as the industry average multiple of earnings before interest, income taxes, depreciation, and amortization (EBITDA) to estimate a terminal value.

As we discussed in Chapter 4, the authors believe that use of a market-derived multiple for calculation of the terminal value is not appropriate, as it mixes elements of the market and income approaches and does not represent a true income approach.

In addition to mixing valuation approaches, it is not clear that a current average industry multiple reflects a long-term estimate of growth consistent with the sustainable long-term growth rate in net cash flows of the existing enterprise or core business. If the growth rate embedded in the multiple is inconsistent, utilizing this method will either overvalue or undervalue the business.

As an example, current multiples in an industry reflect the consensus growth estimates of the market, which are built upon analysts' estimates of earnings. Analysts include both the earnings of the company expected from the existing business and the earnings expected from reinvestment of retained net cash flows and reinvestment of those retained net cash flows in investments that are unspecified. Typically, the net cash flow estimates used in the DCF method valuation are based on the core business

[8]For a good discussion of this common error, see Gilbert E. Matthews, "Cap X = Depreciation Is Unrealistic Assumption for Most Terminal Values," *Shannon Pratt's Business Valuation Update* (March 2002): 1–3. See also Gilbert E. Matthews, "Errors and Omissions in DCF Calculations: A Critique of Delaware's Dr. Pepper Appraisal," *Business Valuation Update* (October 2007): 1–5. In this article, the author states: "In a perpetuity model with a 3% growth rate and assuming a 10-year average life for fixed assets, capital expenditures would exceed depreciation by 15.5% using straight-line depreciation and 11.6% using double-declining method."

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THE RELATIONSHIP BETWEEN RETURN AND MARKET VALUE OF COMMON STOCKS*

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This study examines the empirical relationship between the return and the total market value of NYSE common stocks. It is found that smaller firms have had higher risk adjusted returns, on average, than larger firms. This 'size effect' has been in existence for at least forty years and is evidence that the capital asset pricing model is misspecified. The size effect is not linear in the market value; the main effect occurs for very small firms while there is little difference in return between average sized and large firms. It is not known whether size *per se* is responsible for the effect or whether size is just a proxy for one or more true unknown factors correlated with size.

1. Introduction

The single-period capital asset pricing model (henceforth CAPM) postulates a simple linear relationship between the expected return and the market risk of a security. While the results of direct tests have been inconclusive, recent evidence suggests the existence of additional factors which are relevant for asset pricing. Litzenberger and Ramaswamy (1979) show a significant positive relationship between dividend yield and return of common stocks for the 1936–1977 period. Basu (1977) finds that price–earnings ratios and risk adjusted returns are related. He chooses to interpret his findings as evidence of market inefficiency but as Ball (1978) points out, market efficiency tests are often joint tests of the efficient market hypothesis and a particular equilibrium relationship. Thus, some of the anomalies that have been attributed to a lack of market efficiency might well be the result of a misspecification of the pricing model.

This study contributes another piece to the emerging puzzle. It examines the relationship between the total market value of the common stock of a firm and its return. The results show that, in the 1936–1975 period, the common stock of small firms had, on average, higher risk-adjusted returns

*This study is based on part of my dissertation and was completed while I was at the University of Chicago. I am grateful to my committee, Myron Scholes (chairman), John Gould, Roger Ibbotson, Jonathan Ingersoll, and especially Eugene Fama and and Merton Miller, for their advice and comments. I wish to acknowledge the valuable comments of Bill Schwert on earlier drafts of this paper.

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than the common stock of large firms. This result will henceforth be referred to as the 'size effect'. Since the results of the study are not based on a particular theoretical equilibrium model, it is not possible to determine conclusively whether market value *per se* matters or whether it is only a proxy for unknown true additional factors correlated with market value. The last section of this paper will address this question in greater detail.

The various methods currently available for the type of empirical research presented in this study are discussed in section 2. Since there is a considerable amount of confusion about their relative merit, more than one technique is used. Section 3 discusses the data. The empirical results are presented in section 4. A discussion of the relationship between the size effect and other factors, as well as some speculative comments on possible explanations of the results, constitute section 5.

2. Methodologies

The empirical tests are based on a generalized asset pricing model which allows the expected return of a common stock to be a function of risk β and an additional factor ϕ, the market value of the equity.[1] A simple linear relationship of the form

$$E(R_i)=\gamma_0+\gamma_1\beta_i+\gamma_2[(\phi_i-\phi_m)/\phi_m], \tag{1}$$

is assumed, where

$E(R_i)$ = expected return on security i,
γ_0 = expected return on a zero-beta portfolio,
γ_1 = expected market risk premium,
ϕ_i = market value of security i,
ϕ_m = average market value, and
γ_2 = constant measuring the contribution of ϕ_i to the expected return of a security.

If there is no relationship between ϕ_i and the expected return, i.e., $\gamma_2=0$, (1) reduces to the Black (1972) version of the CAPM.

Since expectations are not observable, the parameters in (1) must be estimated from historical data. Several methods are available for this purpose. They all involve the use of pooled cross-sectional and time series regressions to estimate γ_0, γ_1, and γ_2. They differ primarily in (a) the assumption concerning the residual variance of the stock returns (homoscedastic or heteroscedastic in the cross-sectional), and (b) the treatment of the

[1] In the empirical tests, Φ_i and Φ_m are defined as the market proportion of security i and average market proportion, respectively. The two specifications are, of course, equivalent.

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errors-in-variables problem introduced by the use of estimated betas in (1). All methods use a constrained optimization procedure, described in Fama (1976, ch. 9), to generate minimum variance (m.v.) portfolios with mean returns γ_i, $i=0,\ldots,2$. This imposes certain constraints on the portfolio weights, since from (1)

$$E(R_p)\equiv\gamma_i=\gamma_0\sum_j w_j+\gamma_1\sum_j w_j\beta_j + \gamma_2\left[\left(\sum_j w_j\phi_j-\phi_m\sum_j w_j\right)\Big/\phi_m\right], \qquad i=0,\ldots,2, \tag{2}$$

where the w_j are the portfolio proportions of each asset j, $j=1,\ldots,N$. An examination of (2) shows that $\hat{\gamma}_0$ is the mean return of a standard m.v. portfolio ($\sum_j w_j=1$) with zero beta and $\phi_p\equiv\sum_j w_j\phi_j=\phi_m$ [to make the second and third terms of the right-hand side of (2) vanish]. Similarly, $\hat{\gamma}_1$ is the mean return on a zero-investment m.v. portfolio with beta of one and $\phi_p=0$, and $\hat{\gamma}_2$ is the mean return on a m.v. zero-investment, zero-beta portfolio with $\phi_p=\phi_m$. As shown by Fama (1976, ch. 9), this constrained optimization can be performed by running a cross-sectional regression of the form

$$R_{it}=\gamma_{0t}+\gamma_{1t}\beta_{it}+\gamma_{2t}[(\phi_{it}-\phi_{mt})/\phi_{mt}]+\varepsilon_{it}, \qquad i=1,\ldots,N, \tag{3}$$

on a period-by-period basis, using estimated betas $\hat{\beta}_{it}$ and allowing for either homoscedastic or heteroscedastic error terms. Invoking the usual stationarity arguments the final estimates of the gammas are calculated as the averages of the T estimates.

One basic approach involves grouping individual securities into portfolios on the basis of market value and security beta, reestimating the relevant parameters (beta, residual variance) of the portfolios in a subsequent period, and finally performing either an ordinary least squares (OLS) regression [Fama and MacBeth (1973)] which assumes homoscedastic errors, or a generalized least squares (GLS) regression [Black and Scholes (1974)] which allows for heteroscedastic errors, on the portfolios in each time period.[2] Grouping reduces the errors-in-variables problem, but is not very efficient because it does not make use of all information. The errors-in-variables problem should not be a factor as long as the portfolios contain a reasonable number of securities.[3]

Litzenberger and Ramaswamy (1979) have suggested an alternative method which avoids grouping. They allow for heteroscedastic errors in the cross-section and use the estimates of the standard errors of the security

[2]Black and Scholes (1974) do not take account of heteroscedasticity, even though their method was designed to do so.

[3]Black, Jensen and Scholes (1972, p. 116).

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betas as estimates of the measurement errors. As Theil (1971, p. 610) has pointed out, this method leads to unbiased maximum likelihood estimators for the gammas as long as the error in the standard error of beta is small and the standard assumptions of the simple errors-in-variables model are met. Thus, it is very important that the diagonal model is the correct specification of the return-generating process, since the residual variance assumes a critical position in this procedure. The Litzenberger–Ramaswamy method is superior from a theoretical viewpoint; however, preliminary work has shown that it leads to serious problems when applied to the model of this study and is not pursued any further.[4]

Instead of estimating equation (3) with data for all securities, it is also possible to construct arbitrage portfolios containing stocks of very large and very small firms, by combining long positions in small firms with short positions in large firms. A simple time series regression is run to determine the difference in risk-adjusted returns between small and large firms. This approach, long familiar in the efficient markets and option pricing literature, has the advantage that no assumptions about the exact functional relationships between market value and expected return need to be made, and it will therefore be used in this study.

3. Data

The sample includes all common stocks quoted on the NYSE for at least five years between 1926 and 1975. Monthly price and return data and the number of shares outstanding at the end of each month are available in the monthly returns file of the Center for Research in Security Prices (CRSP) of the University of Chicago. Three different market indices are used; this is in response to Roll's (1977) critique of empirical tests of the CAPM. Two of the three are pure common stock indices — the CRSP equally- and value-weighted indices. The third is more comprehensive: a value-weighted combination of the CRSP value-weighted index and return data on corporate and government bonds from Ibbotson and Sinquefield (1977) (henceforth 'market index').[5] The weights of the components of this index are derived from information on the total market value of corporate and government bonds in various issues of the *Survey of Current Business* (updated annually) and from the market value of common stocks in the CRSP monthly index file. The stock indices, made up of riskier assets, have both higher returns

[4]If the diagonal model (or market model) is an incomplete specification of the return generating process, the estimate of the standard error of beta is likely to have an upward bias, since the residual variance estimate is too large The error in the residual variance estimate appears to be related to the second factor. Therefore, the resulting gamma estimates are biased.

[5]No pretense is made that this index is complete, thus, the use of quotation marks It ignores real estate, foreign assets, etc ; it should be considered a first step toward a comprehensive index. See Ibbotson and Fall (1979)

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and higher risk than the bond indices and the 'market index'.[6] A time series of commercial paper returns is used as the risk-free rate.[7] While not actually constant through time, its variation is very small when compared to that of the other series, and it is not significantly correlated with any of the three indices used as market proxies.

4. Empirical results

4.1. Results for methods based on grouped data

The portfolio selection procedure used in this study is identical to the one described at length in Black and Scholes (1974). The securities are assigned to one of twenty-five portfolios containing similar numbers of securities, first to one of five on the basis of the market value of the stock, then the securities in each of those five are in turn assigned to one of five portfolios on the basis of their beta. Five years of data are used for the estimation of the security beta; the next five years' data are used for the reestimation of the portfolio betas. Stock price and number of shares outstanding at the end of the five year periods are used for the calculation of the market proportions. The portfolios are updated every year. The cross-sectional regression (3) is then performed in each month and the means of the resulting time series of the gammas could be (and have been in the past) interpreted as the final estimators. However, having used estimated parameters, it is not certain that the series have the theoretical properties, in particular, the hypothesized beta. Black and Scholes (1974, p. 17) suggest that the time series of the gammas be regressed once more on the excess return of the market index. This correction involves running the time series regression (for $\hat{\gamma}_2$)

$$\hat{\gamma}_{2t} - R_{Ft} = \hat{\alpha}_2 + \hat{\beta}_2(R_{mt} - R_{Ft}) + \hat{\varepsilon}_{2t}. \tag{4}$$

It has been shows earlier that the theoretical β_2 is zero. (4) removes the effects of a non-zero $\hat{\beta}_2$ on the return estimate $\hat{\gamma}_2$ and $\hat{\alpha}_2$ is used as the final estimator for $\hat{\gamma}_2 - R_F$. Similar corrections are performed for γ_0 and γ_1. The

[6] Mean monthly returns and standard deviations for the 1926–1975 period are.

	Mean return	Standard deviation
'Market index'	0.0046	0.0178
CRSP value-weighted index	0.0085	0.0588
CRSP equally-weighted index	0.0120	0.0830
Government bond index	0.0027	0.0157
Corporate bond index	0.0032	0.0142

[7] I am grateful to Myron Scholes for making this series available. The mean monthly return for the 1926–1975 period is 0.0026 and the standard deviation is 0.0021.

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derivations of the $\hat{\beta}_i$, $i=0,\ldots,2$, in (4) from their theoretical values also allow us to check whether the grouping procedure is an effective means to eliminate the errors-in-beta problem.

The results are essentially identical for both OLS and GLS and for all three indices. Thus, only one set of results, those for the 'market index' with GLS, is presented in table 1. For each of the gammas, three numbers are reported: the mean of that time series of returns which is relevant for the test of the hypothesis of interest (i.e., whether or not $\hat{\gamma}_0$ and $\hat{\gamma}_1$ are different from the risk-free rate and the risk premium, respectively), the associated t-statistic, and finally, the estimated beta of the time series of the gamma from (4). Note that the means are corrected for the deviation from the theoretical beta as discussed above.

The table shows a significantly negative estimate for γ_2 for the overall time period. Thus, shares of firms with large market values have had smaller returns, on average, than similar small firms. The CAPM appears to be misspecified. The table also shows that γ_0 is different from the risk-free rate. As both Fama (1976, ch. 9) and Roll (1977) have pointed out, if a test does not use the true market portfolio, the Sharpe–Lintner model might be wrongly rejected. The estimates for γ_0 are of the same magnitude as those reported by Fama and MacBeth (1973) and others. The choice of a market index and the econometric method does not affect the results. Thus, at least within the context of this study, the choice of a proxy for the market portfolio does not seem to affect the results and allowing for heteroscedastic disturbances does not lead to significantly more efficient estimators.

Before looking at the results in more detail, some comments on econometric problems are in order. The results in table 1 are based on the 'market index' which is likely to be superior to pure stock indices from a theoretical viewpoint since it includes more assets [Roll (1977)]. This superiority has its price. The actual betas of the time series of the gammas are reported in table 1 in the columns labeled $\hat{\beta}_i$. Recall that the theoretical values of β_0 and β_1 are zero and one, respectively. The standard zero-beta portfolio with return $\hat{\gamma}_0$ contains high beta stocks in short positions and low beta stocks in long positions, while the opposite is the case for the zero-investment portfolio with return $\hat{\gamma}_1$. The actual betas are all significantly different from the theoretical values. This suggests a regression effect, i.e., the past betas of high beta securities are overestimated and the betas of low beta securities are underestimated.[8] Past beta is not completely uncorrelated with the error of the current beta and the instrumental variable approach to the error-in-variables problem is not entirely successful.[9]

[8]There is no such effect for β_2 because that portfolio has both zero beta and zero investment, i.e., net holdings of both high and low beta securities are, on average, zero.

[9]This result is first documented in Brenner (1976) who examines the original Fama–McBeth (1973) time series of $\hat{\gamma}_{0t}$.

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Table 1

Portfolio estimators for γ_0, γ_1 and γ_2 based on the 'market index' with generalized least squares estimation [a]

$$R_{it} = \hat{\gamma}_{0t} + \hat{\gamma}_{1t}\hat{\beta}_{it} + \hat{\gamma}_{2t}[(\phi_{it} - \phi_{mt})/\phi_{mt}]$$

Period	$\hat{\gamma}_0 - R_F$	$t(\hat{\gamma}_0 - R_F)$	$\hat{\beta}_0$	$\hat{\gamma}_1 - (R_M - R_F)$	$t(\hat{\gamma}_1 - (R_M - R_F))$	$\hat{\beta}_1$	$\hat{\gamma}_2$	$t(\hat{\gamma}_2)$	$\hat{\beta}_2$
1936–1975	0.00450	2.76	0.45	−0.00092	−1.00	0.75	−0.00052	−2.92	0.01
1936–1955	0.00377	1.66	0.43	−0.00060	−0.80	0.80	−0.00043	−2.12	0.01
1956–1975	0.00531	2.22	0.46	0.00138	0.82	0.73	−0.00062	−2.09	0.01
1936–1945	0.00121	0.30	0.63	−0.00098	−0.77	0.82	−0.00075	−2.32	−0.01
1946–1955	0.00650	2.89	0.03	−0.00021	−0.26	0.75	−0.00015	−0.65	0.06
1956–1965	0.00494	2.02	0.34	−0.00098	−0.56	0.96	−0.00039	−1.27	−0.01
1966–1975	0.00596	1.43	0.49	−0.00232	−0.80	0.69	−0.00080	−1.55	0.01

[a] $\hat{\gamma}_0 - R_F$ = mean difference between return on zero beta portfolio and risk-free rate, $\hat{\gamma}_1 - (R_M - R_F)$ = mean difference between actual risk premium ($\hat{\gamma}_1$) and risk premium stipulated by Sharpe–Lintner model ($R_M - R_F$). $\hat{\gamma}_2$ – size premium. $\hat{\beta}_i$ – actual estimated market risk of $\hat{\gamma}_i$ (theoretical values. $\beta_0 = 0$, $\beta_1 = 1$, $\beta_2 = 0$), all β_0, β_1 are significantly different from the theoretical values. $t(\ )$ = t-statistic.

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The deviations from the theoretical betas are largest for the 'market index', smaller for the CRSP value-weighted index, and smallest for the CRSP equally-weighted index. This is due to two factors: first, even if the true covariance structure is stationary, betas with respect to a value-weighted index change whenever the weights change, since the weighted average of the betas is constrained to be equal to one. Second, the betas and their standard errors with respect to the 'market index' are much larger than for the stock indices (a typical stock beta is between two and three), which leads to larger deviations -- a kind of 'leverage' effect. Thus, the results in table 1 show that the final correction for the deviation of $\hat{\beta}_0$ and $\hat{\beta}_1$ from their theoretical values is of crucial importance for maket proxies with changing weights.

Estimated portfolio betas and portfolio market proportions are (negatively) correlated. It is therefore possible that the errors in beta induce an error in the coefficient of the market proportion. According to Levi (1973), the probability limit of $\hat{\gamma}_1$ in the standard errors-in-the-variables model is

$$\text{plim } \hat{\gamma}_1 = \gamma_1/(1+(\sigma_u^2 \cdot \sigma_2^2)/D) < \gamma_1,$$

with

$$D = (\sigma_1^2 + \sigma_u^2) \cdot \sigma_2^2 - \sigma_{12}^2 > 0,$$

where σ_1^2, σ_2^2 are the variances of the true factors β and ϕ, respectively, σ_u^2 is the variance of the error in beta and σ_{12} is the covariance of β and ϕ. Thus, the bias in $\hat{\gamma}_1$ is unambiguously towards zero for positive γ_1. The probability limit of $\hat{\gamma}_2 - \gamma_2$ is [Levi (1973)]

$$\text{plim } (\hat{\gamma}_2 - \gamma_2) = (\sigma_u^2 \cdot \sigma_{12} \cdot \gamma_1)/D.$$

We find that the bias in $\hat{\gamma}_2$ depends on the covariance between β and ϕ and the sign of γ_1. If σ_{12} has the same sign as the covariance between $\hat{\beta}$ and ϕ, i.e., $\sigma_{12} < 0$, and if $\gamma_1 > 0$, then $\text{plim}(\hat{\gamma}_2 - \gamma_2) < 0$, i.e., $\text{plim}\,\hat{\gamma}_2 < \gamma_2$. If the grouping procedure is not successful in removing the error in beta, then it is likely that the reported $\hat{\gamma}_2$ overstates the true magnitude of the size effect. If this was a serious problem in this study, the results for the different market indices should reflect the problem. In particular, using the equally-weighted stock index should then lead to the smallest size effect since, as was pointed out earlier, the error in beta problem is apparently less serious for that kind of index. In fact, we find that there is little difference between the estimates.[10]

[10]For the overall time period, $\hat{\gamma}_2$ with the equally-weighted CRSP index is -0.00044, with the value weighted CRSP index -0.00044 as well as opposed to the -0.00052 for the 'market index' reported in table 1. The estimated betas of $\hat{\gamma}_0$ and $\hat{\gamma}_1$ which reflect the degree of the error in beta problems are 0.07 and 0.91, respectively, for the equally-weighted CRSP index and 0.13 and 0.87 for the value-weighted CRSP index.

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Thus, it does not appear that the size effect is just a proxy for the unobservable true beta even though the market proportion and the beta of securities are negatively correlated.

The correlation coefficient between the mean market values of the twenty-five portfolios and their betas is significantly negative, which might have introduced a multicollinearity problem. One of its possible consequences is coefficients that are very sensitive to addition or deletion of data. This effect does not appear to occur in this case: the results do not change significantly when five portfolios are dropped from the sample. Revising the grouping procedure — ranking on the basis of beta first, then ranking on the basis of market proportion — also does not lead to substantially different results.

4.2. A closer look at the results

An additional factor relevant for asset pricing — the market value of the equity of a firm — has been found. The results are based on a linear model. Linearity was assumed only for convenience and there is no theoretical reason (since there is no model) why the relationship should be linear. If it is nonlinear, the particular form of the relationship might give us a starting point for the discussion of possible causes of the size effect in the next section. An analysis of the residuals of the twenty-five portfolios is the easiest way to look at the linearity question. For each month t, the estimated residual return

$$\hat{\varepsilon}_{it} = R_{it} - \hat{\gamma}_{0t} - \hat{\gamma}_{1t}\hat{\beta}_{it} - \hat{\gamma}_{2t}[(\phi_{it} - \phi_{mt})/\phi_{mt}], \qquad i = 1, \ldots, 25, \tag{5}$$

is calculated for all portfolios. The mean residuals over the forty-five year sample period are plotted as a function of the mean market proportion in fig. 1. Since the distribution of the market proportions is very skewed, a logarithmic scale is used. The solid line connects the mean residual returns of each size group. The numbers identify the individual portfolios within each group according to beta, '1' being the one with the largest beta, '5' being the one with the smallest beta.

The figure shows clearly that the linear model is misspecified.[11] The residuals are not randomly distributed around zero. The residuals of the portfolios containing the smallest firms are all positive; the remaining ones are close to zero. As a consequence, it is impossible to use $\hat{\gamma}_2$ as a simple size premium in the cross-section. The plot also shows, however, that the misspecification is not responsible for the significance of $\hat{\gamma}_2$ since the linear model underestimates the true size effect present for very small firms. To illustrate this point, the five portfolios containing the smaller firms are

[11] The nonlinearity cannot be eliminated by defining ϕ_i as the log of the market proportion

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deleted from the sample and the parameters reestimated. The results, summarized in table 2, show that the $\hat{\gamma}_2$ remain essentially the same. The relationship is still not linear; the new $\hat{\gamma}_2$ still cannot be used as a size premium.

Fig. 1 suggests that the main effect occurs for very small firms. Further support for this conclusion can be obtained from a simple test. We can regress the returns of the twenty-five portfolios in each result on beta alone and examine the residuals. The regression is misspecified and the residuals contain information about the size effect. Fig. 2 shows the plot of those residuals in the same format as fig. 1. The smallest firms have, on average, very large unexplained mean returns. There is no significant difference between the residuals of the remaining portfolios.

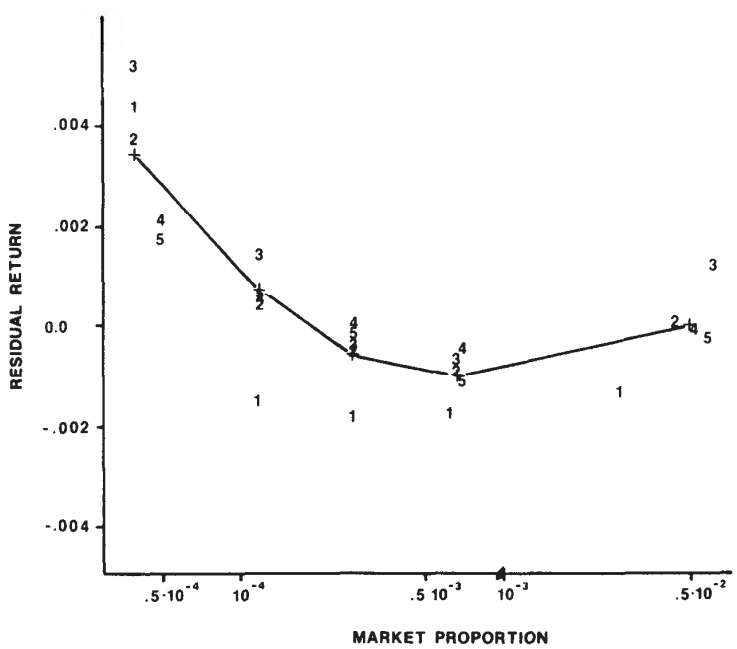

Fig. 1. Mean residual returns of portfolios (1936–1975) with equally-weighted CRSP index as market proxy. The residual is calculated with the three-factor model [eq. (3)]. The numbers 1,...,5 represent the mean residual return for the five portfolios within each size group (1: portfolio with largest beta,...,5: portfolio with smallest beta) + represents the mean of the mean residuals of the five portfolios with similar market values.

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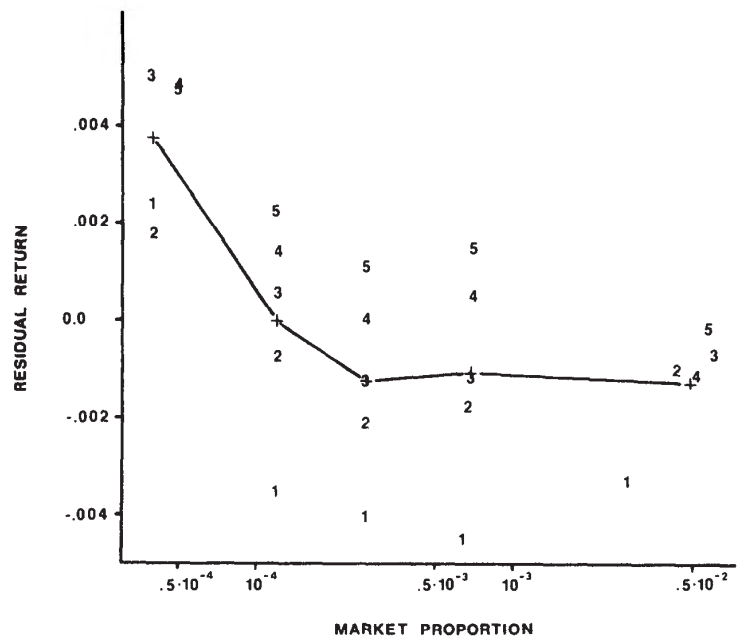

Fig. 2. Mean residual returns of portfolios (1936–1975) with equally-weighted CRSP index as market proxy. The residual is calculated with the two-factor model ($\hat{\varepsilon}_{it} = R_{it} - \hat{\gamma}_{0t} - \hat{\gamma}_{1t}\hat{\beta}_{it}$) The symbols are as defined for fig. 1.

4.3. *'Arbitrage' portfolio returns*

One important empirical question still remains: How important is the size effect from a practical point of view? Fig. 2 suggests that the difference in returns between the smallest firms and the remaining ones is, on average, about 0.4 percent per month. A more dramatic result can be obtained when the securities are chosen solely on the basis of their market value.

As an illustration, consider putting equal dollar amounts into portfolios containing the smallest, largest and median-sized firms at the beginning of a year. These portfolios are to be equally weighted and contain, say, ten, twenty or fifty securities. They are to be held for five years and are rebalanced every month. They are levered or unlevered to have the same beta. We are then interested in the differences in their returns,

$$R_{1t} = R_{st} - R_{lt}, \qquad R_{2t} = R_{st} - R_{at}, \qquad R_{3t} = R_{at} - R_{lt}, \tag{6}$$

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Table 2
Portfolio estimators for γ_2 for all 25 portfolios and for 20 portfolios (portfolios containing smallest firms deleted) based on CRSP equally weighted index with generalized least-squares estimation.[a]

	Size premium $\hat{\gamma}_2$ with	
Period	25 portfolios	20 portfolios
1936–1975	−0.00044 (−2.42)	−0.00043 (−2.54)
1936–1955	−0.00037 (−1.72)	−0.00041 (−1.88)
1956–1975	−0.00056 (−1.91)	−0.00050 (−1.91)
1936–1945	−0.00085 (−2.81)	0.00083 (−2.48)
1946–1955	0.00003 (0.12)	−0.00003 (−0.13)
1956–1965	−0.00023) (−0.81)	−0.00017 (−0.65)
1966–1975	−0.00091 (−1.78)	−0.00085 (−1.84)

[a]t-statistic in parentheses

where R_{st}, R_{at} and R_{lt} are the returns on the portfolios containing the smallest, median-sized and largest firms at portfolio formation time (and $R_{1t} = R_{2t} + R_{3t}$). The procedure involves (a) the calculation of the three differences in raw returns in each month and (b) running time series regressions of the differences on the excess returns of the market proxy. The intercept terms of these regressions are then interpreted as the $\bar{R}_i$, $i=1,\ldots,3$. Thus, the differences can be interpreted as 'arbitrage' returns, since, e.g., R_{1t} is the return obtained from holding the smallest firms long and the largest firms short, representing zero net investment in a zero-beta portfolio.[12] Simple equally weighted portfolios are used rather than more sophisticated minimum variance portfolios to demonstrate that the size effect is not due to some quirk in the covariance matrix.

Table 3 shows that the results of the earlier tests are fully confirmed. $\bar{R}_2$, the difference in returns between very small firms and median-size firms, is typically considerably larger than $\bar{R}_3$, the difference in returns between median-sized and very large firms. The average excess return from holding very small firms long and very large firms short is, on average, 1.52 percent

[12]No *ex post* sample bias is introduced, since monthly rebalancing includes stocks delisted during the five years. Thus, the portfolio size is generally accurate only for the first month of each period

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Table 3
Mean monthly returns on 'arbitrage' portfolios.[a]
$R_j - R_k = \hat{\alpha}_i + \hat{\beta}_i(R_m - R_F)$

	$\tilde{\alpha}_1$[b]			$\tilde{\alpha}_2$[c]			$\tilde{\alpha}_3$[d]		
	$n=10$	$n=20$	$n=50$	$n=10$	$n=20$	$n=50$	$n=10$	$n=20$	$n=50$
Overall period									
1931–1975	0.0152	0.0148	0.0101	0.0130	0.0124	0.0089	0.0021	0.0024	0.0012
	(2.99)	(3.53)	(3.07)	(2.90)	(3.56)	(3.64)	(1.06)	(1.41)	(0.85)
Five-year subperiods									
1931–1935	0.0589	0.0597	0.0427	0.0462	0.0462	0.0326	0.0127	0.0134	0.0101
	(2.25)	(2.81)	(2.35)	(1.92)	(2.55)	(2.46)	(1.09)	(1.49)	(1.42)
1936–1940	0.0201	0.0182	0.0089	0.0118	0.0145	0.0064	0.0084	0.0037	0.0025
	(0.82)	(0.97)	(0.67)	(0.55)	(0.90)	(0.65)	(1.20)	(0.62)	(0.49)
1941–1945	0.0430	0.0408	0.0269	0.0381	0.0367	0.0228	0.0049	0.0038	0.0041
	(2.29)	(2.46)	(2.17)	(2.29)	(2.54)	(2.02)	(1.25)	(1.09)	(1.68)
1946–1950	−0.0060	−0.0046	−0.0036	−0.0058	−0.0059	−0.0029	−0.0002	−0.0104	−0.0007
	(−1.17)	(−0.97)	(−0.97)	(−1.03)	(−1.29)	(−0.83)	(−0.07)	(−0.50)	(−0.38)
1951–1955	−0.0067	−0.0011	0.0013	−0.0004	0.0026	0.0010	−0.0062	−0.0037	0.0003
	(−0.89)	(−0.21)	(0.32)	(−0.07)	(0.72)	(0.39)	(−1.29)	(−0.99)	(0.11)
1956–1960	0.0039	0.0008	0.0037	0.0007	−0.0027	0.0011	0.0031	0.0035	0.0026
	(0.67)	(0.15)	(0.89)	(0.14)	(−0.64)	(0.45)	(0.88)	(1.16)	(0.97)
1961–1965	0.0131	0.0060	0.0024	0.0096	0.0046	0.0036	0.0035	0.0014	−0.0012
	(1.38)	(0.67)	(0.31)	(1.11)	(0.72)	(0.77)	(0.59)	(0.24)	(−0.24)
1966–1970	0.0121	0.0117	0.0077	0.0129	0.0110	0.0071	0.0008	0.0007	0.0006
	(1.64)	(2.26)	(1.91)	(1.93)	(2.71)	(2.43)	(0.23)	(0.22)	(0.27)
1971–1975	0.0063	0.0108	0.0098	0.0033	0.0077	0.0083	0.0030	0.0031	0.0015
	(0.60)	(1.23)	(1.45)	(0.39)	(1.18)	(1.79)	(0.64)	(0.72)	(0.43)

[a]Equally-weighted portfolios with n securities, adjusted for differences in market risk with respect to CRSP value-weighted index, t-statistics in parentheses.
[b]Small firms held long, large firms held short.
[c]Small firms held long, median-size firms held short.
[d]Median-size firms held long, large firms held short.

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per month or 19.8 percent on an annualized basis. This strategy, which suggests very large 'profit opportunities', leaves the investor with a poorly diversified portfolio. A portfolio of small firms has typically much larger residual risk with respect to a value-weighted index than a portfolio of very large firms with the same number of securities [Banz (1978, ch. 3)]. Since the fifty largest firms make up more than 25 percent of the total market value of NYSE stocks, it is not surprising that a larger part of the variation of the return of a portfolio of those large firms can be explained by its relation with the value-weighted market index. Table 3 also shows that the strategy would not have been successful in every five year subperiod. Nevertheless, the magnitude of the size effect during the past forty-five years is such that it is of more than just academic interest.

5. Conclusions

The evidence presented in this study suggests that the CAPM is misspecified. On average, small NYSE firms have had significantly larger risk adjusted returns than large NYSE firms over a forty year period. This size effect is not linear in the market proportion (or the log of the market proportion) but is most pronounced for the smallest firms in the sample. The effect is also not very stable through time. An analysis of the ten year subperiods show substantial differences in the magnitude of the coefficient of the size factor (table 1).

There is no theoretical foundation for such an effect. We do not even know whether the factor is size itself or whether size is just a proxy for one or more true but unknown factors correlated with size. It is possible, however, to offer some conjectures and even discuss some factors for which size is suspected to proxy. Recent work by Reinganum (1980) has eliminated one obvious candidate: the price–earnings (P/E) ratio.[13] He finds that the P/E-effect, as reported by Basu (1977), disappears for both NYSE and AMEX stocks when he controls for size but that there is a significant size effect even when he controls for the P/E-ratio, i.e., the P/E-ratio effect is a proxy for the size effect and not vice versa. Stattman (1980), who found a significant negative relationship between the ratio of book value and market value of equity and its return, also reports that this relationship is just a proxy for the size effect. Naturally, a large number of possible factors remain to be tested.[14] But the Reinganum results point out a potential problem with some of the existing negative evidence of the efficient market hypothesis. Basu believed to have identified a market inefficiency but his P/E-effect is

[13]The average correlation coefficient between P/E-ratio and market value is only 0.16 for individual stocks for thirty-eight quarters ending in 1978. But for the portfolios formed on the basis of P/E-ratio, it rises to 0.82. Recall that Basu (1977) used ten portfolios in his study.

[14]E.g., debt–equity ratios, skewness of the return distribution [Kraus and Litzenberger (1976)].

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just a proxy for the size effect. Given its longevity, it is not likely that it is due to a market inefficiency but it is rather evidence of a pricing model misspecification. To the extent that tests of market efficiency use data of firms of different sizes and are based on the CAPM, their results might be at least contaminated by the size effect.

One possible explanation involving the size of the firm directly is based on a model by Klein and Bawa (1977). They find that if insufficient information is available about a subset of securities, investors will not hold these securities because of estimation risk, i.e., uncertainty about the true parameters of the return distribution. If investors differ in the amount of information available, they will limit their diversification to different subsets of all securities in the market.[15] It is likely that the amount of information generated is related to the size of the firm. Therefore, many investors would not desire to hold the common stock of very small firms. I have shown elsewhere [Banz (1978, ch. 2)] that securities sought by only a subset of the investors have higher risk-adjusted returns than those considered by all investors. Thus, lack of information about small firms leads to limited diversification and therefore to higher returns for the 'undesirable' stocks of small firms.[16] While this informal model is consistent with the empirical results, it is, nevertheless, just conjecture.

To summarize, the size effect exists but it is not at all clear why it exists. Until we find an answer, it should be interpreted with caution. It might be tempting to use the size effect, e.g., as the basis for a theory of mergers — large firms are able to pay a premium for the stock of small firms since they will be able to discount the same cash flows at a smaller discount rate. Naturally, this might turn out to be complete nonsense if size were to be shown to be just a proxy.

The preceding discussion suggests that the results of this study leave many questions unanswered. Further research should consider the relationship between size and other factors such as the dividend yield effect, and the tests should be expanded to include OTC stocks as well.

[15]Klein and Bawa (1977, p 102)

[16]A similar result can be obtained with the introduction of fixed holding costs which lead to limited diversification as well. See Brennan (1975), Banz (1978, ch. 2) and Mayshar (1979)

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Busting the Myth About Size

by Vitali Kalesnik, Ph.D., and Noah Beck

Many market participants (including investors, product providers, and analysts alike) assume that, just as value stocks on average outperform growth, small-cap stocks on average outperform large-caps. Unlike value, however, and contrary to popular opinion, there is little solid evidence that stock size affects performance.

A recent Research Affiliates article by Hsu and Kalesnik (2014) concluded that there are at best three factors from which investors can benefit through passive investing: market, value, and low beta. The size premium was conspicuously missing from that short list. In this article we explore empirical evidence behind the size premium in more detail. The summary below offers a preview of our findings. We let the reader examine the evidence and draw his or her own conclusion. In our opinion the preponderance of evidence does not support the existence of a size premium.

We are not arguing that investors should stop investing in small stocks. A portfolio of small stocks offers a certain level of diversification in an investment program dominated by large-stock strategies. Moreover, major anomalies are stronger in the universe of small stocks (likely because small stocks are more prone to mispricing). Thus, small stocks have the potential to serve as an alpha pool for skilled active managers and rules-based strategies that primarily target factors other than size. Nonetheless, we are skeptical that investors will earn a higher return simply by preferring small stocks over large.

Updating the Evidence

Banz (1981) reported that small-cap stocks outperformed large-cap stocks. For the subsequent decade the phenomenon Banz observed was considered a curious anomaly. The situation changed in 1993, when Eugene Fama and Kenneth French suggested that small stocks may expose investors to some undiversifiable risk that warrants a higher required rate of return. At that moment, the size factor took its place alongside the market and value factors in the original Fama–French three-factor model. Carhart (1997) then made the case for momentum as a fourth return factor. Today the most standard equity pricing model used in academia includes four factors: market, value, size, and momentum.

But consider this: What if a large company were split, on paper only, into two small companies? Suppose there is no change in operations, and imagine that one of the small companies booked all the cash flows on even-numbered days of the month, and the other one accounted for all the cash on odd days. In this scenario, it would be most surprising if the small companies both delivered higher returns than the original large company. Yet the size premium is precisely based on the expectation that small-cap stocks will outperform large-cap stocks!

Summary of Findings on the Size Premium

Arguments in Favor:

1. Over the period July 1926 to July 2014, there was a size premium of 3.4% per annum in the United States.
2. The U.S. size premium is statistically significant (with a p-value of 1.7%), *assuming the returns are normally distributed.*
3. In the 30+ years since the publication of Banz's (1981) article , there has been an average size premium of 1.0% per annum across 18 developed markets including the United States.

Arguments Against:

1. There is an upward bias in size premium estimates due to inaccurate returns on delisted stocks in major databases.
2. Indices and hypothetical portfolios ignore trading costs.
3. The statistical significance of the size premium estimates is likely overstated due to data-mining and reporting bias.
4. Even with the biases that favor small stocks, there is no unquestionably significant evidence in support of the size factor.
   - The estimate of the U.S. size premium is dominated by extreme outliers from the 1930s.
   - The assumption of normality used to obtain statistical significance in the U.S. sample is extremely dubious.
   - There is no statistical significance outside the United States.
5. Even with the biases that favor small stocks, there is no risk-adjusted performance advantage attributable to the size factor.

Source: Research Affiliates.

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For any reasonable economic theory explaining why small-cap stocks are supposed to outperform large-cap stocks, there is an equally plausible theory explaining why the reverse should be true. The source of the specific risk postulated by Fama and French (1993) was unclear 21 years ago, and it is still murky today. Theoretical explanations for the size premium were provided after researchers observed the anomalous regularity in returns—not the other way around. Today investors believe in the size premium on the basis of empirical evidence, not on theoretical arguments. So let's turn to the evidence with updated data.

Following the methodology employed in Fama and French (2012), we grouped stocks in each country by size into two portfolios. The large stock portfolio consists of the top 90% of the market by market capitalization, and the small stock portfolio consists of the bottom 10% of the market. Stocks within the large and small portfolios are weighted by market capitalization. To measure the premium we looked at the arithmetic difference between the small and large stock portfolio returns. We report in **Table 1** the average annualized returns, volatilities, and *t*-statistics in 18 major developed countries from January 1982 to July 2014. Table 1 also displays data for the United States over the longer period from July 1926 to July 2014.

In the 88-year U.S. sample, the size premium is 3.4% per annum. Assuming a normal distribution of premium estimates (we will discuss later why this assumption may not be warranted), the size premium is statistically significant with a *t*-stat of 2.38, which corresponds to a *p*-value of 1.7%. After 1981, when Banz's paper appeared, the premium is positive in the United States and positive on average in the international sample, but it is not statistically significant anywhere. The substantial, statistically significant average return observed in the long-term U.S. dataset is the main reason why size is popularly believed to be one of the most important factors.

Examining the U.S. Data

Existence of the size premium in the United States is practically an article of faith in the practice of asset management as well as the academic literature. The empirical evidence, however, does not stand up very well to closer scrutiny. The data are doubtful for several reasons, including overestimated small-cap returns due to missing data on delisted stocks; the absence of transaction costs in the calculation of index returns; biases resulting from data-mining and the publishing process; and misestimated statistical measures based on the assumption of normality. In addition, there proves to be no return advantage on a risk-adjusted basis.

Table 1. Size Premium: U.S. and International Evidence

Nation	Average Return (Ann.)	Average Volatility (Ann.)	*t*-stat
Post Publication Period, 1982–2014			
Australia	−1.1%	10.2%	−0.64
Austria	2.0%	13.7%	0.85
Belgium	3.0%	10.7%	1.59
Canada	0.7%	9.2%	0.43
Denmark	−0.2%	13.0%	−0.09
France	2.9%	9.9%	1.67
Germany	−0.5%	10.5%	−0.27
Hong kong	−0.8%	16.5%	−0.26
Ireland	4.9%	18.3%	1.53
Italy	−0.8%	11.0%	−0.39
Japan	3.3%	13.9%	1.36
Netherlands	1.7%	10.8%	0.88
Norway	−0.2%	15.0%	−0.07
Singapore	2.3%	15.6%	0.83
Sweden	0.7%	12.6%	0.34
Switzerland	−2.2%	10.7%	−1.18
United Kingdom	0.8%	9.4%	0.48
United States	1.9%	9.4%	1.15
Equally Weighted Avg. of 18 Countries	1.0%	5.5%	1.05
Full Sample, United States, 1926–2014			
United States	3.4%	13.5%	2.38

Note: Within each country we split stocks into large and small portfolios. Following Fama and French (2012), the portfolio of large stocks comprises 90% of the national market and the small-stock portfolio comprises 10%. Portfolios are capitalization-weighted. The size premium is estimated as the arithmetic average of the differences in return between the small and the large portfolios

Source: Research Affiliates, using CRSP/Compustat and Worldscope/Datastream data.

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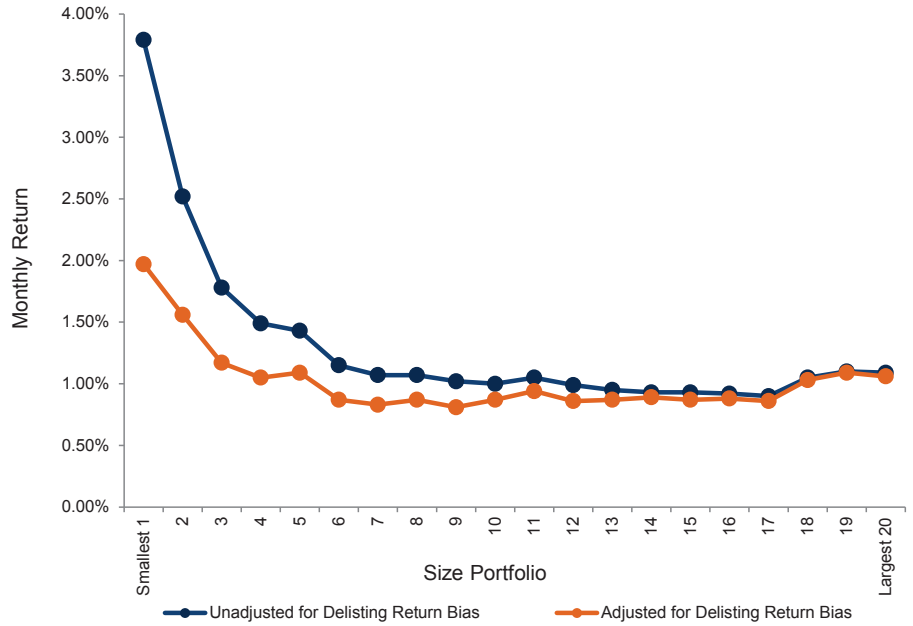
Delisting bias. Shareholders do not necessarily lose the full amount of their investment in a company when it is delisted from a major stock exchange. Often the stock can still be traded in the over-the-counter (OTC) market, and the investor may receive some residual value if the company is liquidated. Nonetheless, returns on stocks after they have been delisted are likely to be very negative. Moreover, all companies are subject to business and financial risks that might result in their stock's falling short of listing requirements, but small stocks by market capitalization are appreciably more likely to be removed from an exchange. Shumway (1997) pointed out that regular performance databases overestimated small-cap stock returns because they did not include returns on delisted stocks. If a database that is used in simulating portfolios omits the strongly negative returns of delisted stocks, the hypothetical results will be better than what actual portfolios can achieve in practice.

To estimate the impact of the delisting bias on the size premium, Shumway and Warther (1999) looked at the smallest and the most distressed stocks for which they could obtain reliable data, namely, stocks listed on the NASDAQ exchange. We represent their findings in **Figure 1**. The chart shows the average monthly returns for 20 groups of stocks sorted by size before and after correcting for the upward bias in the database. Clearly, the smallest stocks are significantly more affected by the delisting bias. After adjusting for the delisting bias, the statistical significance of the size premium completely disappears. It is unreasonable to suppose that the effect Shumway and Warther quantified for NASDAQ stocks is missing from other exchanges.

Transaction costs. Theoretical simulations ignore an important component of investment performance measurement: trading expenses—the actual costs of buying or selling investments. Small stocks by definition have much lower trading capacity and, correspondingly, much higher transaction costs. Soon after the first articles documenting the size effect appeared, researchers asked how much of the premium remains when trading costs are taken into account. Stoll and Whaley (1983) showed that transaction costs accounted for a significant part of the size premium for stocks listed on the New York Stock Exchange and the American Stock Exchange.

Data-mining and reporting bias. There are literally hundreds of known factors in the existing literature, and many papers documenting new factors are published every year. In our opinion the vast majority of these factors are spurious products of data-mining. We are not alone in taking a skeptical position. Lo and MacKinlay (1990), Black (1993), and MacKinlay (1995), among others, have argued that many factors, notably including size, are likely to be a result of data-mining.

Figure 1. Average Stock Returns by Size Group



Source: Research Affiliates, using data from Shumway and Warther (1999).

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And, in finance no less than the physical and biological sciences, striking results—especially new discoveries—tend to win the competition for space in academic journals.

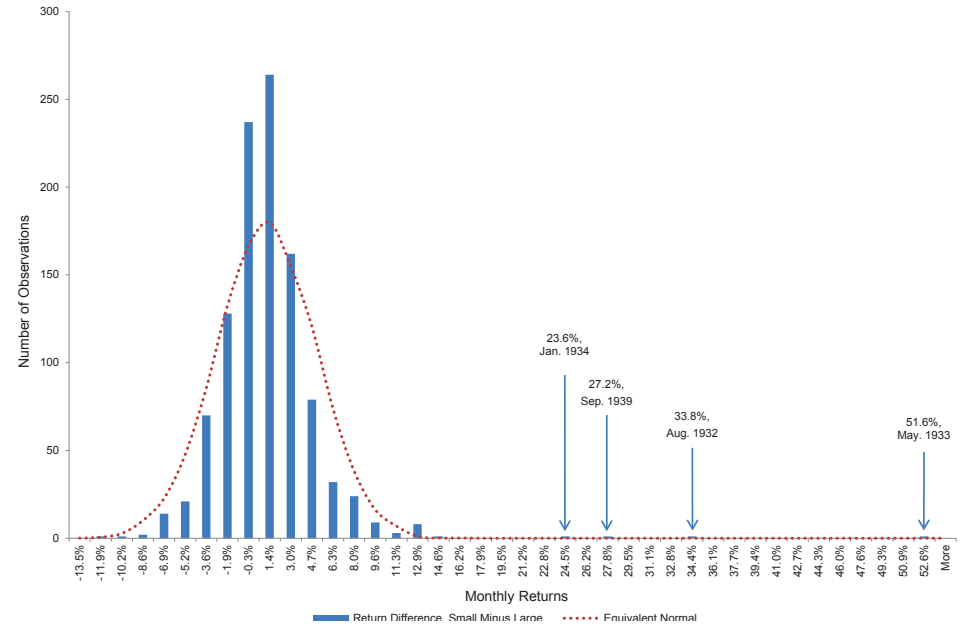
The standard procedure for determining whether a factor is statistically significant is to see if its *t*-stat crosses a certain threshold. Normally the threshold is set at 1.96 for a 5% confidence level. With a *t*-stat of 2.38, the U.S. size premium passes this test for the 1926–2014 sample. But Harvey, Liu, and Zhu (2014) rightly observed that if many researchers are looking for statistical irregularities, then the 1.96 criterion is too low; it allows many inherently random outliers to be misidentified as valid factors. They argue that the threshold for the size factor should have been closer to a *t*-stat of 2.50 in 1993.[1] Size does not pass this test.

Non-normality of returns. Standard statistical testing assumes that the estimate of a variable—in this case, the average of the size premium—quickly converges to a normal distribution.[2] If, however, the underlying data include large outliers, then the assumption of normality is unfounded. The differences between the small and large stock portfolio returns exhibit just such outliers. **Figure 2** is a histogram of the return differences. For comparison, we display on the same chart a normal distribution with the same mean and standard deviation.

We indicate on the chart four extreme outliers of 6 sigma or higher. "Sigma" may be an unfamiliar statistical term, so let us put these outlier returns in perspective. The 23.6% premium registered in January 1934 is a 6-sigma event. If it were drawn from normal distribution, this would be a one-in-67-million-year event, like the one that wiped out the dinosaurs. The 27.2% difference in returns in September 1939 is a 6.9-sigma event; in a normal distribution, it would have about a one-in-five chance of occurring in the 4.5 billion years since the planet earth came into existence. The 33.8% premium in August 1932 is an 8.6-sigma event, and the 51.6% premium in May 1933 is a 13.1-sigma event. If these last two outliers were drawn from a normal distribution, each would have much less than a one-in-a-hundred chance of occurring in the entire 13.8 billion years the universe has existed.

To add to the problem, all four outliers occurred in the 1930s. If they were removed, the estimated size premium in Table 1 would drop from 3.4% to 1.9% and lose statistical significance. (There is a similar outcome in the post-war period: The estimated size premium is about 1.9% premium with a *t*-stat of 1.52.) We do not argue, however, that truncating or otherwise transforming the sample will give us a better estimate. What happened in the 1930s is very valuable information about the economy and the stock market. The average return from the full sample, including the

Figure 2. Distribution of Return Differences



Source: Research Affiliates, using data from Shumway and Warther (1999).

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unadjusted outliers, is the best estimate available as long as the statistical bounds around it are borne in mind. If the size premium is predicated on exceedingly rare events, then we'll have to wait many lifetimes to determine with confidence whether or not it exists.

No risk-adjusted benefit. Academics are interested in the arithmetic average returns in a simulated long/short portfolio, but practitioners are concerned with the actual risk-adjusted returns that they can generate from their investments—and the majority do not engage in short-selling. We display in **Table 2** the average geometrically chained cumulative returns of the long-only portfolios of small and large stocks. These results are produced using the same databases we used earlier in this article, so they contain the same biases that we noted above.

Small stocks outperform large stocks in this sample, but, because small stocks are generally more volatile, the Sharpe ratios reveal that small-cap investing provides a miniscule advantage in the risk-adjusted return. If investors are switching from large stocks to small in the hope of a premium, they should realize that they are increasing the volatility, too. The estimates of average returns are very noisy, and are likely overstated due to the biases we described earlier; the estimates of volatility on the other hand are real. (Estimates of the mean are always less certain than estimates of standard deviation.) We suggest that investors seeking higher returns consider boosting their overall equity allocation rather than chasing the illusory size premium in an attempt to add risk on the cheap within the existing allocation. A large-cap stock portfolio would have higher returns than a mix of small-cap stocks and risk-free assets designed to have the same volatility. In other words, the added risk of small-cap stocks is essentially uncompensated. Note that even in the only data set with a statistically significant size premium (i.e., the U.S. full sample from 1926–2014), the Sharpe ratio is actually lower for small stocks.

Concluding Remarks

We placed our inquiry in a historical context, starting with Banz's (1981) paper, because the widespread belief in a size premium is largely a result of its early discovery. Market capitalization data were readily available to early researchers writing doctoral dissertations and journal articles, and, as we have seen, the performance

Table 2. Average Returns on Long-Only Portfolios

Nation	Small Stocks			Large Stocks			Difference		
	Average Return	Average Volatility	Sharpe Ratio	Average Return	Average Volatility	Sharpe Ratio	Average Return	Average Volatility	Sharpe Ratio
Post Publication Period, 1982–2014									
Australia	10.8%	24.9%	0.26	12.4%	23.4%	0.35	−1.6%	1.5%	−0.08
Austria	13.3%	21.5%	0.42	10.2%	24.4%	0.24	3.1%	−2.9%	0.18
Belgium	15.8%	18.7%	0.62	12.6%	20.3%	0.41	3.2%	−1.6%	0.21
Canada	11.2%	21.4%	0.33	11.1%	18.7%	0.37	0.1%	2.7%	−0.04
Denmark	12.1%	20.1%	0.39	12.6%	19.4%	0.43	−0.4%	0.7%	−0.04
France	15.7%	20.5%	0.56	12.5%	21.0%	0.39	3.2%	−0.5%	0.17
Germany	11.0%	18.4%	0.36	11.0%	21.4%	0.31	0.0%	−3.0%	0.05
Hong kong	10.6%	31.9%	0.20	12.5%	29.2%	0.28	−1.9%	2.7%	−0.08
Ireland	18.3%	23.6%	0.60	12.6%	23.8%	0.35	5.7%	−0.2%	0.24
Italy	8.1%	23.6%	0.16	8.7%	24.9%	0.18	−0.6%	−1.3%	−0.02
Japan	9.3%	23.8%	0.21	6.4%	21.8%	0.10	2.9%	2.0%	0.11
Netherlands	14.7%	20.0%	0.52	13.1%	19.0%	0.46	1.6%	1.0%	0.06
Norway	13.6%	24.9%	0.38	13.3%	25.9%	0.35	0.2%	−1.0%	0.02
Singapore	10.1%	31.7%	0.19	9.6%	24.3%	0.22	0.5%	7.3%	−0.03
Sweden	14.8%	24.7%	0.42	13.8%	24.9%	0.39	0.9%	−0.2%	0.04
Switzerland	11.0%	17.9%	0.38	13.5%	17.3%	0.53	−2.5%	0.6%	−0.16
United Kingdom	11.8%	19.8%	0.38	11.5%	17.7%	0.41	0.3%	2.1%	−0.03
United States	13.3%	19.1%	0.48	12.0%	15.2%	0.51	1.3%	3.9%	−0.04
Arithmetic average:	12.5%	22.6%	0.38	11.6%	21.8%	0.35	0.9%	0.8%	0.03
Full Sample, United States, 1926–2014									
United States	11.8%	27.2%	0.31	9.8%	18.4%	0.34	2.1%	8.7%	−0.03

Note: Within each country we split stocks into capitalization-weighted large and small portfolios. Following Fama and French (2012), the large stock portfolio comprises 90% of the national market, and the small stock portfolio, 10%. The returns shown are the geometric average returns of the small and large stock portfolios. The difference columns represent the simple differences of the geometric average return, volatility, and Sharpe ratios.

Source: Research Affiliates, using CRSP/Compustat and Worldscope/Datastream data.

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of small stocks was exceptional in the 1930s. Eugene Fama was one of Rolf Banz's professors at the University of Chicago; in fact, as a member of Banz's dissertation committee, he was intimately familiar with Banz's research on the small-cap anomaly.[3] Fama and Kenneth French included the size premium in their influential three-factor model, an analytical advance that opened the gate for empirical research into studying factors previously unexplained by then-existing theories. Riding on the popularity of the Fama–French theory, the size premium was soon entrenched in the pantheon of risk factors.

Berk (1997) argued that the size premium observed in the data is nothing more than a poor way of value investing. Value investing relies on buying cheaply priced companies as measured by a ratio of price to company fundamentals. Investing based on size, measured by company market capitalization, would use only the price side of the valuation measure. Because it would therefore use only a fraction of the relevant information, the strategy is significantly weaker than a value strategy that uses prices as they relate to company fundamentals. In our view, Berk's argument is, to date, the strongest explanation why the size premium is observed.

However, we go one step further. If Berk questioned the size premium as a separate factor, we question the size premium as a phenomenon. Today, more than 30 years after the initial publication of Banz's paper, the empirical evidence is extremely weak even before adjusting for possible biases. The return premium is not statistically significant in any of the international markets, whether taken alone or in combination. The U.S. long-term size premium is driven by the extreme outliers, which occurred three-quarters of a century ago. These extreme outliers confound the standard techniques of setting confidence bounds around the estimated premium. Finally, adjusting for biases, most notably the delisting bias, makes the size premium vanish. If the size premium were discovered today, rather than in the 1980s, it would be challenging to even publish a paper documenting that small stocks outperform large ones. All this evidence makes us question the existence of the size premium as such.

We are not arguing that investors should completely abandon small stocks. Small stocks are more volatile than large stocks, and they receive considerably less attention from sell-side analysts. Consequently, small stocks are more likely to be mispriced. The major anomalies are, in fact, stronger in the small-cap sector. Small stocks are more attractive as an alpha pool to be fished by skillful active managers and exploited by rules-based value and momentum strategies.

Endnotes

1. The authors argue further that "a newly discovered factor today should have a *t*-ratio that exceeds 3.0." Page 35.
2. This result relies on the central limit theorem, which says that, as the number of random observations increases, the arithmetic average converges to a normal distribution. If the observations include extreme outliers, the convergence can be either extremely slow or may not occur at all.
3. Fox (2009), page 204.

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Vitali Kalesnik is responsible for quantitative research using advanced econometric tools in asset pricing and active asset allocation. This research is used to enhance Research Affiliates' products—in particular, RAFI® Fundamental Index strategies and global tactical asset allocation products. In addition, Vitali is an adjunct professor in business and economics at Chapman University, Orange, California.

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Survey: Market Risk Premium and Risk-Free Rate used for 54 countries in 2025

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ABSTRACT

This paper contains the statistics of a survey about the Risk-Free Rate (**R_F**) and the Market Risk Premium (**MRP**) used in 2025 for **54 countries**. We got answers for 103 countries, but we only report the results for 54 countries with more than 6 answers.

The paper also contains the links to previous years surveys, from 2008 to 2024.

1. Market Risk Premium (MRP), Risk Free Rate (R_F) and Km [R_F + MRP] used in 2025 in 54 countries
2. Changes from 2015 to 2018, 2019, 2020, 2021, 2022 and 2023
3. Previous surveys
4. Expected and Required Equity Premium: different concepts
5. Conclusion
   Exhibit 1. Mail sent in April 2025.
   Exhibit 2. Some webs recommended by respondents.

JEL Classification: G12, G31, M21

Keywords: equity premium; required equity premium; expected equity premium; risk-free rate

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1. Market Risk Premium (MRP), Risk Free Rate (RF) and Km [RF + MRP] used in 2025 in 54 countries

We sent a short email (see exhibit 1) in April, 2025 to more than 14,000 email addresses of finance and economics professors, analysts and managers of companies obtained from previous correspondence, papers and webs of companies and universities. We asked about the Risk-Free Rate (**RF**) and the Market Risk Premium (**MRP**) **used *"to calculate the required return to equity in different countries"***.

By May 14, 2025, we had received 1,547 emails. 152 persons answered that they do not use MRP (see table 1), most of them use Km (required return to equity) but do not use MRP nor RF. The remaining emails had specific Risk-Free Rates and MRPs used in 2025 for one or more countries.[1] We would like to sincerely thank everyone who took the time to answer us.

Table 1. MRP and RF used in 2025: 1,547 emails

	Total
Answers reported (MRP figures)	**2,749**
Answers for countries with less than 6 answera	**167**
Outliers	**37**
"I can't provide you those figures: now are confidential"	**82**
Only MRP or RF (not both)	**45**
"We do not use MRP"	**152**

Table 2 contains the statistics of the **MRP** used in 2025 **for 54 countries**. We got answers for 103 countries, but we only report the results for 54 countries with more than 6 answers.

Table 3 contains the statistics of the Risk-Free Rate (**RF**) used in 2025 in the 54 countries[2] and **Table 4** contains the average of **Km** (required return to equity: Km = Risk-Free Rate + MRP).

Figure 1 is a graphic representation of the answers (MRP and RF) we got for USA.

Figure 1. Answers for USA. RF and MRP used in 2025

[1] We considered 37 of them as outliers because they provided a very small MRP (below 2%)

[2] Fernandez, P. (2020), "'Normalized' Risk-Free Rate: Fiction or Science Fiction?" Available at: https://ssrn.com/abstract=3708863

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Table 2. Market Risk Premium (MRP) used for 54 countries in 2025

MRP	Number of Answers	Average	Median	MAX	min
USA	1079	5.5%	5.0%	15.0%	2.0%
Spain 2025	396	5.9%	6.0%	15.0%	2.0%
Argentina	11	16.4%	19.2%	22.0%	7.5%
Australia	27	6.3%	6.0%	10.0%	2.0%
Austria	31	5.7%	5.5%	9.0%	4.3%
Belgium	36	5.7%	5.2%	9.0%	4.3%
Bolivia	7	17.0%	17.9%	21.0%	13.0%
Brazil	44	7.9%	7.6%	21.0%	3.0%
Canada	57	5.6%	5.5%	8.0%	2.0%
Chile	14	6.6%	5.9%	15.0%	2.2%
China	19	5.6%	6.0%	8.0%	2.3%
Colombia	13	9.4%	8.9%	15.0%	5.5%
Czech Republic	16	6.3%	6.4%	8.0%	4.5%
Denmark	17	5.1%	5.4%	6.2%	3.2%
Dominican Rep.	6	10.2%	9.9%	12.7%	9.1%
Ecuador	13	13.9%	13.9%	17.7%	10.0%
Egypt	9	14.5%	14.5%	18.0%	11.0%
Finland	12	5.7%	5.4%	9.0%	4.3%
France	68	5.1%	5.1%	8.0%	2.1%
Germany	206	5.4%	5.2%	9.0%	2.0%
Greece	23	7.4%	7.5%	9.3%	5.5%
India	15	7.1%	7.0%	15.0%	3.5%
Ireland	19	4.7%	4.8%	7.7%	2.0%
Israel	17	5.8%	6.0%	8.0%	4.3%
Italy	71	6.0%	6.0%	8.0%	3.5%
Japan	36	5.1%	5.7%	6.2%	2.8%
Kenya	7	10.7%	11.0%	14.3%	6.9%
Korea, (South)	9	5.6%	5.5%	7.0%	4.0%
Lithuania	17	5.8%	5.5%	9.0%	4.3%
Luxembourg	29	4.7%	4.6%	7.7%	2.0%
Malaysia	7	6.4%	6.2%	8.0%	5.0%
Mexico	34	6.8%	6.7%	15.0%	2.2%
Netherlands	23	5.3%	5.0%	6.7%	4.3%
New Zealand	7	6.2%	6.2%	7.5%	4.3%
Nigeria	6	12.1%	12.5%	15.0%	7.0%
Norway	16	5.2%	5.0%	7.0%	4.3%
Pakistan	6	13.2%	14.5%	16.4%	6.0%
Peru	18	5.5%	6.2%	7.0%	2.0%
Phillipines	9	7.2%	7.0%	9.0%	6.0%
Poland	27	5.5%	5.5%	5.9%	5.0%
Portugal	28	5.6%	6.0%	7.0%	3.0%
Romania	15	7.1%	7.0%	11.0%	5.0%
Russia	17	12.0%	12.3%	16.0%	8.4%
Saudi Arabia	15	8.7%	9.0%	12.0%	5.1%
Singapore	9	4.8%	4.7%	6.0%	4.3%
South Africa	18	7.4%	7.3%	9.4%	6.0%
Sweden	28	5.6%	5.0%	8.0%	4.3%
Switzerland	34	4.2%	4.4%	5.0%	3.0%
Taiwan	14	5.9%	5.1%	8.0%	4.6%
Thailand	6	6.5%	6.5%	8.0%	5.0%
United Kingdom	68	5.4%	5.1%	12.0%	2.0%
Uruguay	8	7.7%	7.6%	9.0%	6.5%
Venezuela	6	28.0%	28.0%	32.0%	23.0%
Vietnam	6	8.2%	7.9%	11.0%	6.5%

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Table 3. Risk Free Rate (RF) used for 54 countries in 2025

RF	Number of Answers	Average	Median	MAX	min
USA	1079	4.1%	4.3%	7.0%	0.7%
Spain 2025	396	3.3%	3.2%	7.0%	1.5%
Argentina	11	8.9%	9.5%	12.0%	4.2%
Australia	27	4.2%	4.4%	5.0%	2.2%
Austria	31	3.4%	3.0%	5.0%	2.8%
Belgium	36	3.4%	3.1%	5.0%	2.5%
Bolivia	7	16.0%	16.0%	18.0%	14.0%
Brazil	44	10.9%	12.0%	15.0%	3.5%
Canada	57	3.3%	3.5%	4.0%	2.0%
Chile	14	5.2%	5.4%	6.8%	2.6%
China	19	2.3%	2.0%	4.1%	1.6%
Colombia	13	6.3%	4.4%	11.6%	1.7%
Czech Republic	16	4.6%	4.4%	6.0%	4.0%
Denmark	17	2.4%	2.3%	3.5%	2.0%
Dominican Rep.	6	6.1%	6.9%	7.0%	4.4%
Ecuador	13	7.6%	8.0%	10.2%	4.0%
Egypt	9	24.6%	25.0%	28.2%	20.0%
Finland	12	3.3%	3.0%	5.0%	2.5%
France	68	3.3%	3.2%	5.0%	2.5%
Germany	206	2.7%	2.6%	5.0%	1.0%
Greece	23	3.5%	3.5%	4.0%	3.3%
India	15	6.8%	6.5%	9.0%	6.0%
Ireland	19	2.5%	2.4%	2.8%	2.2%
Israel	17	4.2%	4.2%	5.0%	3.5%
Italy	71	3.4%	3.6%	5.0%	2.5%
Japan	36	1.6%	1.4%	3.8%	0.5%
Kenya	7	13.8%	13.7%	15.0%	13.0%
Korea, (South)	9	3.3%	3.0%	4.3%	2.6%
Lithuania	17	3.5%	3.4%	5.0%	3.0%
Luxembourg	29	2.5%	2.5%	3.0%	2.4%
Malaysia	7	4.7%	4.8%	6.0%	3.7%
Mexico	34	8.0%	9.0%	10.4%	1.5%
Netherlands	23	2.8%	2.7%	3.5%	2.0%
New Zealand	7	4.3%	4.5%	4.7%	3.8%
Nigeria	6	15.5%	15.0%	19.8%	12.0%
Norway	16	3.8%	4.0%	4.5%	2.0%
Pakistan	6	12.5%	12.5%	14.0%	11.0%
Peru	18	6.1%	6.6%	7.0%	4.0%
Phillipines	9	6.3%	6.2%	7.0%	5.8%
Poland	27	5.4%	5.3%	5.7%	5.2%
Portugal	28	3.2%	3.2%	4.0%	2.0%
Romania	15	6.5%	7.0%	7.5%	3.0%
Russia	17	14.2%	15.3%	16.0%	10.0%
Saudi Arabia	15	6.0%	6.0%	7.0%	5.0%
Singapore	9	3.1%	2.8%	4.0%	2.5%
South Africa	18	10.5%	10.7%	11.3%	9.5%
Sweden	28	3.0%	3.0%	5.0%	2.4%
Switzerland	34	2.4%	2.7%	3.0%	0.5%
Taiwan	14	1.8%	1.6%	2.6%	1.6%
Thailand	6	2.6%	2.5%	3.5%	2.0%
United Kingdom	68	4.1%	4.4%	5.3%	2.0%
Uruguay	8	7.8%	7.5%	9.8%	6.5%
Venezuela	6	14.0%	14.0%	18.0%	10.0%
Vietnam	6	3.4%	3.2%	4.4%	3.0%

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Table 4. Km [Required return to equity (market): RF + MRP)] used for 54 countries in 2025

Km = RF + MRP	Number of Answers	Average	Median	MAX	min
USA	1079	9.6%	9.5%	19.8%	5.0%
Spain 2025	396	9.2%	9.3%	19.0%	5.0%
Argentina	11	25.3%	25.7%	34.0%	15.8%
Australia	27	10.5%	10.0%	15.0%	4.2%
Austria	31	9.1%	9.0%	12.0%	7.8%
Belgium	36	9.1%	9.0%	12.0%	7.6%
Bolivia	7	33.0%	32.9%	36.0%	30.0%
Brazil	44	18.8%	19.3%	35.3%	7.8%
Canada	57	8.9%	8.5%	12.0%	5.5%
Chile	14	11.7%	11.2%	19.0%	7.8%
China	19	7.9%	8.3%	10.0%	4.2%
Colombia	13	15.6%	13.3%	25.0%	7.2%
Czech Republic	16	10.9%	10.9%	13.0%	9.2%
Denmark	17	7.5%	7.8%	9.5%	5.3%
Dominican Rep.	6	16.3%	16.2%	19.6%	14.3%
Ecuador	13	21.4%	21.0%	25.7%	18.0%
Egypt	9	39.1%	39.3%	45.0%	34.0%
Finland	12	9.1%	8.8%	12.0%	7.7%
France	68	8.4%	8.3%	11.5%	5.8%
Germany	206	8.1%	8.0%	12.0%	4.5%
Greece	23	10.9%	10.8%	13.0%	9.0%
India	15	13.9%	13.8%	21.0%	10.0%
Ireland	19	7.2%	7.1%	10.1%	4.5%
Israel	17	10.0%	10.0%	11.8%	7.8%
Italy	71	9.5%	9.6%	13.0%	7.0%
Japan	36	6.7%	6.8%	9.3%	3.3%
Kenya	7	24.5%	25.0%	27.6%	21.0%
Korea, (South)	9	8.8%	9.0%	10.6%	7.0%
Lithuania	17	9.3%	9.1%	12.0%	7.8%
Luxembourg	29	7.2%	7.3%	10.1%	4.5%
Malaysia	7	11.1%	10.7%	13.0%	9.6%
Mexico	34	14.9%	15.1%	24.0%	8.5%
Netherlands	23	8.1%	7.7%	10.2%	7.0%
New Zealand	7	10.5%	10.3%	12.1%	8.9%
Nigeria	6	27.5%	28.0%	34.1%	19.0%
Norway	16	9.0%	9.0%	10.5%	6.5%
Pakistan	6	25.7%	26.0%	30.0%	18.5%
Peru	18	11.6%	11.6%	13.6%	8.0%
Phillipines	9	13.4%	13.1%	14.8%	12.0%
Poland	27	10.8%	10.7%	11.2%	10.7%
Portugal	28	8.8%	8.9%	10.3%	6.5%
Romania	15	13.6%	13.9%	14.8%	12.0%
Russia	17	26.2%	25.3%	31.2%	23.8%
Saudi Arabia	15	14.7%	16.0%	18.0%	10.1%
Singapore	9	7.9%	7.9%	9.0%	6.8%
South Africa	18	17.9%	17.5%	20.7%	16.0%
Sweden	28	8.6%	8.0%	11.0%	6.7%
Switzerland	34	6.6%	6.5%	8.0%	4.8%
Taiwan	14	7.7%	7.0%	9.6%	6.2%
Thailand	6	9.1%	9.5%	11.5%	7.0%
United Kingdom	68	9.6%	9.6%	16.0%	5.1%
Uruguay	8	15.5%	15.0%	18.5%	13.5%
Venezuela	6	42.0%	41.9%	46.0%	39.0%
Vietnam	6	11.6%	11.3%	14.0%	10.5%

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2. Changes from 2015 to 2018, 2019, 2020, 2021, 2022 and 2023

Tables 5 and 6 compare the results of the 2023 survey with the results of the surveys published in 2015, 2018, 2019, 2020, 2021 and 2022.

Table 5. Km [Required return to equity (market): RF + MRP)]
Averages of the surveys of 2023, 2022, 2021, 2020, 2019, 2018 and 2015

	average Km (RF + MRP)						
	2023	2022	2021	2020	2019	2018	2015
USA	9,5	8,3	7,3	7,5	8,3	8,2	7,9
Spain	10,1	8,8	7,4	7,6	8,1	8,8	8,1
Argentina	57,7	58,3	41,6	29,6	25,0	23,2	35,5
Australia	10,0	9,7	9,0	10,3	9,3	9,7	9,1
Austria	9,5	7,6	6,5	7,1	7,4	8,2	8,5
Belgium	10,2	7,2	6,5	7,1	7,4	7,8	6,8
Brazil	21,5	20,1	14,2	12,7	15,4	15,7	16,5
Canada	9,5	8,5	7,5	7,5	8,3	8,7	8,2
Chile	11,8	13,1	10,2	10,2	10,5	10,2	10,4
China	12,8	12,6	9,0	9,8	11,5	10,1	12,6
Colombia	20,6	16,5	13,8	14,5	13,9	15,4	12,1
Czech Rep.	10,9	10,1	7,8	8,2	8,7	8,5	7,4
Denmark	9,0	7,2	6,5	7,0	7,2	7,6	6,8
Finland	9,4	7,0	6,5	7,5	7,3	7,6	6,9
France	9,0	7,6	6,6	7,0	7,2	7,5	7,1
Germany	8,2	6,9	6,4	6,6	6,8	6,7	6,6
Greece	15,0	8,2	7,8	19,1	19,7	20,6	29,3
Hungary	16,7	11,6	10,4	10,5	11,9	11,5	9,4
India	15,5	12,5	12,9	11,8	14,8	14,7	15,8
Indonesia	14,9	13,2	12,9	13,9	16,2	15,6	16,4
Ireland	9,6	7,3	6,6	7,9	7,4	8,1	6,8
Israel	10,8	8,7	6,8	7,8	8,4	7,7	6,1
Italy	11,1	7,7	7,0	7,5	7,9	8,4	6,9
Japan	7,1	6,4	5,7	7,1	7,2	6,0	6,5
Korea (South)	9,3	9,7	8,3	8,1	9,1	8,8	8,5
Mexico	16,0	14,8	12,2	13,7	15,4	15,3	12,3
Netherlands	8,7	7,5	6,7	7,5	7,3	7,5	7,7
New Zealand	10,9	9,5	8,0	8,6	8,9	8,9	9,5
Norway	9,2	7,5	7,2	7,0	7,4	8,1	6,9
Peru	14,9	13,3	11,1	10,7	13,1	12,6	11,2
Poland	13,4	9,7	8,2	9,0	9,7	9,4	7,9
Portugal	11,6	7,8	8,2	8,7	10,1	10,4	7,3
Russia	27,6	20,0	13,8	13,7	16,8	16,5	17,1
South Africa	18,1	16,4	15,1	14,6	16,4	14,5	15,9
Sweden	7,5	7,4	8,4	7,1	7,4	8,9	6,5
Switzerland	7,4	7,2	5,3	7,0	7,3	8,0	6,5
Thailand	11,1	10,1	9,5	10,2	11,3	12,4	16,0
Turkey	32,7	33,6	27,2	21,2	20,8	18,0	17,1
UK	9,8	8,5	6,9	6,9	8,3	7,5	7,3
Uruguay	17,7	12,7	11,3	15,2	12,8	13,6	10,7
Venezuela	64,3	58,8	60,2	34,5	36,3	28,6	23,1

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Table 6. Market Risk Premium (MRP) and Risk Free Rate (RF) (%)
Averages of the surveys of 2023, 2022, 2021, 2020, 2019, 2018 and 2015

	Av. 2023		Av. 2022		Av. 2021		Av. 2020		Av. 2019		Av. 2018		Av. 2015	
	RF	MRP	RF	MRP	RF	MRP	RF	MRP	RF	MRP	RF	MRP	RF	MRP
USA	3,8	5,7	2,7	5,6	1,8	5,5	1,9	5,6	2,7	5,6	2,8	5,4	2,4	5,5
Spain	3,5	6,6	2,1	6,7	1,0	6,4	1,3	6,3	1,7	6,4	2,1	6,7	2,2	5,9
Argentina	29,6	28,1	28,4	29,9	24,2	17,4	12,3	17,3	10,1	14,9	9,3	13,9	12,6	22,9
Australia	3,8	6,2	3,4	6,3	2,6	6,4	2,4	7,9	2,8	6,5	3,1	6,6	3,1	6,0
Austria	2,7	6,8	1,8	5,8	0,6	5,9	0,9	6,2	1,3	6,1	2,0	6,2	2,8	5,7
Belgium	3,8	6,4	1,4	5,8	0,6	5,9	0,9	6,2	1,2	6,2	1,6	6,2	1,3	5,5
Brazil	12,2	9,3	10,3	9,8	6,5	7,7	4,8	7,9	7,2	8,2	7,3	8,4	9,0	7,5
Canada	3,5	6,0	2,8	5,7	1,9	5,6	1,8	5,7	2,5	5,8	2,9	5,8	2,3	5,9
Chile	4,9	6,9	5,7	7,4	3,9	6,3	3,6	6,6	4,2	6,3	4,1	6,1	3,9	6,5
China	4,2	8,6	3,9	8,7	2,8	6,2	3,1	6,7	4,0	7,5	3,8	6,3	4,5	8,1
Colombia	11,6	9,0	9,8	6,7	6,9	6,9	6,3	8,2	6,2	7,7	6,7	8,7	3,8	8,3
Czech Rep.	4,3	6,6	4,1	6,0	2,0	5,8	1,8	6,4	2,4	6,3	2,6	5,9	1,8	5,6
Denmark	2,9	6,2	1,4	5,8	0,7	5,8	0,9	6,1	1,2	6,0	1,6	6,0	1,3	5,5
Finland	3,2	6,2	1,4	5,6	0,6	5,9	1,0	6,5	1,1	6,2	1,7	5,9	1,2	5,7
France	3,0	6,0	1,3	6,3	0,8	5,8	0,8	6,2	1,2	6,0	1,6	5,9	1,5	5,6
Germany	2,5	5,7	1,2	5,7	0,6	5,8	0,8	5,8	1,1	5,7	1,4	5,3	1,3	5,3
Greece	4,1	10,9	1,6	6,6	0,9	6,9	6,4	12,7	4,3	15,4	4,8	15,8	15,0	14,3
Hungary	8,3	8,4	4,9	6,7	3,3	7,1	3,1	7,4	4,0	7,9	3,6	7,9	0,6	8,8
India	7,1	8,5	5,6	6,9	5,6	7,3	4,8	7,0	6,5	8,3	6,8	7,9	7,4	8,4
Indonesia	6,9	8,0	5,5	7,7	5,9	7,0	6,3	7,6	7,2	9,0	6,8	8,8	7,5	8,9
Ireland	2,9	6,7	1,5	5,8	0,7	5,9	1,3	6,6	1,4	6,0	1,6	6,5	1,3	5,5
Israel	3,9	6,9	2,7	6,0	1,1	5,7	1,5	6,3	2,0	6,4	1,9	5,8	0,9	5,2
Italy	4,0	7,1	1,7	6,0	1,0	6,0	1,3	6,2	1,6	6,3	2,3	6,1	1,5	5,4
Japan	1,1	6,1	0,5	5,9	0,5	5,2	0,9	6,2	1,1	6,1	0,3	5,7	0,7	5,8
Korea (South)	2,9	6,4	3,7	6,0	2,4	5,9	2,0	6,1	2,5	6,6	2,4	6,4	2,3	6,2
Mexico	8,3	7,7	7,4	7,4	5,8	6,4	5,4	8,3	7,1	8,3	6,8	8,5	4,3	8,0
Netherlands	3,0	5,6	1,3	6,2	0,9	5,8	1,6	5,9	1,3	6,0	1,7	5,8	1,8	5,9
New Zealand	4,7	6,3	3,8	5,7	2,0	6,0	2,4	6,2	3,0	5,9	3,1	5,8	2,9	6,6
Norway	3,4	5,8	1,7	5,8	1,8	5,4	1,2	5,8	1,4	6,0	2,4	5,7	1,4	5,5
Peru	6,5	8,4	6,4	6,9	4,3	6,8	3,7	7,0	5,6	7,5	5,3	7,3	4,0	7,2
Poland	6,1	7,2	4,0	5,7	2,7	5,5	2,4	6,6	3,1	6,6	3,4	6,0	2,7	5,2
Portugal	3,4	8,2	1,6	6,2	1,4	6,8	1,6	7,1	2,6	7,5	3,2	7,2	1,6	5,7
Russia	9,4	18,2	5,8	14,2	5,7	8,1	5,9	7,8	8,3	8,5	7,8	8,7	7,4	9,7
South Africa	9,4	8,7	9,1	7,3	8,1	7,0	6,7	7,9	8,0	8,4	7,6	6,9	8,2	7,7
Sweden	1,9	5,7	1,4	6,0	0,9	7,5	1,0	6,1	1,3	6,1	1,8	7,1	1,1	5,4
Switzerland	1,7	5,6	1,4	5,8	0,1	5,2	0,9	6,1	1,1	6,2	1,1	6,9	1,1	5,4
Thailand	3,0	8,1	3,1	7,0	2,2	7,3	4,5	5,7	3,1	8,2	3,5	8,9	8,7	7,3
Turkey	14,4	18,3	22,6	11,0	17,7	9,5	10,9	10,3	11,2	9,6	10,3	7,7	7,8	9,3
UK	3,9	6,0	2,4	6,1	1,3	5,6	1,1	5,8	2,1	6,2	2,0	5,5	2,1	5,2
Uruguay	8,3	9,3	5,4	7,3	4,2	7,1	6,1	9,1	4,4	8,4	5,3	8,3	3,6	7,1
Venezuela	34,8	29,5	32,7	26,1	40,4	19,8	11,4	23,1	12,6	23,7	11,7	16,9	3,5	19,6

3. Previous surveys

2008	http://ssrn.com/abstract=1344209
2010	http://ssrn.com/abstract=1606563; http://ssrn.com/abstract=1609563
2011	http://ssrn.com/abstract=1822182; http://ssrn.com/abstract=1805852
2012	http://ssrn.com/abstract=2084213
2013	http://ssrn.com/abstract=914160
2014	http://ssrn.com/abstract=1609563
2015	https://ssrn.com/abstract=2598104
2016	https://ssrn.com/abstract=2776636
2017	https://ssrn.com/abstract=2954142
2018	https://ssrn.com/abstract=3155709
2019	https://ssrn.com/abstract=3358901
2020	https://ssrn.com/abstract=3560869

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2021	https://ssrn.com/abstract=3861152
2022	https://ssrn.com/abstract=3803990
2023	https://ssrn.com/abstract=4407839
2024	https://ssrn.com/abstract=4754347

Welch (2000) performed two surveys with finance professors in 1997 and 1998, asking them what they thought the Expected MRP would be over the next 30 years. He obtained 226 replies, ranging from 1% to 15%, with an average arithmetic EEP of 7% above T-Bonds.[3] Welch (2001) presented the results of a survey of 510 finance and economics professors performed in August 2001 and the consensus for the 30-year arithmetic EEP was 5.5%, much lower than just 3 years earlier. In an update published in 2008 Welch reports that the MRP "used in class" in December 2007 by about 400 finance professors was on average 5.89%, and 90% of the professors used equity premiums between 4% and 8.5%.

Johnson et al (2007) report the results of a survey of 116 finance professors in North America done in March 2007: 90% of the professors believed the Expected MRP during the next 30 years to range from 3% to 7%.

Graham and Harvey (2007) indicate that U.S. CFOs reduced their average EEP from 4.65% in September 2000 to 2.93% by September 2006 (st. dev. of the 465 responses = 2.47%). In the 2008 survey, they report an average EEP of 3.80%, ranging from 3.1% to 11.5% at the tenth percentile at each end of the spectrum. They show that average EEP changes through time. Goldman Sachs (O'Neill, Wilson and Masih 2002) conducted a survey of its global clients in July 2002 and the average long-run EEP was 3.9%, with most responses between 3.5% and 4.5%.

Ilmanen (2003) argues that surveys tend to be optimistic: *"survey-based expected returns may tell us more about hoped-for returns than about required returns".* Damodaran (2008) points out that *"the risk premiums in academic surveys indicate how far removed most academics are from the real world of valuation and corporate finance and how much of their own thinking is framed by the historical risk premiums... The risk premiums that are presented in classroom settings are not only much higher than the risk premiums in practice but also contradict other academic research".*

Table 4 of Fernandez et al (2011a) shows the evolution of the Market Risk Premium used for the USA in 2011, 2010, 2009 and 2008 according to previous surveys (Fernandez et al, 2009, 2010a and 2010b).

The magazine *Pensions and Investments* (12/1/1998) carried out a survey among professionals working for institutional investors: the average EEP was 3%. Shiller[4] publishes and updates an index of investor sentiment since the crash of 1987. While neither survey provides a direct measure of the equity risk premium, they yield a broad measure of where investors or professors expect stock prices to go in the near future. The 2004 survey of the Securities Industry Association (SIA) found that the median EEP of 1500 U.S. investors was about 8.3%. Merrill Lynch surveys more than 300 institutional investors globally in July 2008: the average EEP was 3.5%.

A main difference of this survey with previous ones is that this survey asks about the **Required** MRP, while most surveys are interested in the **Expected** MRP.

4. Expected and Required Equity Premium: different concepts

Fernandez and F. Acín (2015) claim and show that Expected Return and Required Return are two very different concepts. Fernandez (2007, 2009b) claims that the term "equity premium" is used to designate four different concepts:

1. **Historical** equity premium (HEP): historical differential return of the stock market over treasuries.

[3] At that time, the most recent Ibbotson Associates Yearbook reported an arithmetic HEP versus T-bills of 8.9% (1926–1997).

[4] See http://icf.som.yale.edu/Confidence.Index

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2. **Expected** equity premium (EEP): expected differential return of the stock market over treasuries.
3. **Required** equity premium (REP): incremental return of a diversified portfolio (the market) over the risk-free rate required by an investor. It is used for calculating the required return to equity.
4. **Implied** equity premium (IEP): the required equity premium that arises from assuming that the market price is correct.

The four concepts (HEP, REP, EEP and IEP) designate different realities. The **HEP** is easy to calculate and is equal for all investors, provided they use the same time frame, the same market index, the same risk-free instrument and the same average (arithmetic or geometric). But the **EEP,** the **REP** and the **IEP** may be different for different investors and are not observable.

The **HEP** is the historical average differential return of the market portfolio over the risk-free debt. The most widely cited sources are Ibbotson Associates and Dimson *et al.* (2007).

Numerous papers and books assert or imply that there is a "market" EEP. However, it is obvious that investors and professors do not share "homogeneous expectations" and have different assessments of the **EEP**. As Brealey et al. (2005, page 154) affirm, *"Do not trust anyone who claims to know what returns investors expect".*

The **REP** is the answer to the following question: What incremental return do I require for investing in a diversified portfolio of shares over the risk-free rate? It is a crucial parameter because the REP is the key to determining the company's required return to equity and the WACC. Different companies may use, and in fact do use, different **REPs**.

The **IEP** is the implicit REP used in the valuation of a stock (or market index) that matches the current market price. The most widely used model to calculate the IEP is the dividend discount model: the current price per share (P_0) is the present value of expected dividends discounted at the required rate of return (Ke). If d_1 is the dividend per share expected to be received in year 1, and g the expected long term growth rate in dividends per share,

$$P_0 = d_1 / (Ke - g), \text{ which implies: } IEP = d_1/P_0 + g - R_F \qquad (1)$$

The estimates of the IEP depend on the particular assumption made for the expected growth (g). Even if market prices are correct for all investors, there is not an IEP common for all investors: there are many pairs (IEP, g) that accomplish equation (1). Even if equation (1) holds for every investor, there are many *required* returns (as many as expected growths, g) in the market. Many papers in the financial literature report different estimates of the IEP with great dispersion, as for example, Claus and Thomas (2001, IEP = 3%), Harris and Marston (2001, IEP = 7.14%) and Ritter and Warr (2002, IEP = 12% in 1980 and -2% in 1999). There is no a common **IEP** for all investors.

For a particular investor, the **EEP** is not necessary equal to the REP (unless he considers that the market price is equal to the value of the shares). Obviously, an investor will hold a diversified portfolio of shares if his EEP is higher (or equal) than his REP and will not hold it otherwise.

We can find out the REP and the EEP of an investor by asking him, although for many investors the REP is not an explicit parameter but, rather, it is implicit in the price they are prepared to pay for the shares. However, it is not possible to determine the REP for the market as a whole, because it does not exist: even if we knew the REPs of all the investors in the market, it would be meaningless to talk of a REP for the market as a whole. There is a distribution of REPs and we can only say that some percentage of investors have REPs contained in a range. The average of that distribution cannot be interpreted as the REP of the market nor as the REP of a representative investor.

Much confusion arises from not distinguishing among the four concepts that the phrase *equity premium* designates: Historical equity premium, Expected equity premium, Required equity premium and Implied equity premium. 129 of the books reviewed by Fernandez (2009b) identify Expected and Required equity premium and 82 books identify Expected and Historical equity premium.

Finance textbooks should clarify the MRP by incorporating distinguishing definitions of the four different concepts and conveying a clearer message about their sensible magnitudes.

5. Conclusion

Most previous surveys have been interested in the Expected MRP, but this survey asks about the Required MRP.

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This paper contains the statistics of a survey about the Risk-Free Rate (**RF**) and the Market Risk Premium (**MRP**) used in 2025 for **54 countries**. We got answers for 103 countries, but we only report the results for countries with more than 6 answers.

This survey links with the *Equity Premium Puzzle*: Fernandez et al (2009), argue that the equity premium puzzle may be explained by the fact that many market participants (equity investors, investment banks, analysts, companies…) do not use standard theory (such as a standard representative consumer asset pricing model…) for determining their Required Equity Premium, but rather, they use historical data and advice from textbooks and finance professors. Many investors still use historical data and textbook prescriptions to estimate the required and the expected equity premium.

EXHIBIT 1. Mail sent in April 2025

Survey Market Risk Premium and Risk-Free Rate 2025

We are doing a **survey** about the **Market Risk Premium** (MRP or Equity Premium) and **Risk-Free Rate** that companies, analysts, regulators and professors use to calculate the **required return on equity** in different countries.

I would be grateful if you would kindly answer the following 2 questions. No companies, individuals or universities will be identified, and only aggregate data will be made public. I will send you the results in a month.

Best regards and thanks,

Pablo Fernandez. Professor of Finance. IESE Business School. Spain.

2 questions:

1. The Market Risk Premium that I am using in 2025
for USA is: _____%
for_____ is: _____ %
for_____ is: _____ %

2. The Risk-Free rate that I am using in 2025
for USA is: _____ %
for _____ is: _____ %
for _____ is: _____ %

EXHIBIT 2. Some webs recommended by respondents.

Equity premium: http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/ctryprem.html
http://www.market-risk-premia.com/market-risk-premia.html
http://www.marktrisikoprämie.de/marktrisikopraemien.html

US risk free rate: http://www.treasury.gov/resource-center/data-chart-center/interest-rates/Pages/TextView.aspx?data=yieldYear&year=2015

risk free rate: http://www.basiszinskurve.de/basiszinssatz-gemaess-idw.html
http://www.econ.yale.edu/~shiller/
http://www.cfosurvey.org/pastresults.htm
http://alephblog.com/

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Fernandez, P., J. Aguirreamalloa and P. Linares (2014), "Market Risk Premium and Risk Free Rate Used for 51 Countries in 2013: A Survey with 6,237 Answers", downloadable in http://ssrn.com/abstract=914160

Fernandez, P., J. Aguirreamalloa and L. Corres (2012), "Market Risk Premium Used in 82 Countries in 2012: A Survey with 7,192 Answers", downloadable in http://ssrn.com/abstract=2084213

Fernandez, P. and I. F. Acín (2015), "Expected and Required Returns: Very Different Concepts", downloadable in http://ssrn.com/abstract=2591319

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KROLL

April 15, 2025

Kroll Cost of Capital Inputs Updated to Reflect Heightened Uncertainty in Global Economy

Executive Summary

Kroll regularly reviews fluctuations in global economic and financial market conditions that may warrant changes to our equity risk premium (ERP) and accompanying risk-free rate recommendations. The risk-free rate and ERP are key inputs used to calculate the cost of equity capital in the context of the Capital Asset Pricing Model (CAPM) and other models used to develop discount rates. We also update country risk data on a quarterly basis for 175+ countries using various models.

Based on recent economic indicators and financial market conditions, **the Kroll Recommended U.S. ERP is increased from 5.0% to 5.5%** when developing USD-denominated discount rates as of April 15, 2025, and thereafter, until further guidance is issued. This is matched with the higher of a U.S. normalized risk-free rate of 3.5% or the spot 20-year U.S. Treasury yield as of the valuation date.

The Kroll Recommended Eurozone ERP is being reaffirmed in the range of 5.5% to 6.0% when developing EUR-denominated discount rates as of April 15, 2025, and thereafter, until further guidance is issued. However, we now believe that an ERP towards the ***higher* end of the range (i.e., closer to a 6.0% ERP)** is likely more appropriate. This is matched with the higher of a German normalized risk-free rate of 2.5% or the spot 15-year German government bond yield as of the valuation date.

Incremental country risk adjustments for other Eurozone countries with a sovereign debt rating below AAA may be appropriate. Please note that this information does not supersede Germany's IDW (Institut der Wirtschaftsprüfer) guidance for projects that will be reviewed by German auditors or regulators.

We will continue to monitor economic and geopolitical events that may change our guidance in the coming months. We may also issue in the future a more detailed report on the rationale for the change in ERP recommendations.

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Background

Recently, uncertainty has risen materially for the global economy, which is leading economists and market participants to rethink their expectations for the remainder of 2025. There are three major sources of downside risks and uncertainty that support our decision to increase our ERP recommendations as of April 15, 2025.

First, and foremost, the uncertainty in the current international trade environment, and further escalation in trade conflicts, are likely to continue disrupting the global economy and global financial markets in 2025. On April 2, 2025 the U.S. Administration announced plans to impose a baseline 10% tariff on imports from most countries, and tariffs far in excess of 10% for countries with which the U.S. has a goods trade deficit. This comes at the heels of other previously announced or imposed tariffs that were already in effect (e.g., steel and aluminum, automobiles and auto parts, etc.). One week later (April 9th), the U.S. Administration instituted a 90-day "pause" on excess reciprocal tariffs, while still leaving in place the 10% baseline tariffs for most countries, except for China, which saw tariffs raised to 125%. Notably, this tariff was later raised to 145%, with China retaliating with a 125% tariff on certain U.S. goods. For perspective, China is the third largest supplier of goods to the U.S., after Mexico and Canada, but the largest U.S. trade deficit (in goods) is with China.[1]

Almost daily, there are announcements of possible new tariffs or exceptions followed by a reprieve or delay in effective dates for some of them. The uncertainty created by the scope, magnitude, and timing of these tariffs, along with the possible ensuing retaliation by U.S. trading partners may disrupt global trade and potentially lead to higher inflation and/or an economic slowdown in the U.S. and other countries. Businesses are starting to delay M&A and capital expenditure/expansion plans, as they wait for the tariff situation to become less ambiguous. Consumer confidence has dropped significantly in light of these developments. A scenario of stagflation or even recession has been resurrected by several economists for the U.S. economy. Real growth forecasts for other countries and regions are also being downgraded.

Financial markets in the U.S. and elsewhere are already reeling from this uncertainty, creating significant volatility for bonds and equities. Even if the U.S. Administration is successful in negotiating new trade agreements with the rest of the world, we believe that supply chain disruptions, manufacturing relocations, and other business decisions (e.g., potential price increases) in response to the new tariff environment will lead to heightened equity risk for some time.

Second, there is heightened uncertainty about budget policies, potential tax cuts, increased government spending and a related rise in budget deficits, not just in the U.S. but elsewhere (e.g., Germany), which could place upward pressure on long-term interest rates and disrupt global financial markets. The U.S. dollar is still the world's reserve currency, but the current trade uncertainty is challenging the U.S. dollar status and leading to greater volatility in exchange rates and long-term interest rates.

[1] Based on 2024 full year data. See "U.S. International Trade in Goods and Services" releases by the U.S. Census Bureau and the U.S. Bureau of Economic Analysis. At the time of writing, the latest report was released on April 3, 2025 and can be found here (see Part C): https://www.bea.gov/sites/default/files/2025-04/trad0225.pdf.

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The negative impact on markets from higher long-term interest rates could be mitigated if real growth accelerates materially due to the additional fiscal spending measures.

Finally, there are other global geopolitical events warranting close watch including, but not limited to, a reignition of the ongoing conflicts in the Middle East, an unsatisfactory resolution of the Russia-Ukraine war, and a potential withdrawal of the U.S. from NATO.

The combination of these risks is already causing significant upheaval in global financial markets, with heightened volatility likely to persist in the coming months.

Volatility of Current Spot Yields on Government Bonds

As investors attempt to predict the pace and magnitude of future rate cuts by major central banks, we continue to observe high levels of volatility in the spot yields of government bonds of major economies. The uncertainty created by policies from the new U.S. administration could add further volatility to bond markets in 2025. Long-term bonds yields may continue to fluctuate considerably in the near- to medium-term before stabilizing. During these periods, valuation professionals may need to consider using a moving average of spot yields to mitigate the impact of this volatility on their valuation analyses (e.g., weekly or monthly averages).

We will continue to closely monitor the situation and publish new guidance when appropriate. Please contact our support team with any questions: costofcapital.support@kroll.com.

Kroll Cost of Capital Inputs

Data as of April 15, 2025

	U.S. (in USD)	Eurozone ** (in EUR)	U.K. †† (in GBP)	Canada †† (in CAD)	Australia †† (in AUD)
Normalized Risk-Free Rate	Higher of 3.5% or Spot*	Higher of 2.5% or Spot†	Higher of 4.0% or Spot‡	Higher of 3.5% or Spot§	Higher of 3.5% or Spot#
Kroll Recommended Equity Risk Premium	5.5% *	5.5% to 6.0%†	n/a	n/a	n/a

* We recommend using the spot 20-year U.S. Treasury yield as the proxy for the risk-free rate, if the prevailing yield as of the valuation date is higher than our U.S. normalized risk-free rate of 3.5%. This guidance is effective when developing USD-denominated discount rates as of June 16, 2022, and thereafter. Based on current economic indicators and financial market conditions, the Kroll Recommended U.S. ERP is 5.5% when developing USD-denominated discount rates as of April 15, 2025, and thereafter.

† We recommend using the spot 15-year German government bond yield as the proxy for the risk-free rate, if the prevailing yield as of the valuation date is higher than our German normalized risk-free rate of 2.5%. This guidance is effective when developing EUR-denominated discount rates as of March 31, 2024, and thereafter. Based on current economic and financial market conditions, the Kroll Recommended Eurozone ERP remains in the range of 5.5% to 6.0%, and we believe that an ERP towards the higher end of the range (i.e., closer to 6.0%) is likely more appropriate when developing EUR-denominated discount rates as of April 15, 2025, and thereafter.

‡ We recommend using the spot 20-year U.K. Gilt yield as the proxy for the risk-free rate, if the prevailing yield as of the valuation date is higher than our U.K. normalized risk-free rate of 4.0%. This guidance is effective when developing GBP-denominated discount rates as of October 18, 2022, and thereafter.

§ We recommend using the spot Government of Canada Benchmark Long-Term Bond yield as the proxy for the risk-free rate, if the prevailing yield as of the valuation date is higher than our Canada normalized risk-free rate of 3.5%. This guidance is effective when developing CAD-denominated discount rates as of October 18, 2022, and thereafter.

We recommend using the spot 10-year Australia Commonwealth Government bond yield as the proxy for the risk-free rate, if the prevailing yield as of the valuation date is higher than our Australia normalized risk-free rate of 3.5%. This guidance is effective when developing AUD-denominated discount rates as of October 31, 2022, and thereafter.

** German normalized risk-free rate and Eurozone equity risk premium (ERP) for use in EUR-denominated discount rates from a German investor perspective. Additional country risk adjustments may be warranted when estimating discount rates for other countries in the Eurozone.

†† Although currently we do not have an official Kroll Recommended ERP for the U.K., Canada and Australia, historical and other forward-looking ERP information for these countries is available in the International Cost of Capital Inputs dataset within the Cost of Capital Navigator.

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Congressional Budget Office
Nonpartisan Analysis for the U.S. Congress

The Long-Term Budget Outlook: 2025 to 2055

MARCH | 2025

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Projections at a Glance

This report presents the Congressional Budget Office's projections of what the federal budget and the economy would look like over the next 30 years if current laws generally remained unchanged. Those long-term projections are based on the agency's January 2025 demographic projections (which reflect information, laws, and policies as of November 15, 2024), economic projections (which reflect laws, policies, and economic developments as of December 4, 2024), and 10-year budget projections (which include the effects of legislation enacted as of January 6, 2025). The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas.

The Federal Budget

Debt held by the public, boosted by large deficits, reaches its highest level ever in 2029 (measured as a percentage of gross domestic product, or GDP) and then continues to grow, reaching 156 percent of GDP in 2055. It remains on track to increase thereafter. Mounting debt would slow economic growth, push up interest payments to foreign holders of U.S. debt, and pose significant risks to the fiscal and economic outlook; it could also cause lawmakers to feel constrained in their policy choices.

The deficit remains large by historical standards over the next 30 years, reaching 7.3 percent of GDP in 2055. That amount results from rising interest costs and sustained primary deficits, which exclude net outlays for interest and average 0.3 percent of GDP more over the next 30 years than they did over the past 50 years.

Outlays, which are already high by historical standards, rise over the 2025–2055 period, reaching 26.6 percent of GDP in 2055. Rising interest costs; spending for the major health care programs, particularly Medicare; and spending for Social Security, especially over the next decade, drive that growth.

Revenues increase over the next few years, largely because certain provisions of the 2017 tax act are scheduled to expire. Thereafter, they generally rise, reaching 19.3 percent of GDP in 2055, as growth in real income—that is, income adjusted to remove the effects of changes in prices—boosts receipts from the individual income tax.

The U.S. Economy

Population growth, which has a significant effect on the economy, is slower over the next 30 years than it was over the past 30 years. Without immigration, the U.S. population would begin to shrink in 2033.

Economic growth is slower over the next three decades than it was over the past three decades. The slowdown in the growth of output results from slower growth in the size and productivity of the labor force; the latter stems partly from increased federal borrowing.

Inflation slows through 2027 to a rate that is consistent with the Federal Reserve's long-term goal of 2 percent and then remains at rates that are consistent with that goal from 2027 to 2055.

The interest rate on 10-year Treasury notes stays close over the next three decades to what it was, on average, over the past 30 years, reflecting upward pressure from increases in federal borrowing and downward pressure from slowdowns in the growth of the labor force.

Changes in CBO's Budget Projections Since March 2024

Federal debt held by the public in 2054 is now projected to be 12 percent of GDP less than it was projected to be in last year's report, and the deficit is now projected to be 1.3 percent of GDP less. Lower spending, particularly for net interest costs and Medicare, and higher revenues in the current projections contribute to the lower projected debt and smaller projected deficits.

Changes in CBO's Economic Projections Since March 2024

The economy is now expected to grow more slowly, on average, over the next 30 years than CBO projected last year. That decrease stems mainly from slower growth of private investment and consumer spending over the next decade and slower growth of the labor force over the last decade of the projection period. The interest rate on 10-year Treasury notes is also lower, on average, in the current projections.

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By the Numbers

The Long-Term Budget Outlook, by Fiscal Year

Percentage of GDP	Average, 1995–2024	Actual, 2024	2025	2035	2045	2055
Revenues	**17.2**	**17.1**	**17.1**	**18.3**	**18.9**	**19.3**
Individual income taxes	8.1	8.4	8.7	10.0	10.5	10.9
Payroll taxes	6.0	5.9	5.8	5.9	5.9	5.9
Corporate income taxes	1.7	1.8	1.7	1.2	1.2	1.2
Other	1.4	0.9	0.9	1.1	1.2	1.3
Outlays	**21.1**	**23.4**	**23.3**	**24.4**	**25.3**	**26.6**
Mandatory	12.3	14.1	14.0	15.1	15.6	16.1
Social Security	4.5	5.0	5.2	6.0	5.9	6.1
Major health care programs	4.4	5.6	5.8	6.7	7.6	8.1
Medicare	2.6	3.0	3.1	4.0	4.8	5.2
Medicaid, CHIP, and premium tax credits and related spending	1.8	2.6	2.7	2.7	2.8	2.9
Other mandatory	3.3	3.4	3.0	2.4	2.1	1.9
Discretionary	7.0	6.3	6.1	5.3	5.1	5.1
Net interest	1.8	3.1	3.2	4.1	4.6	5.4
Total deficit (-)	**-3.9**	**-6.4**	**-6.2**	**-6.1**	**-6.4**	**-7.3**
Primary deficit (-)	-2.1	-3.3	-3.0	-2.1	-1.8	-1.9
Debt held by the public at the end of each period	60	98	100	118	136	156

See Chapter 1 and Chapter 2. Outlays and deficits have been adjusted to exclude the effects of shifts in the timing of certain payments when October 1, the first day of the fiscal year, falls on a weekend.

The Long-Term Economic Outlook, by Calendar Year

Percent	Average, 1995–2024	Actual, 2024	2025	2035	2045	2055
Growth of real (inflation-adjusted) GDP	2.5	2.8	2.1	1.8	1.5	1.4
Inflation						
Growth of the PCE price index	2.1	2.5	2.2	2.0	2.0	2.0
Growth of the consumer price index for all urban consumers	2.5	3.0	2.2	2.3	2.3	2.3
Labor force participation rate	64.7	62.6	62.7	61.4	61.4	61.2
Unemployment rate	5.6	4.0	4.3	4.3	4.2	4.0
Interest rates						
On 10-year Treasury notes	3.7	4.2	4.1	3.8	3.7	3.8
On all federal debt held by the public (by fiscal year)	3.8	3.4	3.4	3.6	3.6	3.6

See Chapter 3 and Appendix C.

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Notes About This Report

The Congressional Budget Office's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which conform to a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

The long-term budget projections in this report are based on the demographic, economic, and 10-year budget projections that CBO published in January 2025. The demographic projections reflect information, laws, and policies as of November 15, 2024, when those projections were completed. The economic projections reflect those demographic projections as well as laws, policies, economic developments, and preliminary budget projections as of December 4, 2024. The published 10-year budget projections, which build on those demographic and economic projections, include the effects of legislation enacted as of January 6, 2025. The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas.

In accordance with statutory requirements, CBO's projections reflect the assumptions that current laws generally remain unchanged, that some mandatory programs are extended after their authorizations lapse, and that spending on Medicare and Social Security continues as scheduled even if their trust funds are exhausted.

Unless this report indicates otherwise, all years referred to in describing budget projections are federal fiscal years, which run from October 1 to September 30 and are designated by the calendar year in which they end. Years referred to in describing economic projections are calendar years.

When October 1 (the first day of the fiscal year) falls on a weekend, certain payments that ordinarily would have been made on that day are instead made at the end of September and thus are shifted into the previous fiscal year. In this report, budget projections have been adjusted to treat the payments as if they were not subject to the shifts.

Unless this report notes otherwise, Medicare outlays are presented net of premiums paid by beneficiaries and other offsetting receipts, which reduce outlays for the program.

Numbers in the text, tables, and figures may not add up to totals because of rounding.

Supplemental information files—the data underlying the tables and figures in this report, supplemental budget projections, and the economic variables underlying those projections—are posted on CBO's website at www.cbo.gov/publication/61187#data. Previous editions of this report are available at http://tinyurl.com/2t6r8nn2.

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Executive Summary

Each year, the Congressional Budget Office publishes a report presenting its projections of what the federal budget and the economy would look like over the next 30 years if current laws generally remained unchanged. This report is the latest in that series. The long-term projections presented here are based on the demographic, economic, and 10-year budget projections that CBO published in January 2025. The demographic projections reflect information, laws, and policies as of November 15, 2024. The economic projections reflect laws, policies, and economic developments as of December 4, 2024. The budget projections include the effects of legislation enacted as of January 6, 2025. The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas.

The Long-Term Budget Outlook

Debt

In CBO's projections, federal debt held by the public, measured as a percentage of gross domestic product (GDP), increases in every year of the 2025–2055 period. By 2029, that debt climbs to 107 percent of GDP, exceeding the historical peak it reached immediately after World War II. In 2055, it reaches 156 percent of GDP and remains on track to increase thereafter. Such large and growing debt would slow economic growth, push up interest payments to foreign holders of U.S. debt, and pose significant risks to the fiscal and economic outlook; it could also cause lawmakers to feel constrained in their policy choices.

Deficits

The total federal budget deficit remains large by historical standards over the next 30 years, averaging 6.3 percent of GDP—more than one and a half times its average over the past 50 years—and reaching 7.3 percent of GDP in 2055. Those amounts are the result of rising interest costs and sustained primary deficits, which exclude net outlays for interest. Primary deficits average 2.0 percent of GDP over the 30-year period; over the past 50 years, they averaged 1.7 percent of GDP.

Outlays and Revenues

Federal outlays rise over the next 30 years, reaching 26.6 percent of GDP in 2055. They have exceeded that level only twice: during World War II and during the coronavirus pandemic. Growth in net interest costs; spending for federal health care programs, particularly Medicare; and spending for Social Security, especially over the next decade, drive that increase. Measured as a percentage of GDP, revenues increase over the next few years, largely because of the scheduled expiration of certain provisions of the 2017 tax act. Revenues generally continue to rise thereafter, reaching 19.3 percent of GDP in 2055, mainly because growth in real income (that is, income adjusted to remove the effects of changes in prices) boosts receipts from individual income taxes.

Changes in CBO's Budget Projections

Federal debt held by the public in 2054 is now projected to be 12 percent of GDP less than it was projected to be in last year's report, and the deficit is now projected to be 1.3 percent of GDP less. Lower spending, particularly for net interest costs and Medicare, and higher revenues in CBO's current projections result in smaller debt and deficits.

Projections for **2055**

Debt held by the public: **156%** of GDP

Budget deficit: **7.3%** of GDP

Outlays: **26.6%** of GDP

Revenues: **19.3%** of GDP

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The Budget Outlook in Five Figures

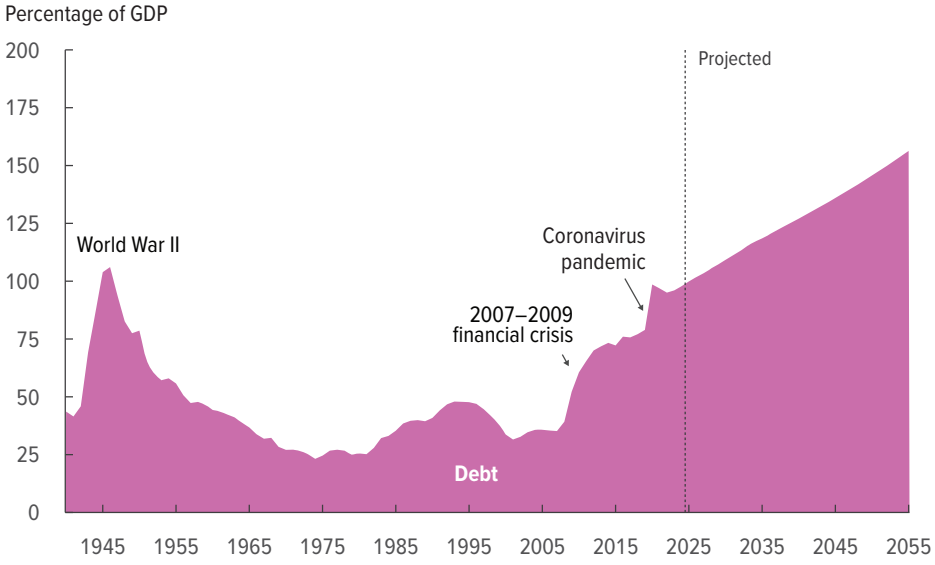
Outlook for
Debt and Deficits

Debt held by the public reaches **107%** of GDP in 2029, exceeding the historical peak reached just after World War II, and its growth continues through 2055.

Deficits average **6.3%** of GDP over the 30-year period, which is **2.5** percentage points more than they averaged over the past 50 years.

Federal Debt Held by the Public

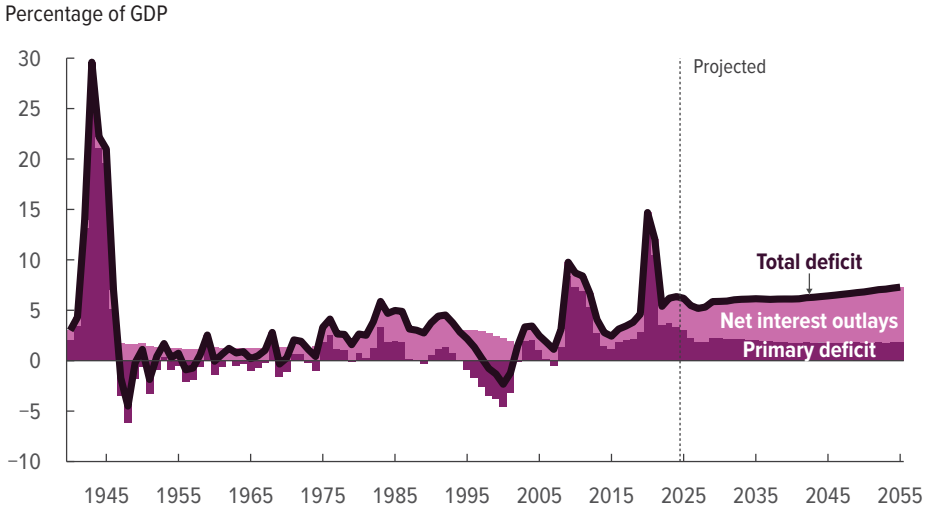
Debt increases in relation to GDP, exceeding any previously recorded level in 2029 and continuing to soar through 2055. It is on track to increase even more thereafter.



See Figure 1-1 on page 10.

Total Deficits, Primary Deficits, and Net Interest Outlays

In CBO's projections, sustained primary deficits (which exclude net interest costs), combined with the growing federal debt held by the public and the rising average interest rate on that debt, cause net outlays for interest measured as a percentage of GDP to increase more than one and a half times by 2055. That year, the total deficit is 7.3 percent of GDP.



See Figure 1-1 on page 10.

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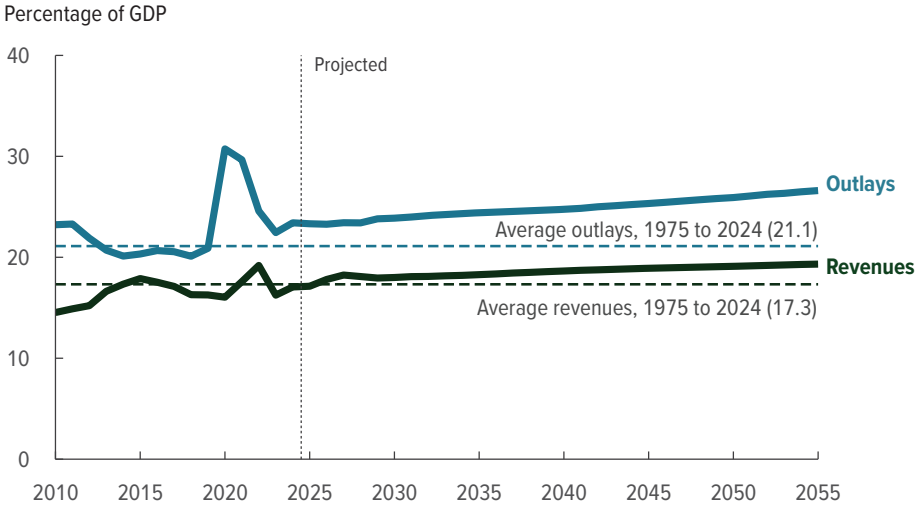
Total Outlays and Revenues

From 2025 to 2055, federal spending continues to exceed revenues. Spending and revenues each represent a larger percentage of GDP over that period than they did, on average, over the past 50 years.



See Figure 2-1 on page 18.

Outlook for **Spending**

Net outlays for interest increase more than one and a half times, reaching **5.4%** of GDP in 2055.

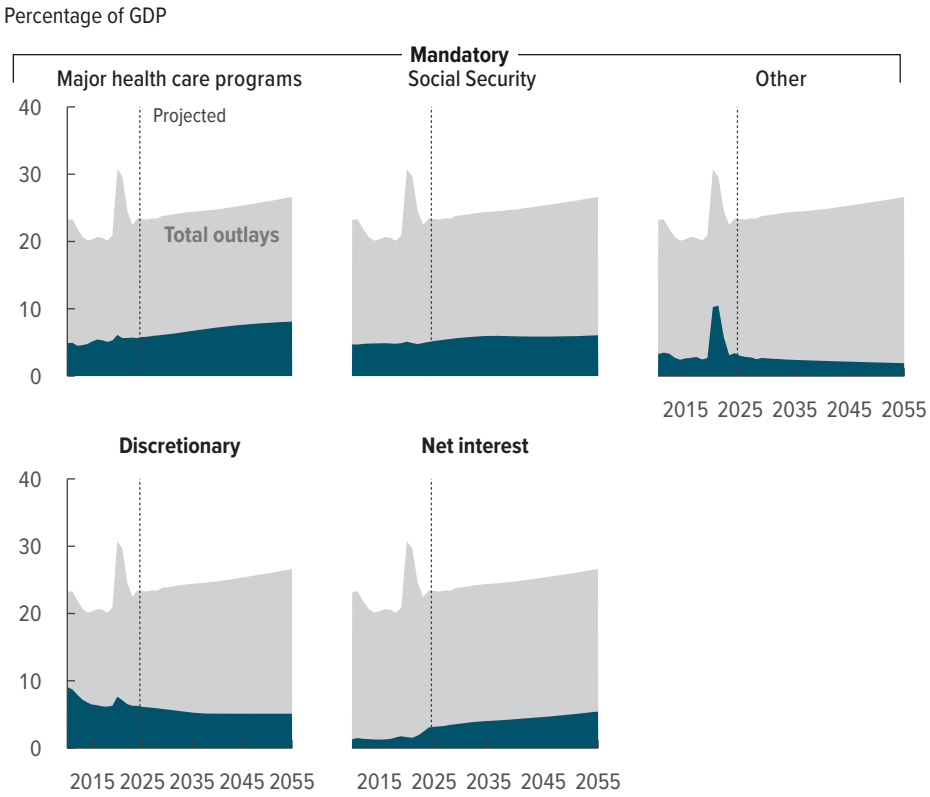
Outlays for the major health care programs climb to **8.1%** of GDP in 2055.

Outlays, by Category

Total outlays grow by 3.3 percent of GDP from 2025 to 2055. Driven by increases in the average interest rate on federal debt and mounting debt, net outlays for interest measured in relation to the size of the economy increase more than one and a half times over the period, reaching 5.4 percent of GDP in 2055.

As the population ages and health care costs grow, outlays for the major health care programs measured in relation to the economy also rise over the next three decades, by 2.3 percentage points between 2025 and 2055. That year, outlays for Social Security, Medicare, and Medicaid for people age 65 or older account for more than 50 percent of all noninterest spending.

See Figure 2-2 on page 19.



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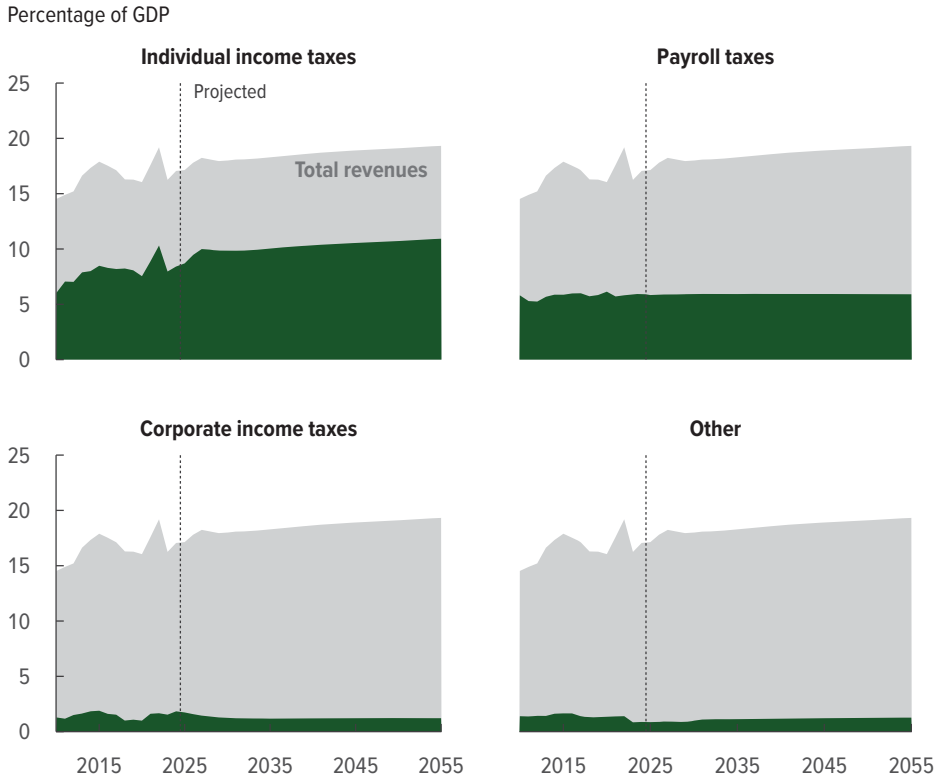
Revenues, by Source

Total revenues grow by 2.2 percent of GDP from 2025 to 2055. Receipts from individual income taxes account for nearly all of that growth because increases in real income (income that is adjusted to remove the effects of changes in prices) mean that a larger share of income becomes subject to higher tax rates.

See Figure 2-6 on page 27.



The Long-Term Budget Outlook, by Fiscal Year

Percentage of GDP	Average, 1995–2024	Actual, 2024	2025	2035	2045	2055
Revenues	**17.2**	**17.1**	**17.1**	**18.3**	**18.9**	**19.3**
Individual income taxes	8.1	8.4	8.7	10.0	10.5	10.9
Payroll taxes	6.0	5.9	5.8	5.9	5.9	5.9
Corporate income taxes	1.7	1.8	1.7	1.2	1.2	1.2
Other	1.4	0.9	0.9	1.1	1.2	1.3
Outlays	**21.1**	**23.4**	**23.3**	**24.4**	**25.3**	**26.6**
Mandatory	12.3	14.1	14.0	15.1	15.6	16.1
Social Security	4.5	5.0	5.2	6.0	5.9	6.1
Major health care programs	4.4	5.6	5.8	6.7	7.6	8.1
Medicare	2.6	3.0	3.1	4.0	4.8	5.2
Medicaid, CHIP, and premium tax credits and related spending	1.8	2.6	2.7	2.7	2.8	2.9
Other mandatory	3.3	3.4	3.0	2.4	2.1	1.9
Discretionary	7.0	6.3	6.1	5.3	5.1	5.1
Net interest	1.8	3.1	3.2	4.1	4.6	5.4
Total deficit (-)	**-3.9**	**-6.4**	**-6.2**	**-6.1**	**-6.4**	**-7.3**
Primary deficit (-)	-2.1	-3.3	-3.0	-2.1	-1.8	-1.9
Debt held by the public at the end of each period	60	98	100	118	136	156

See Chapter 1 and Chapter 2. When October 1 (the first day of the fiscal year) falls on a weekend, certain payments that would have ordinarily been made on that day are instead made at the end of September and thus are shifted into the previous fiscal year. Outlays and deficits have been adjusted to remove the effects of those timing shifts.

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The Long-Term Demographic and Economic Outlook

Demographic trends are key determinants of the long-term budget and economic outlook. In CBO's projections, the U.S. population grows more slowly over the next 30 years than it did over the past 30 years. Without immigration, the population would begin to shrink in 2033, in part because fertility rates remain below the rate that would be required for a generation to replace itself.

Economic Growth

In CBO's projections, real GDP grows at an average rate of 1.6 percent per year from 2025 to 2055, slightly slower than the growth of real potential GDP—the maximum sustainable output of the economy—over that period. Real potential GDP is projected to increase at an average rate of 1.7 percent per year over the next 30 years, slower than the 2.4 percent average growth seen over the past 30 years. That slowdown is attributable to slower growth over the 2025–2055 period in the potential labor force (an estimate of how big the labor force would be if economic output and other key variables were at their maximum sustainable amounts) and of potential labor force productivity (the ratio of real potential GDP to the potential labor force).

Potential Labor Force

The potential labor force grows by an average of 0.3 percent per year over the next 30 years—much more slowly than the average annual growth of 0.8 percent seen over the past 30 years. Most of that slowdown stems from slower population growth and increases in the average age of the population.

Potential Labor Force Productivity

The growth of potential labor force productivity slows over the next 30 years because of two key factors: the slower accumulation of capital (mainly attributable to increased federal borrowing) and slower growth of total factor productivity (the average real output per unit of combined labor and capital services) in the nonfarm business sector.

Inflation and Interest Rates

Inflation slows through 2027 to a rate that is consistent with the Federal Reserve's long-term goal of 2 percent. Over that period, interest rates on 10-year Treasury notes stay close to their average over the past 30 years. Interest rates are projected to face upward pressure from increases in federal borrowing and downward pressure from slowdowns in the growth of the labor force.

Changes in CBO's Economic Projections

Compared with last year's long-term economic projections, CBO's current projections include slower average annual growth of real GDP, slower growth of real potential GDP over the latter part of the projection period, a smaller labor force at the end of the period, little change in the outlook for inflation, and generally lower interest rates. The slower growth of real GDP in this year's projections stems mainly from slower growth of private investment and consumer spending over the next decade and slower growth of real potential GDP over the last decade of the projection period. The slower growth of real potential GDP reflects a reduction in CBO's projections of population growth. Changes to population projections also reduce the projected growth of the labor force over the last 10 years of the projection period. The interest rate on 10-year Treasury notes is lower than CBO projected last year because of changes to CBO's method for forecasting interest rates on Treasury securities; those changes account for projections of inflation that are lower in the future than historical averages.

Outlook for **Economic Growth**

The growth of real GDP averaged **2.5%** per year over the past 30 years. Over the next 30 years, real GDP growth averages **1.6%** per year.

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The Demographic and Economic Outlook in Four Figures

Outlook for the **Population**

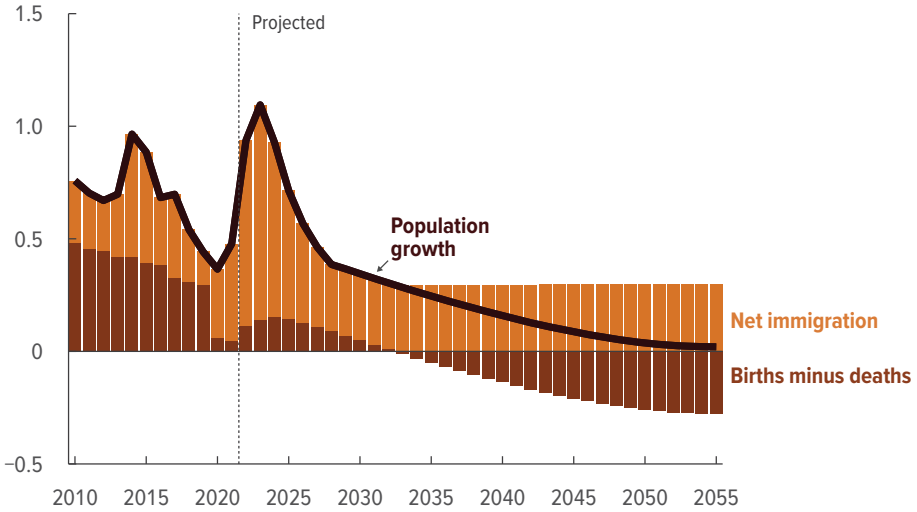
Without immigration, the U.S. population would start to shrink in 2033.

Slower growth of the population leads to slower growth in the labor force.

Population Growth and Contributing Factors

In CBO's projections, deaths exceed births beginning in 2033. Thereafter, without immigration, the U.S. population would shrink.

Percent

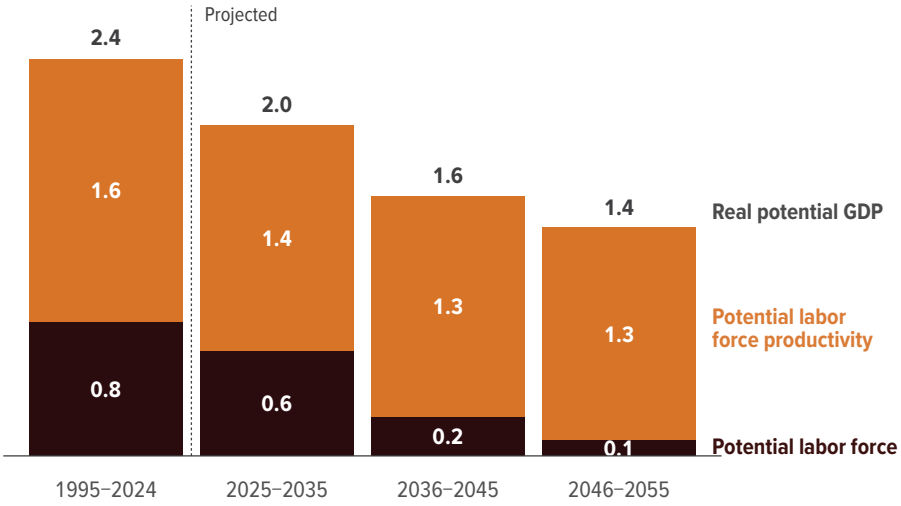


See Figure 3-1 on page 30.

Average Annual Growth of Real Potential GDP and Its Components

Real potential GDP grows more slowly from 2025 to 2055 than it has, on average, over the past 30 years. That decline is explained by slower projected growth in the size and productivity of the potential labor force.

Percent



See Figure 3-3 on page 33.

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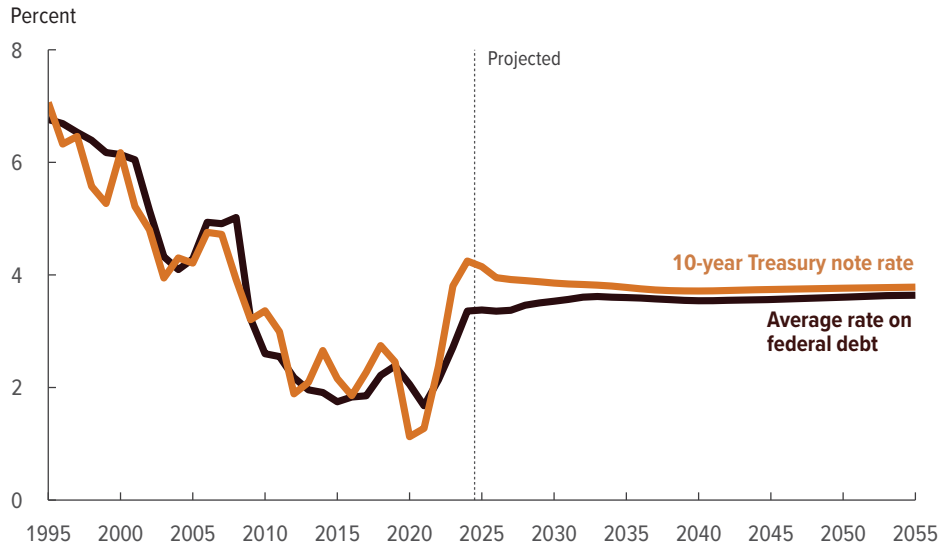
Average Interest Rates on Federal Debt and on 10-Year Treasury Notes

In CBO's projections, the interest rate on 10-year Treasury notes and the average rate on federal debt held by the public through 2025 are similar to what they were, on average, over the past 30 years. Interest rate projections reflect upward pressure from growing federal debt and downward pressure from slower growth of the labor force.

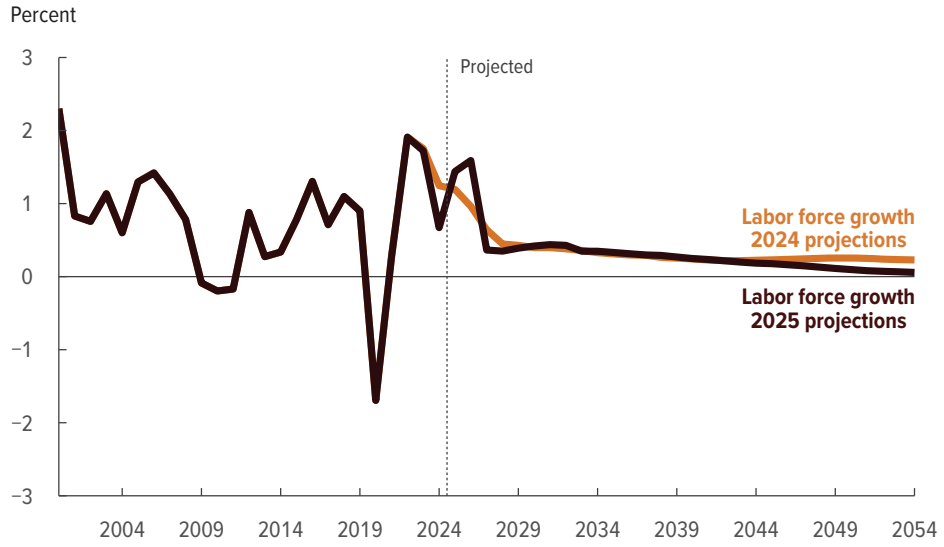
See Figure 3-4 on page 36.



CBO's 2024 and 2025 Projections of Labor Force Growth

In CBO's current projections, the labor force grows at roughly the same rate through 2044 as CBO projected last year. After that, the labor force grows more slowly in this year's projections than in last year's because of slower projected growth of the population.

See Figure B-2 on page 46.



The Long-Term Economic Outlook, by Calendar Year

Percent

	Average, 1995–2024	Actual, 2024	2025	2035	2045	2055
Growth of real (inflation-adjusted) GDP	2.5	2.8	2.1	1.8	1.5	1.4
Inflation						
Growth of the PCE price index	2.1	2.5	2.2	2.0	2.0	2.0
Growth of the consumer price index for all urban consumers	2.5	3.0	2.2	2.3	2.3	2.3
Labor force participation rate	64.7	62.6	62.7	61.4	61.4	61.2
Unemployment rate	5.6	4.0	4.3	4.3	4.2	4.0
Interest rates						
On 10-year Treasury notes	3.7	4.2	4.1	3.8	3.7	3.8
On all federal debt held by the public (by fiscal year)	3.8	3.4	3.4	3.6	3.6	3.6

See Chapter 3 and Appendix C.

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Chapter 1: Debt and Deficits

Overview

Over the next 30 years, if current laws generally remained unchanged, federal debt held by the public would grow far beyond any previously recorded level, the Congressional Budget Office projects. That increase in the debt would be driven by persistently large total deficits—the result of high and rising interest costs and sustained primary deficits (that is, deficits excluding net outlays for interest; see Figure 1-1).

In CBO's projections, federal debt, measured in relation to the size of the economy, surpasses its historical peak in 2029. That large and growing debt has significant economic and financial consequences. Over time, it slows economic growth, drives up interest payments to foreign holders of U.S. debt, makes the nation's fiscal position more vulnerable to an increase in interest rates, heightens the risk of a fiscal crisis, and increases the likelihood of other adverse outcomes.

The long-term budget projections in this report are based on the demographic, economic, and 10-year budget projections that CBO published in January 2025. The demographic projections reflect information, laws, and policies that were in place as of November 15, 2024. The economic projections reflect laws, policies, and economic developments as of December 4, 2024. The budget projections incorporate the effects of legislation enacted as of January 6, 2025.[1] The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas. CBO is working to analyze the effects of policy changes that have occurred since the projections in this report were finalized. (Several of those would lower CBO's projections of net immigration.)

Even if federal laws and policies remained unchanged, CBO's budget projections would be subject to considerable uncertainty. If developments in the economy, demographics, or other factors that affect revenues and outlays diverged from the agency's projections, budgetary outcomes would diverge as well. That uncertainty grows over time because changes in factors that affect the budget become increasingly difficult to anticipate over longer time horizons.

Debt and Deficits Through 2055

In CBO's projections, federal debt held by the public rises in every year of the 2025–2055 period, reaches 156 percent of gross domestic product (GDP) in 2055, and remains on course to grow larger thereafter (see Table 1-1).[2] In 2029, it climbs to 107 percent of GDP, exceeding the historical peak of 106 percent reached in 1946, immediately after World War II.

An alternative measure, gross federal debt, amounts to 123 percent of GDP in 2025 and grows to 169 percent of GDP by 2055. Gross federal debt consists of debt held by the public and debt held by government accounts. It can be challenging to use as an indicator of the government's overall financial position because about one-fifth of gross federal debt is held in federal trust funds, mostly for Social Security, federal and military retirement programs, and Medicare. When outlays exceed revenues for such a program, gross debt is unchanged even though the government's overall financial position has worsened.[3]

1. For more details, see Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875, *Additional Information About the Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/61135, and *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

2. Debt held by the public is a measure that indicates the extent to which federal borrowing affects the availability of private funds for other borrowers. All else being equal, an increase in government borrowing reduces the amount of money available to other borrowers, putting upward pressure on interest rates and reducing private investment. That measure of debt is the one CBO uses most often in its reports on the budget.

3. When outlays for a program such as Social Security exceed its revenues, the Treasury issues debt to the public to cover the shortfall and finance payments to beneficiaries. After that issuance of securities to the public, the Treasury redeems a corresponding amount of securities from the trust funds, which reduces the debt held by government accounts.

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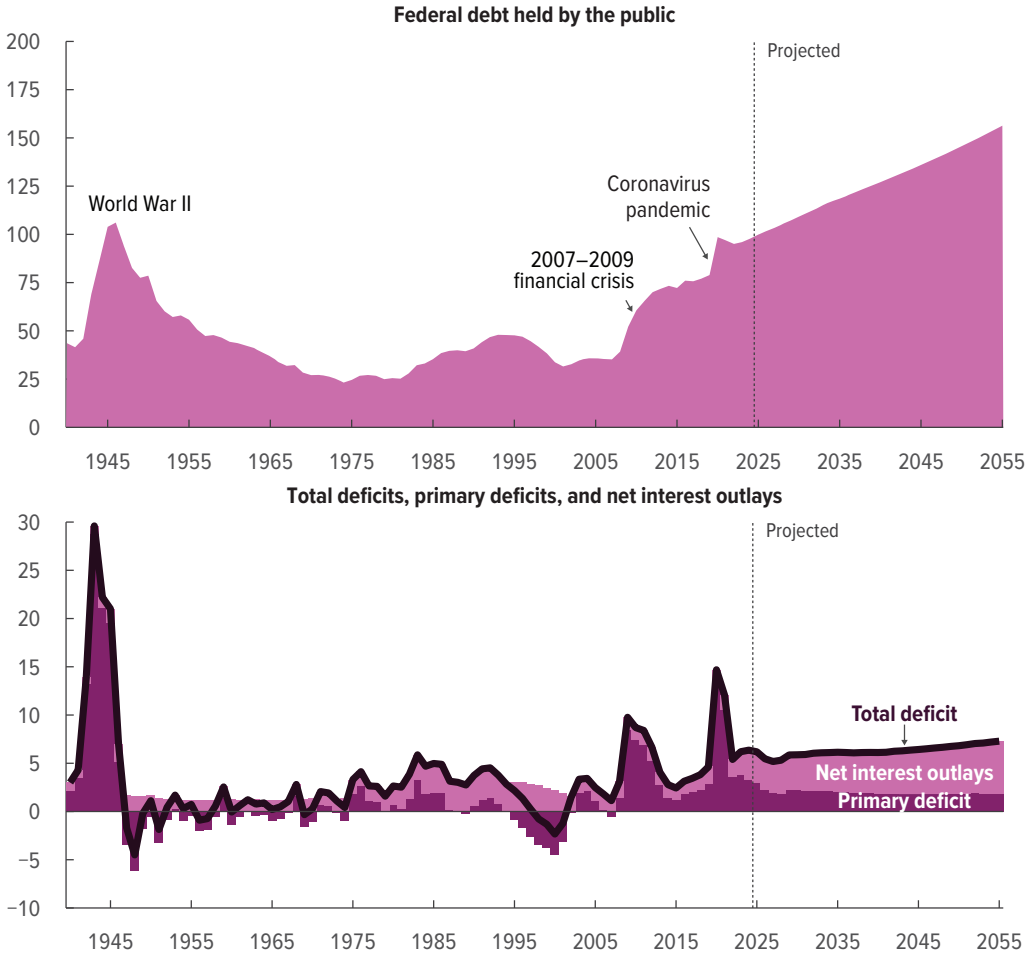
Figure 1-1.

Debt and Deficits

Percentage of GDP



In CBO's projections, federal debt held by the public, which is already large by historical standards, grows further over the next 30 years. By 2055, that debt rises to 156 percent of GDP and is on track to continue increasing.

The total deficit increases over the next 30 years, reaching 7.3 percent of GDP in 2055. Net interest outlays reach 5.4 percent of GDP in 2055, boosted by the rising average interest rate on federal debt and by sustained primary deficits. Throughout that period, when measured as a share of GDP, those outlays are larger than their average over the past 50 years.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

Primary deficits exclude net outlays for interest. In this figure, deficits were calculated by subtracting revenues from outlays; thus, positive values indicate deficits, and negative values indicate surpluses, which occur when revenues exceed outlays.

GDP = gross domestic product.

The increase in debt held by the public in CBO's projections results from persistently large deficits. From 2025 to 2055, deficits average 6.3 percent of GDP—more than one and a half times their average over the past half century. By 2055, they reach 7.3 percent of GDP. That growth in total deficits occurs for two reasons: higher interest costs and sustained primary deficits.

Net interest costs increase in relation to GDP between 2025 and 2055. Those costs reach 5.4 percent of GDP in 2055 and are larger in every year than their average of 2.1 percent of GDP over the past 50 years. Higher average interest rates on federal debt held by the public account for about a quarter of the projected rise in net interest costs over the 2025–2055 period; primary deficits account for the rest.

The primary deficit averages 2.0 percent of GDP over the 30-year period and settles at 1.9 percent of GDP in

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2055.[4] Over the past 50 years, by comparison, primary deficits averaged 1.7 percent of GDP. The persistent primary deficits in CBO's projections reflect a trend that began in 2008. Primary surpluses (in which revenues exceed noninterest spending) occurred in about one-third of the years between 1975 and 2007. None have occurred since.

Consequences of Large and Growing Federal Debt

If federal debt held by the public kept growing faster than GDP, as CBO projects it would under current law, it would have far-reaching implications for the nation's fiscal and economic outlook.[5] That large and growing debt would have many consequences, including the following:

- Borrowing costs throughout the economy would rise, reducing private investment and slowing the growth of economic output.
- Rising interest costs associated with federal debt would drive up interest payments to foreign holders of that debt and thus decrease national income.
- The United States' fiscal position would be more vulnerable to an increase in interest rates, because the larger debt is, the more an increase in interest rates raises debt-service costs.
- The risk of a fiscal crisis—that is, a situation in which investors lose confidence in the value of the U.S. government's debt—would increase. Such a crisis would cause interest rates to rise abruptly and other disruptions to occur.
- The likelihood of other adverse outcomes would also increase. For example, expectations of higher inflation could erode confidence in the U.S. dollar as the dominant international reserve currency.
- Lawmakers might feel constrained from using federal tax and spending policies to respond to unforeseen events or for other purposes, such as to promote economic activity or strengthen national defense.

When policymakers consider legislation that would increase the debt, they face a trade-off between those effects of greater debt and the other effects for people, businesses, and the economy as a whole of policies that would increase federal spending or reduce taxes.[6] For example, federal investment—including investment financed by deficits—raises productivity in the private sector and boosts output. That increased output would generally lead to increased revenues; however, those additional revenues would probably not fully offset the budgetary costs of the increased investment and any borrowing needed to finance it.[7] As another example, reductions in individual income tax rates would strengthen people's incentive to work, which would drive up the supply of labor and, thus, increase output. Again, that increased output would generally lead to increased revenues; however, those additional revenues would probably not fully offset the budgetary costs of the reductions in tax rates.[8] The effects of policy changes would depend on the specifics of the policies. Policymakers also might consider multiple policies together, taking their overall impact into account.

Slower Economic Growth

Large and growing federal debt would slow economic growth over time. That slower growth would result from a decrease in private investment, though some factors would bolster investment, partially offsetting that decline.

The increased federal borrowing associated with larger amounts of debt reduces the resources available for private investment. It also tends to drive up interest rates, which raises borrowing costs in both the public and private sectors. As a result, investment in capital used to produce goods and services decreases. That reduction in private investment would slow economic growth. Specifically, as investment in capital declined, workers would, on average, have fewer resources to do their jobs. Consequently, they would be less productive, their compensation would be lower, and they would therefore be less inclined to work. Those effects would increase over time as federal borrowing grew.

4. Primary deficits reflect the difference between noninterest spending and revenues—the main mechanisms through which lawmakers can directly influence the trajectory of federal debt and interest costs.

5. For more details about federal debt and the consequences of its growth, see Congressional Budget Office, *Federal Debt: A Primer* (March 2020), www.cbo.gov/publication/56165.

6. Larger debt can also have benefits. For instance, higher interest rates on Treasury securities can help people save for retirement by increasing the returns they earn on those assets.

7. See Congressional Budget Office, *Effects of Physical Infrastructure Spending on the Economy and the Budget Under Two Illustrative Scenarios* (August 2021), www.cbo.gov/publication/57327.

8. For a discussion of the effects of changes in individual income tax rates on revenues, see Congressional Budget Office, "Additional Information About the Effects of Expiring Provisions of the 2017 Tax Act in CBO's Baseline Projections," *CBO Blog* (December 4, 2024), www.cbo.gov/publication/60987.

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Table 1-1.

Key Projections for Selected Years

Percentage of GDP

	2025	2035	2045	2055
Revenues				
Individual income taxes	8.7	10.0	10.5	10.9
Payroll taxes	5.8	5.9	5.9	5.9
Corporate income taxes	1.7	1.2	1.2	1.2
Other[a]	0.9	1.1	1.2	1.3
Total	**17.1**	**18.3**	**18.9**	**19.3**
Outlays				
Mandatory				
Social Security	5.2	6.0	5.9	6.1
Major health care programs[b]	5.8	6.7	7.6	8.1
Other	3.0	2.4	2.1	1.9
Subtotal	14.0	15.1	15.6	16.1
Discretionary	6.1	5.3	5.1	5.1
Net interest	3.2	4.1	4.6	5.4
Total	**23.3**	**24.4**	**25.3**	**26.6**
Total deficit (-)[c]	**-6.2**	**-6.1**	**-6.4**	**-7.3**
Primary deficit (-)[c,d]	**-3.0**	**-2.1**	**-1.8**	**-1.9**
Debt held by the public at the end of the period	**100**	**118**	**136**	**156**

Continued

The projected reduction in private investment stemming from larger amounts of debt is partially offset by several factors. First, additional government borrowing strengthens people's incentive to save, partly by driving up interest rates, and increased saving generally leads to increased investment.[9] Second, higher interest rates tend to attract more foreign capital to the United States, and some of those funds become available for private investment. And third, policies that increase federal borrowing while strengthening people's incentives to work and save, encouraging businesses to invest, or supporting effective federal investment would boost private-sector productivity and, therefore, private investment.[10]

Increased Interest Payments to Foreign Holders of U.S. Debt

If federal debt held by the public continued to grow, the government would spend more on interest payments—including payments to foreign investors, who currently hold roughly one-third of that debt overall. Increases in interest payments to foreign investors would, in turn, reduce the nation's net international income, which is the difference between income received from and paid to foreign residents, firms, and governments. When net international income declines, national income also declines, all else being equal.[11]

Greater Vulnerability to an Increase in Interest Rates

Larger amounts of debt make the United States' fiscal position more vulnerable to an increase in interest rates. The

9. Some people might also increase their saving if they expect lawmakers to raise taxes or cut spending on benefits to cover the cost of the additional debt. See Jonathan Huntley, *The Long-Run Effects of Federal Budget Deficits on National Saving and Private Domestic Investment*, Working Paper 2014-02 (Congressional Budget Office, February 2014), www.cbo.gov/publication/45140.

10. See Congressional Budget Office, *Effects of Physical Infrastructure Spending on the Economy and the Budget Under Two Illustrative Scenarios* (August 2021), www.cbo.gov/publication/57327, and *The Macroeconomic and Budgetary Effects of Federal Investment* (June 2016), www.cbo.gov/publication/51628.

11. When foreign holdings of U.S. debt increase, so do interest payments to foreign investors, which decreases national income—but the increase in demand for Treasury securities causes interest rates to fall, which increases national income. The net effect of those forces on national income depends on a number of factors, including the sensitivity of interest rates to increases in foreign demand for federal debt and the economic effects of changes in spending or revenues that the debt was issued to finance.

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Table 1-1. Continued

Key Projections for Selected Years

Percentage of GDP

	2025	2035	2045	2055
Addendum:				
Social Security				
Revenues[e]	4.5	4.7	4.7	4.6
Outlays[f]	5.2	6.0	5.9	6.1
Contribution to the deficit (-)[c,g]	**-0.7**	**-1.3**	**-1.2**	**-1.4**
Medicare				
Revenues[e]	1.5	1.6	1.7	1.7
Outlays[f]	3.8	4.9	6.0	6.6
Offsetting receipts	-0.7	-0.9	-1.2	-1.4
Contribution to the deficit (-)[c,g]	**-1.7**	**-2.4**	**-3.1**	**-3.5**
GDP at the end of the period (trillions of dollars)	30.1	43.9	62.9	88.4

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

This table provides information specified in section 3111 of S. Con. Res. 11, the Concurrent Resolution on the Budget for Fiscal Year 2016.

CBO's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which conform to a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

When October 1 (the first day of the fiscal year) falls on a weekend, certain payments that ordinarily would have been made on that day are instead made at the end of September and thus are shifted into the previous fiscal year. All projections have been adjusted to exclude the effects of those timing shifts.

GDP = gross domestic product.

a. Consists of excise taxes, remittances to the Treasury from the Federal Reserve System, customs duties, estate and gift taxes, and miscellaneous fees and fines.

b. Consists of outlays for Medicare (net of premiums and other offsetting receipts), Medicaid, and the Children's Health Insurance Program, as well as premium tax credits for health insurance purchased through the marketplaces established under the Affordable Care Act and related spending. The premium tax credits subsidize the purchase of health insurance. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

c. When outlays exceed revenues, the result is a deficit. Values in this row were calculated by subtracting outlays from revenues; thus, negative values indicate deficits.

d. Primary deficits exclude net outlays for interest.

e. Includes payroll taxes other than the employer's share of payroll taxes that federal agencies pay; those payments are intragovernmental transactions. Also includes income taxes paid on Social Security benefits, which are credited to the Social Security and Medicare trust funds.

f. For Social Security, outlays do not include those related to the administration of the program, which are discretionary. For Medicare, outlays include those related to the administration of the program. Outlays for those two programs do not include intragovernmental offsetting receipts stemming from the employer's share of payroll taxes that federal agencies pay.

g. The net increase in the deficit shown here differs from the change in the trust fund balance for the program. It does not include intragovernmental transactions, interest earned on balances, or outlays related to the administration of the program.

amounts of debt in CBO's projections increase the risk that if interest rates were higher than projected, interest costs would be substantially greater. Conversely, lower interest rates would result in lower-than-projected interest costs.

Greater Risk of a Fiscal Crisis

The likelihood of a fiscal crisis would increase if federal debt continued to grow faster than GDP, because mounting debt could erode investors' confidence in the U.S. government's fiscal position. Such an erosion of confidence would lower the value of Treasury securities and further drive up interest rates on federal debt as investors demanded higher yields to purchase those securities. Concerns about the government's fiscal position could lead to a sudden increase in people's expectations for inflation or a drop in the value of the dollar, either of which would make a fiscal crisis more likely.

A fiscal crisis could lead to a financial crisis. In a fiscal crisis, increases in Treasury rates would reduce the market value of outstanding government securities. The resulting losses incurred by institutions and businesses—including insurance companies, banks, mutual funds, and pension funds—could be large enough to cause

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some financial institutions to fail. Because the United States plays a central role in the international financial system, such a crisis could spread globally as liquidity declined and financial institutions reduced their lending, leading to an economic contraction.

Risk Factors. The risk of a fiscal crisis depends on more than the amount of federal debt. Ultimately, it is the government's cost of servicing the debt and its ability to refinance that debt that matter. Among the factors affecting debt-service costs and the ability to refinance are investors' expectations about the budget, the economy, and domestic and international financial conditions, including interest rates and exchange rates.

CBO cannot reliably quantify the probability of a fiscal crisis. In the agency's assessment, no tipping point can be identified at which the debt-to-GDP ratio would become so high that it would make a crisis likely or imminent, nor is there a specific tipping point beyond which interest costs would become so high in relation to GDP that they were unsustainable.

Risk of a Crisis in the Near Term. Although the risk of a fiscal crisis cannot be reliably quantified, it appears to be low in the near term despite the large amount of federal debt. The near-term risk is mitigated by certain characteristics of the U.S. financial system that tend to sustain demand for Treasury securities. For example, the Federal Reserve conducts independent monetary policy, government debt is issued in U.S. dollars, the dollar holds a central place in the global financial system, and few investments can provide returns comparable to those of Treasury securities at similarly low levels of credit risk.

Concern about a fiscal crisis in the near term is not currently apparent in financial markets. However, the risk of a fiscal crisis could change suddenly in the wake of unexpected events. For example, a rise in interest rates that persisted for an extended period could cause investors to become concerned about the government's fiscal position over the long term.

Increased Likelihood of Other Adverse Effects

Even in the absence of a fiscal crisis, large and growing debt could have adverse effects on the economy in addition to those already incorporated in CBO's projections. Those effects could include a gradual decline in the value of Treasury securities and other domestic assets, heightened expectations of inflation, and a loss of confidence in the U.S. dollar as the dominant international reserve currency. Such developments would make it more difficult to finance public and private activity.

Increased Perception of Fiscal Constraints Among Lawmakers

The size of the debt might make lawmakers feel constrained from using deficit-financed fiscal policy to respond to unforeseen events, promote economic activity, or further other goals. Large amounts of debt could also undermine the international geopolitical role of the United States if lawmakers were reluctant to increase spending to prepare for or respond to an international crisis. In addition, as debt and the resulting interest costs continued to grow, greater adjustments to the noninterest components of the budget would be required to reduce deficits.

Uncertainty of CBO's Long-Term Projections

CBO's budget projections are intended to show what would happen to federal spending, revenues, deficits, and debt if current laws governing taxes and spending generally remained the same. Actual outcomes will depend on future legislative, administrative, and judicial actions, which could increase or decrease budget deficits.

Even if federal laws remained unchanged over the next three decades, budgetary outcomes would differ from those in CBO's projections because of unanticipated changes in economic conditions, demographics, or other factors. Those other factors include the extent to which people receive benefits and tax preferences and the costs of goods and services linked to government subsidies, including food and health care.

Uncertainty About the Economic Outlook

CBO's economic projections are subject to a high degree of uncertainty. For instance, severe and protracted economic downturns are rare, but if such a downturn occurred, budgetary outcomes could significantly diverge from those in CBO's projections. Economic downturns can reduce revenues and raise outlays for unemployment insurance, nutrition assistance, and other programs that provide support to people and businesses. In addition, downturns have historically prompted lawmakers to enact legislation that further reduces revenues and increases federal spending in an effort to increase people's income, bolster the financial position of state and local governments, and stimulate economic activity and employment.

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Conversely, economic growth could be stronger than CBO projects. An increase in productivity—because of technological changes, for example—or the discovery and development of natural resources could cause such a development. In that case, revenues would be higher than CBO projects, and outlays, including those for income support programs, would be lower.

The effect of artificial intelligence (AI) on the economic outlook is another source of uncertainty. Because AI has the potential to change how businesses and the federal government produce and provide goods and services, it could affect economic growth, employment and wages, and the distribution of income in ways that are difficult to predict. The direction of those effects (that is, whether they would increase or decrease federal revenues or spending), their size, and their timing are all uncertain.[12]

The impact of climate change is also uncertain. CBO expects climate change to reduce economic growth over the coming decades, and the effects of climate change are expected to increase over time. However, because climate change is an evolving phenomenon, the nature and extent of those effects are uncertain.[13] (For a discussion of the effects of climate change on CBO's projections of economic growth, see Appendix C.)

Another source of uncertainty is how the average interest rate on federal debt held by the public will evolve. A change in the international importance of the U.S. dollar could affect the overall demand for Treasury securities and, thus, the path of interest rates. And a shift in the average maturity of newly issued Treasury securities would affect the supply of long-term Treasury securities relative to short-term Treasury securities, which would also affect the path of long-term interest rates. Uncertainty about the path of interest rates contributes to uncertainty about the effects that larger deficits and debt would have on the economy.

Uncertainty About the Demographic Outlook

CBO's long-term demographic projections are subject to significant uncertainty because, compounded over many years, even small changes in rates of net immigration, fertility, or mortality could greatly affect outcomes later in the projection period.

Projections of net immigration are especially uncertain because national and international laws, policies, and economic and political events can have significant effects on migration, and information about migration—particularly information about people who leave the United States—can be scarce.

If fertility rates differed from the agency's projections, some effects on the budget and the economy would occur more quickly than others. For example, a change in fertility rates would affect spending for pregnant women and infants in the Medicaid program in the near term, but those children would not enter the labor force for some time.

In addition, differences in mortality rates would cause outlays for the major health care programs and Social Security to diverge from CBO's projections. If mortality rates were lower than CBO projects, outlays for Medicare and Social Security would grow as people lived longer. If mortality rates were higher than CBO projects, such outlays would be smaller.

12. See Congressional Budget Office, *Artificial Intelligence and Its Potential Effects on the Economy and the Federal Budget* (December 2024), www.cbo.gov/publication/60774.

13. See Chad Shirley and William Swanson, *The Effects of Climate Change on GDP in the 21st Century*, Working Paper 2025-02 (Congressional Budget Office, February 2025), www.cbo.gov/publication/61186; and Congressional Budget Office, *The Risks of Climate Change to the United States in the 21st Century* (December 2024), www.cbo.gov/publication/60845.

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Chapter 2: Spending and Revenues

Overview

In the Congressional Budget Office's projections, which reflect the assumption that current laws governing taxes and spending generally remain unchanged, total federal outlays equal 23.3 percent of gross domestic product (GDP) in 2025, remain near that level through 2028, and increase as a share of the economy each year thereafter, reaching 26.6 percent in 2055.[1] Over the 2025–2055 period, outlays average about 25 percent of GDP—roughly 4 percentage points more than their average from 1975 to 2024 (see Figure 2-1). That increase in outlays over the next 30 years is driven mainly by three factors:

- Higher net interest costs, which result from growing federal debt and a rising average interest rate on that debt;
- Growth in spending on the government's major health care programs—particularly Medicare—caused by the rising cost of health care and the aging of the population (that is, an increase in the average age of the population); and
- Increased spending on Social Security, especially in the first decade of the projection period, which is also due to the aging of the population.

Measured as a percentage of GDP, federal revenues are projected to rise from 17.1 percent in 2025 to 18.2 percent in 2027 largely because of the scheduled expiration of certain provisions of the 2017 tax act (Public Law 115-97). Revenues remain near that level through 2030 in CBO's projections and rise steadily thereafter, reaching 19.3 percent of GDP in 2055. That steady increase occurs mainly because income grows faster than prices, resulting in larger individual income tax receipts. Over the next 30 years, revenues are projected to average about 19 percent of GDP, about 1 percentage point more than they averaged over the past 50 years.

CBO's long-term budget projections, often referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which reflect a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years. (For a description of the specifications underlying the projections, see Appendix A.)

Spending

Federal spending in the United States has exceeded the 26.6 percent of GDP that it is projected to reach in 2055 in only two periods—a three-year span during World War II and two years during the coronavirus pandemic. From 1943 to 1945, when defense expenditures increased sharply, total federal spending topped 40 percent of GDP. In 2020 and 2021, outlays rose to roughly 30 percent of GDP.

The government's spending falls into three broad categories: mandatory spending, discretionary spending, and net outlays for interest. Mandatory spending includes outlays for most federal benefit programs—including the major health care programs and Social Security—and outlays for certain other payments to people, businesses, nonprofit institutions, and state and local governments. Such spending is generally governed by statutory criteria and is not normally constrained by the annual appropriation process.

Discretionary spending encompasses outlays for an array of federal activities that are funded through or controlled

1. Deficits and outlays have been adjusted to exclude the effects of shifts that occur in the timing of certain payments when the fiscal year begins on a weekend. The long-term budget projections in this report are based on the demographic, economic, and 10-year budget projections that CBO published in January 2025. The demographic projections reflect information, laws, and policies as of November 15, 2024. The economic projections reflect laws, policies, and economic developments as of December 4, 2024. The budget projections incorporate the effects of legislation enacted as of January 6, 2025. The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas. See Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875, *Additional Information About the Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/61135, and *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

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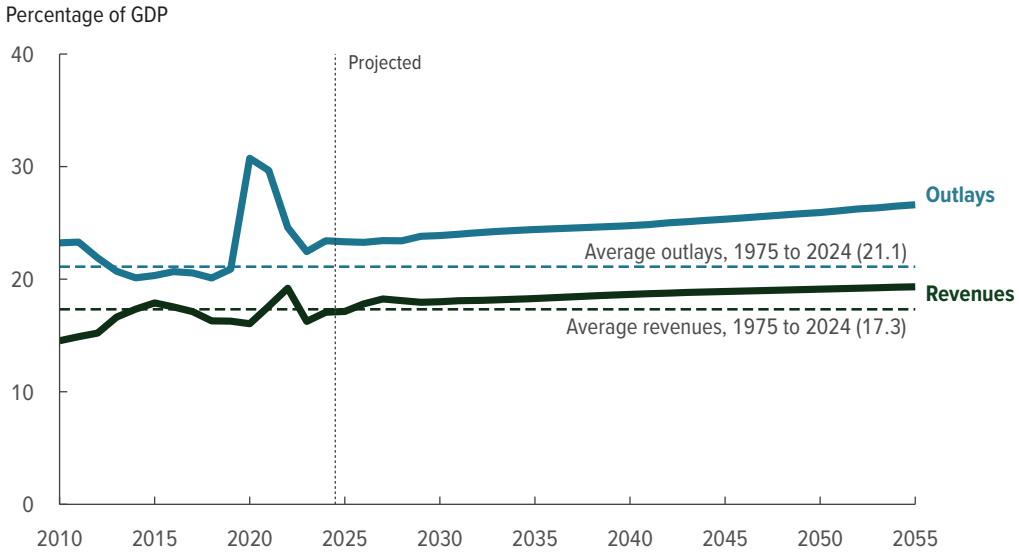
Figure 2-1.

Total Outlays and Revenues



In CBO's projections, outlays exceed revenues in every year, resulting in persistently large budget deficits.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

GDP = gross domestic product.

by appropriations. That category includes most defense spending and spending for many nondefense activities, such as elementary and secondary education, housing assistance, international affairs, the administration of justice, and highway programs.

In the federal budget, net outlays for interest consist of the government's interest payments on federal debt, offset by interest income that the government receives.

CBO's extended baseline includes the following projections of those three categories of outlays (see Figure 2-2):

- Mandatory spending rises steadily from 14.0 percent of GDP in 2025 to 16.1 percent in 2055, driven mostly by growth in outlays for Medicare and, in the first decade, growth in outlays for Social Security.
- Discretionary spending amounts to 6.1 percent of GDP in 2025, declines to 5.1 percent in 2038, and then is assumed to remain at that level through 2055.
- Net outlays for interest increase from 3.2 percent of GDP in 2025 to 5.4 percent in 2055. Such outlays are expected to exceed mandatory spending on all programs other than the major health care programs and Social Security in 2025. If interest costs followed their projected path, net interest outlays would exceed all discretionary outlays in 2052.

Growth in outlays for the major health care programs and in net interest costs reshapes the spending patterns of the federal government over the next three decades in CBO's projections (see Figure 2-3). Net interest costs account for a larger portion of total federal spending in 2055 than they do in 2025. And the share of total noninterest spending going to the major health care programs and Social Security increases from a little more than one-half in 2025 to two-thirds in 2055.

Mandatory Spending

In CBO's extended baseline projections, the growth in mandatory spending is driven by increased spending on the major health care programs and, especially in the first decade, on Social Security. Other mandatory spending declines in relation to GDP over the next 30 years.

Spending on the major health care programs climbs largely because, in CBO's estimation, health care costs per person will continue to rise. The aging of the population also contributes to growth in spending on health care programs and on Social Security. Outlays for Social Security, Medicare, and Medicaid for people age 65 or older account for a share of total federal noninterest spending that increases from 40 percent in 2025 to more than 50 percent in 2055.

Major Health Care Programs. Spending on the major health care programs consists of outlays for Medicare,

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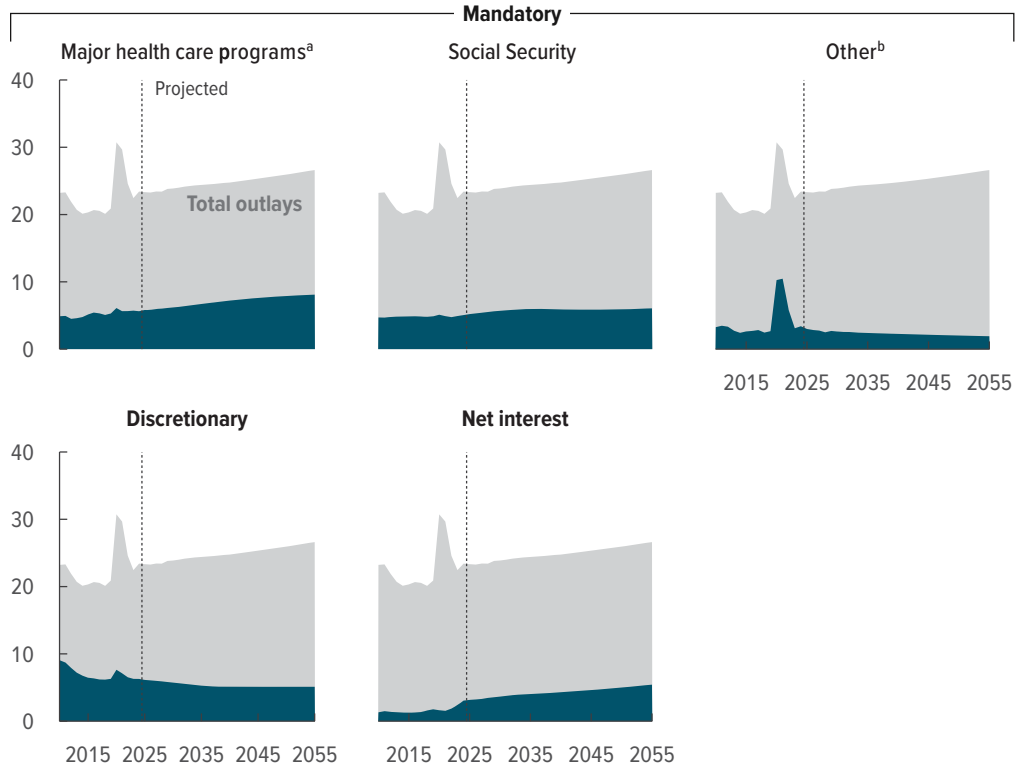
Figure 2-2.

Outlays, by Category

Percentage of GDP



Over the long term, net outlays for interest and spending on the major health care programs and Social Security are projected to rise in relation to GDP; taken together, all other spending is projected to decline.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

GDP = gross domestic product.

a. Consists of outlays for Medicare (net of premiums and other offsetting receipts), Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

b. Consists of all mandatory spending other than that for Social Security and the major health care programs. "Other mandatory" includes the refundable portions of the earned income tax credit, the child tax credit, and the American Opportunity Tax Credit.

Medicaid, the Children's Health Insurance Program (CHIP), and premium tax credits (which subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act) and related spending.[2] Net federal spending on those programs increases from 5.8 percent of GDP in 2025 to 8.1 percent in 2055 in CBO's projections.

The primary driver of that increase is spending on Medicare, which currently provides health insurance to 68 million people (about 90 percent of whom are at least 65 years old). Medicare spending (net of offsetting receipts, which are mostly premiums paid by enrollees) grows by 2.0 percent of GDP over the 30-year projection period, reaching 5.2 percent of GDP in 2055 (see Figure 2-4). Spending on the other major health care programs—that is, outlays for Medicaid, CHIP, and premium tax credits and related spending—grows by 0.2 percent of GDP over the next three decades, reaching 2.9 percent of GDP in 2055.

In CBO's projections, spending on Medicare accounts for over half of all spending on the major health care programs in 2025 and about two-thirds of such spending in 2055. The projected growth in Medicare spending in relation to the size of the economy over the next three

2. Related spending refers to spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

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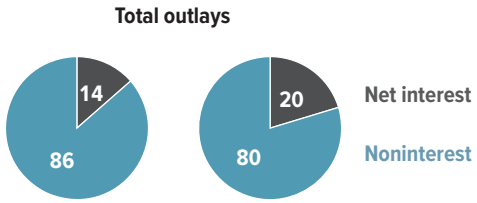
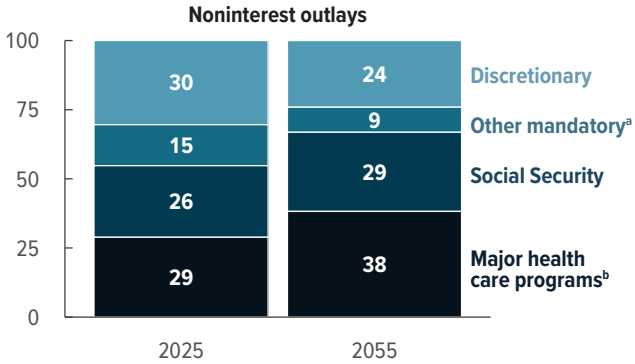
Figure 2-3.

Composition of Outlays, 2025 and 2055

Percent



In CBO's projections for 2055, net interest costs account for one-fifth of all federal outlays, and spending for the major health care programs constitutes nearly two-fifths of noninterest outlays. Those projected shares represent significant increases from 2025.



Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

a. Consists of all mandatory spending other than that for Social Security and the major health care programs. "Other Mandatory" includes the refundable portions of the earned income tax credit, the child tax credit, and the American Opportunity Tax Credit.

b. Consists of outlays for Medicare (net of premiums and other offsetting receipts), Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

decades stems from rising health care costs per person and the aging of the population. (For a discussion of Medicare's trust funds, see Box 2-1.)

Social Security. In CBO's projections, over the next 10 years, spending on Social Security continues a trend that has been underway for nearly two decades by increasing as a percentage of GDP—from 5.2 percent in 2025 to 6.0 percent in 2035. It then remains at about that level through 2055. (For a discussion of the Social Security trust funds, see Box 2-2 on page 24.)

From 2025 to 2035, the number of Social Security beneficiaries increases by 12 million, from 70 million (or 20 percent of the population) to 82 million (or 22 percent of the population). The number of beneficiaries continues to increase thereafter, though more slowly, rising by 14 million over the 2036–2055 period and reaching 97 million (or 26 percent of the population) in that final year. The rate of increase in the number of beneficiaries slows after 2035, in part because the youngest members of the large baby boom generation turn 70—the age by which nearly everyone claims Social Security benefits—in 2034.[3]

Other Mandatory Programs. Other mandatory spending (that is, mandatory spending excluding outlays for the major health care programs and Social Security) includes outlays for the Supplemental Nutrition Assistance Program (SNAP), unemployment compensation, retirement programs for federal civilian and military employees, certain programs for veterans, Supplemental Security Income, and certain refundable tax credits.[4]

Spending on other mandatory programs is projected to total 3.0 percent of GDP in 2025. It then declines as a share of the economy in CBO's projections, falling to 2.4 percent of GDP in 2035 and 1.9 percent in 2055.[5] Such spending averaged 3.2 percent of GDP over the past 50 years and has generally remained between 2 percent and 4 percent of GDP since the mid-1960s.[6]

The projected decline in other mandatory spending through 2035 occurs in part because the benefit amounts for many of the programs are adjusted for inflation each

3. The baby boom generation comprises people born between 1946 and 1964.

4. Refundable tax credits reduce a filer's overall income tax liability (the amount they owe); if the credit exceeds the filer's income tax liability, the government pays all or some portion of that excess to the taxpayer (and the payment is treated as an outlay in the budget). For more information, see Congressional Budget Office, *Refundable Tax Credits* (January 2013), www.cbo.gov/publication/43767.

5. CBO's baseline projections of mandatory spending generally reflect the assumption that current laws remain in place, but section 257(b)(2) of the Balanced Budget and Emergency Deficit Control Act of 1985, which governs those projections, makes exceptions to that general rule for certain programs whose authorization is scheduled to expire, such as SNAP: CBO's baseline projections reflect the assumption that those programs continue as currently authorized.

6. That spending was significantly greater in 2020 and 2021—10.3 percent and 10.5 percent of GDP, respectively.

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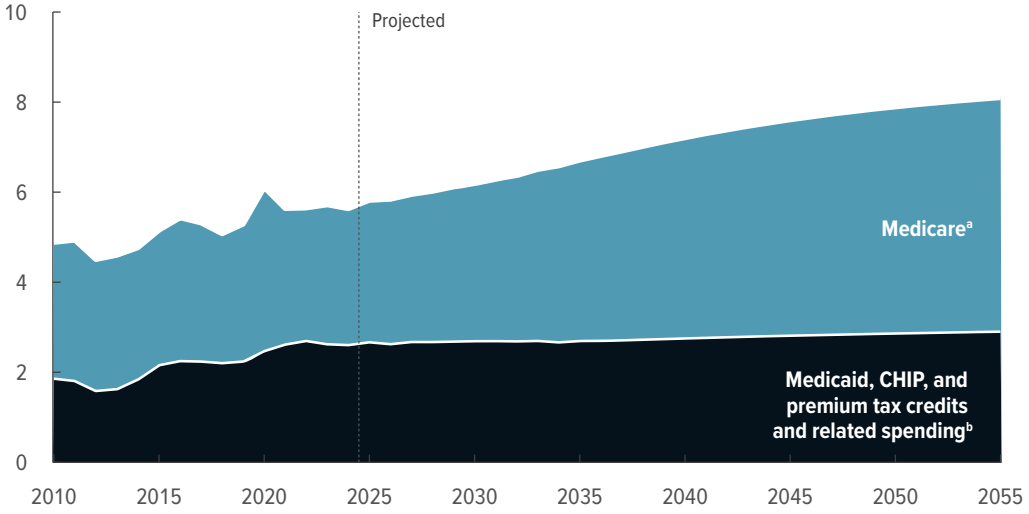
Figure 2-4.

Composition of Outlays for the Major Health Care Programs

Percentage of GDP



Growth in spending on Medicare is projected to account for more than 90 percent of the increase in spending on the major health care programs over the next 30 years.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

CHIP = Children's Health Insurance Program; GDP = gross domestic product.

a. Net of premiums and other offsetting receipts.

b. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

year—and in CBO's economic forecast, inflation is less than the rate of growth in nominal GDP (that is, GDP without any adjustment to account for inflation). After 2035, spending on other mandatory programs, excluding that on refundable tax credits, is assumed to decline as a percentage of GDP at roughly the same annual rate at which it is projected to decline between 2032 and 2035. Outlays for refundable tax credits decline because certain energy-related refundable tax credits are scheduled to expire and because income is projected to grow, pushing more taxpayers into an income range in which tax credits reduce their tax liability (the amount they owe) rather than result in outlays.

Causes of Growth in Mandatory Spending. Rising health care costs per person and the aging of the population are the two main reasons for the sharp increase in projected spending on the major health care programs over the next 30 years. The aging of the population also leads to an increase in spending on Social Security. All told, if the population was not aging (that is, if the age distribution of the population remained as it is in 2025), spending on the major health care programs and Social Security in 2055 would be 2.7 percent of GDP less than CBO projects.

CBO assessed the combined effects of those two factors by projecting what would occur over the 2025–2055 period if health care costs per person (adjusted to remove the effects of demographic changes, such as the aging of the population) grew at the rate of potential GDP per person—a slower rate of cost growth than the agency currently projects—and the average age of the population did not increase.[7] Under those conditions, spending on the major health care programs would be 6.7 percent of GDP in 2055, 0.2 percentage points more than the agency currently projects for 2025. Without the aging of the population, spending on Social Security would be 4.8 percent of GDP in 2055, 0.4 percentage points less than the agency projects for 2025 (see Figure 2-5 on page 25).

Rising Health Care Costs per Person. In CBO's projections for the second and third decades of the projection period, federal health care spending per beneficiary (adjusted to remove the effects of demographic changes)

7. Potential GDP is the maximum sustainable output of the economy. The analysis of the causes of the growth in spending on the major health care programs encompasses gross spending on Medicare and does not reflect receipts credited to the program from premiums and other sources.

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Box 2-1.

Medicare Trust Funds

The Hospital Insurance (HI) Trust Fund is used to pay for benefits under Medicare Part A, which covers inpatient hospital services, care provided in skilled nursing facilities, home health care, and hospice care. The HI trust fund derives income from several sources. In the Congressional Budget Office's projections, about three-quarters of the trust fund's annual income over the next 30 years comes from the Medicare payroll tax, and roughly one-eighth, from income taxes on Social Security benefits, on average. The rest comes from other sources. CBO's projections reflect the assumption—specified in law—that Medicare will continue to pay for benefits under Part A, regardless of the status of the program's trust fund.[1]

Medicare's other trust fund, the Supplementary Medical Insurance (SMI) Trust Fund, is used to pay for outpatient services (including physicians' services) under Part B of the program and prescription drugs under Part D. The SMI trust fund differs from the HI trust fund in that most of its income comes in the form of transfers from the general fund of the Treasury rather than from a specified set of revenues collected from the public.

Exhaustion of the Trust Funds' Balances

One measure of the financial position of a trust fund is the projected year in which the fund's balance would be exhausted. In CBO's projections, the HI trust fund's balance is exhausted in 2052. The balance generally increases through 2038, but expenditures begin to outstrip income the following year.

Although CBO's projections reflect the assumption that benefits would be paid as scheduled even after the HI trust fund was exhausted, total payments to health plans and providers for services covered under Part A would be limited by law to the amount of income credited to the fund after the balance's exhaustion. Total benefits would need to be reduced (in relation to the amounts in CBO's baseline projections) by 6.4 percent in 2053, 6.6 percent in 2054, and 6.9 percent in 2055 for the trust fund's outlays to match its revenues in those years, CBO estimates. It is unclear what changes the Centers for Medicare & Medicaid Services could make to operate the Part A program under those circumstances.

By contrast, the balance of the SMI trust fund cannot be exhausted. The transfers from the general fund that make up most of the fund's income are automatically adjusted to cover the differences between the program's spending and specified income.

Actuarial Balance

Another measure of the financial position of the HI trust fund is its actuarial balance, which is a single number that summarizes the fund's current balance and annual future streams of revenues and outlays over a certain period.[2] In CBO's projections, the HI trust fund's actuarial balance measured over a 25-year period is negative—an actuarial *deficit* of 0.13 percent of taxable payroll (or 0.06 percent of gross domestic product,

1. Provisions in section 257 of the Deficit Control Act require CBO to project spending for certain programs, including Medicare and Social Security, under the assumption that they will be fully funded, and thus able to make all scheduled payments, even if the trust funds associated with those programs do not have sufficient resources to make full payments. See sec. 257(b)(1) of the Balanced Budget and Emergency Deficit Control Act of 1985, Public Law 99-177 (codified at 2 U.S.C. § 907(b)(1)).

2. The actuarial balance is the sum of the present value of projected income and the current trust fund balance minus the sum of the present value of projected outlays and a year's worth of benefits at the end of the period. (A present value is a single number that expresses a flow of current and future income or payments in terms of an equivalent lump sum received or paid today.)

Continued

increases faster than the average of 3.4 percent that potential GDP per person grows annually: On average, annual growth in spending on Medicare per beneficiary is 0.9 percentage points faster, and that in spending on Medicaid per beneficiary 0.2 percentage points faster, than annual growth in potential GDP per person.[8]

That additional cost growth in health care accounts for about half of the increase over the 2025–2055 period in spending on the major health care programs measured as a percentage of GDP.[9]

Aging of the Population. Over the 2025–2055 period, about half of the projected increase in total spending on

8. The amount by which the growth rate of nominal health care spending per person (adjusted to remove the effects of demographic changes) exceeds the growth rate of potential GDP per person is referred to in this report as additional cost growth. For a discussion of how CBO projects federal spending on health care beyond the 10-year budget period, see Congressional Budget Office, *The 2022 Long-Term Budget Outlook* (July 2022), Appendix D, www.cbo.gov/publication/57971.

9. For a description of the methods CBO uses to assess how additional cost growth and the aging of the population affect spending on the major health care programs, see Appendix A.

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Box 2-1. Continued

Medicare Trust Funds

or GDP).[3] In other words, the government could pay for the services prescribed by current law and maintain the necessary trust fund balance, including sufficient funds to provide an additional year's worth of benefits, through 2049 if lawmakers immediately and permanently raised the HI payroll tax rate, which is currently 2.9 percent, by 0.13 percentage points. Other ways to maintain the necessary trust fund balance include reducing payments, combining tax increases with payment reductions, or transferring money to the trust fund by amounts equivalent to 0.13 percent of taxable payroll.

Changes in CBO's Projections Since March 2024

The year in which the HI trust fund's balance is exhausted in CBO's current projections—2052—is 17 years later than it was in the agency's most recent estimate of that date, which was published in March 2024.[4] Measured in relation to taxable payroll, the HI trust fund's 25-year actuarial deficit is 0.45 percentage points smaller in the current projections than it was in last year's. (Measured in relation to GDP, the actuarial deficit is 0.20 percentage points smaller than projected last year.)

CBO now projects expenditures from the trust fund to be smaller and income to the trust fund to be greater than it projected last year. Expenditures are projected to be smaller for three reasons: Spending for Medicare Part A in 2024 was less than anticipated, CBO now expects payments to hospitals to grow more slowly than it did last year, and the agency updated its modeling of federal payments to insurers in the Medicare Advantage program, which allows beneficiaries to receive their Medicare coverage through private plans. Because Medicare fee-for-service spending determines Medicare Advantage benchmarks, the slower growth in Medicare Part A spending led CBO to lower its projections of Medicare Advantage spending. In addition, the Medicare program recently modified the Medicare Advantage payment formula to explicitly exclude payments that cover a portion of medical residency training, known as graduate medical education (GME) payments. Whereas in its previous projections, CBO modeled the effects of the exclusion of those payments as though they reduced Medicare Advantage payments in both Part A and Part B, CBO has changed its model so that the exclusion reduces only Part A Medicare Advantage payments because GME payments are covered only under Part A of Medicare.

CBO's projections of income to the HI trust fund are higher this year than they were last year for three main reasons. First, the agency increased its projections of revenues from payroll taxes because it now projects faster growth in wages and to account for updated historical data from the Department of the Treasury. Second, revenues from the taxation of benefits are greater in the current projections because of changes in the distribution of income and an upward revision to CBO's projections of pension income and Social Security benefits. Finally, interest income to the trust fund is now projected to be greater than estimated last year because of the larger trust fund balances in this year's projections.

Projections of the HI trust fund's finances are sensitive to small changes in projections of its expenditures and income. As a result, those estimates are highly uncertain.

3. Taxable payroll is the total amount of earnings (wages and self-employment income) that is subject to the payroll tax. Although the trust fund remains solvent beyond 2049 in CBO's projections, there is an actuarial deficit because the calculation of the actuarial balance includes an additional year of expenditures. Annual outlays exceed annual revenues to the trust fund in 2050 (the additional year in this case), so that balance is negative.

4. Congressional Budget Office, *The Long-Term Budget Outlook: 2024 to 2054* (March 2024), pp. 20–21, www.cbo.gov/publication/59711.

the major health care programs, measured as a percentage of GDP, is attributable to the aging of the population. The increase primarily results from greater spending on Medicare because it is the largest of the programs and most beneficiaries qualify for it at age 65. (See Figure 3-2 on page 31 for CBO's projections of the population by age group.)[10] As the group of people who qualify for Medicare becomes larger and, on average, older, Medicare spending will grow, not only because of the greater number of beneficiaries but also because spending on health care tends to increase as people age.

From 2025 to 2055, the projected increase in spending on Social Security, measured as a percentage of GDP, is entirely

10. In this report, "population" refers to the Social Security area population, which includes all residents of the 50 states and the District of Columbia, as well as civilian residents of U.S. territories. It also includes federal civilian employees and members of the U.S. armed forces living abroad and their dependents, U.S. citizens living abroad, and noncitizens living abroad who are eligible for Social Security benefits on the basis of their earnings while in the United States.

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Box 2-2.

Social Security Trust Funds

The Social Security program is funded almost entirely by receipts from payroll taxes and income taxes on the program's benefits, which are credited to the Old-Age and Survivors Insurance (OASI) Trust Fund and the Disability Insurance (DI) Trust Fund. Currently, 96 percent of the funding comes from the Social Security payroll tax, which applies to annual earnings below a specified amount ($176,100 in 2025).[1]

Exhaustion of the Trust Funds' Balances

A commonly used measure of Social Security's financial position is the dates by which the balances of the two trust funds would be exhausted. CBO projects that, under current law, the balance of the OASI trust fund would be exhausted in 2033 and the balance of the DI trust fund would be exhausted after the 30-year projection period. If their balances were combined, the balance of the Old-Age, Survivors, and Disability Insurance (OASDI) trust funds would be exhausted in 2034.

CBO has estimated the amounts by which annual benefits would have to be reduced in each year after the trust funds' balances were exhausted for the trust funds' outlays to match their revenues. If the two funds were treated as separate entities, as they are under current law, and the transfer of resources between the funds was not permitted, the reductions in benefits for OASI would begin in 2034. CBO estimates that OASI benefits would need to be reduced (in relation to the amount in CBO's baseline projections) by an amount that rises from 24 percent that year to 28 percent in 2055. (As required by law, CBO's baseline projections reflect the assumption that spending on Social Security continues as scheduled regardless of the amounts in the program's trust funds.) DI benefits would not face reductions in the 2025–2055 projection period.

1. The rest of the funding is from receipts from income taxes on Social Security benefits and from interest earned on the trust funds' balances.

If the trust fund balances were combined, the reductions in benefits would begin one year later. Total OASI and DI benefits would need to be reduced by an amount that rises from 21 percent in 2035 to 26 percent in 2055.

Actuarial Balance

Another commonly used measure of Social Security's financial position is the program's actuarial balance, which summarizes the trust funds' current balances and annual streams of revenues and outlays over a future period, typically 75 years.[2] CBO will release updated projections about Social Security's financial position later this year.

Changes in CBO's Projections Since August 2024

Considering the trust funds individually, CBO projected in August 2024, when it last published its 75-year projections for the Social Security program, that the balance of the OASI trust fund would be exhausted in 2033.[3] The agency has not changed that projection. In the current projections, the balance of the DI trust fund would be exhausted after the 30-year projection period. (CBO will provide an updated projection of the year of exhaustion for the DI trust fund later this year.) In CBO's most recent 75-year projections for the program, that balance was exhausted in calendar year 2064. The year in which the Social Security trust funds' balances, were they combined, is projected to be exhausted—2034—has not changed since last August.

2. The actuarial balance is the sum of the present value of projected income and the current trust fund balance minus the sum of the present value of projected outlays and a year's worth of benefits at the end of the period. (A present value is a single number that expresses a flow of current and future income or payments in terms of an equivalent lump sum received or paid today.)

3. Congressional Budget Office, *CBO's 2024 Long-Term Projections for Social Security* (August 2024), www.cbo.gov/publication/60392.

attributable to the aging of the population.[11] The effects of that aging, which push spending on Social Security up, are partially offset by increases in the full retirement age for Social Security, which reduce lifetime benefits for affected beneficiaries and thus push spending down.[12]

Discretionary Spending

In CBO's long-term projections, discretionary outlays follow the agency's 10-year baseline projections through

11. To assess how the aging of the population would affect spending on Social Security, CBO produced estimates using two scenarios: In the first scenario, the population does not age—that is, the age distribution of the population remains the same as it was in 2025 throughout the projection period. In the second scenario (the scenario underlying the extended baseline), the population ages as projected in CBO's demographic projections. The agency then compared the outcomes under the two scenarios.

12. For more details about the full retirement age for Social Security, see Zhe Li, *The Social Security Retirement Age*, Report R44670, version 14 (Congressional Research Service, July 6, 2022), https://tinyurl.com/yndurmpa.

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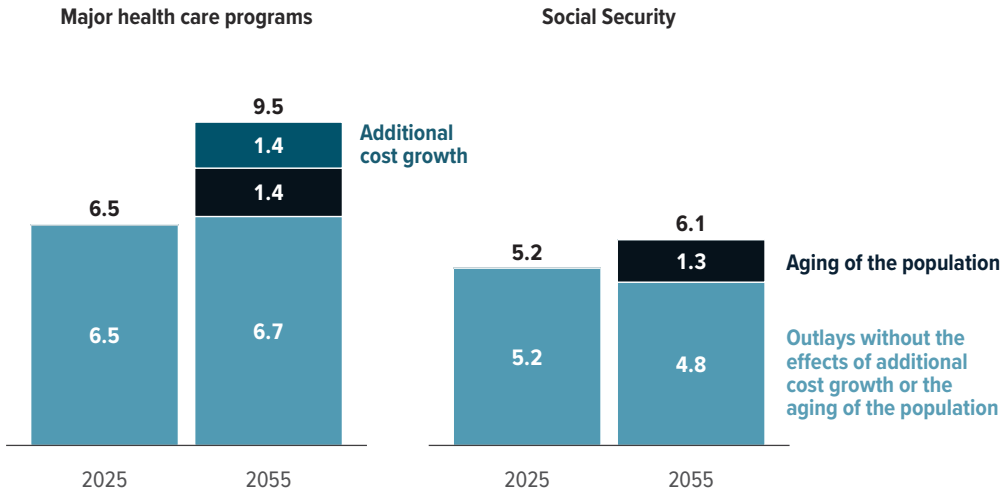
Figure 2-5.

Composition of Growth in Outlays for the Major Health Care Programs and Social Security, 2025 to 2055

Percentage of GDP



Growth in spending on the major health care programs is driven in part by cost growth above and beyond that accounted for by demographic changes and the growth of potential GDP per person. Spending on those programs, as well as spending on Social Security, is also boosted by the aging of the population.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

The spending on the major health care programs examined here consists of gross spending on Medicare (which does not account for premiums or other offsetting receipts), Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

Additional cost growth is the amount by which the growth rate of nominal health care spending per person (adjusted to remove the effects of demographic changes) exceeds the growth rate of potential GDP per person. Potential GDP is the maximum sustainable output of the economy.

GDP = gross domestic product.

2035.[13] On average, about half of all discretionary outlays in those years are dedicated to national defense, largely reflecting the allocation in 2025. The rest of those outlays are for nondefense spending, which funds an array of activities and programs. After 2035, discretionary spending in CBO's projections reflects the assumption that such spending transitions (over a five-year period) to grow at the rate of nominal GDP.

Discretionary spending generally decreases as a percentage of GDP in CBO's extended baseline projections—falling from 6.1 percent in 2025 to 5.1 percent in 2038 and remaining at that level through 2055. From 2038 to 2055, discretionary spending measured in relation to GDP is lower than in any year since at least 1962, the first year for which the Office of Management and Budget reports such data.

Net Outlays for Interest

Over the past 50 years, the government's net interest costs ranged from 1.2 percent to 3.2 percent of GDP, averaging 2.1 percent. In CBO's projections, such costs amount to 3.2 percent of GDP in 2025 and rise to 4.1 percent of GDP in 2035, as federal debt grows and the average interest rate on that debt rises. Net outlays for interest continue to increase thereafter and reach 5.4 percent of GDP in 2055. At that point, they are projected to amount to more than a quarter of revenues, to surpass all discretionary outlays, and to exceed total mandatory outlays for all programs other than the major

13. CBO's current 10-year baseline projections reflect laws that were in place as of January 6, 2025. The continuing resolution then in effect (the American Relief Act, 2025, P.L. 118-158) provided funding for the federal government through March 14, 2025. CBO's baseline incorporates the funding provided by that continuing resolution on an annualized basis—that is, calculated as if the funding provided by the continuing resolution was in effect for the entire fiscal year. Because the resulting amount exceeds the limit, or cap, on discretionary funding for defense programs in 2025 that was established by the Fiscal Responsibility Act of 2023 (P.L. 118-5) and in place when CBO finalized its budget projections, the total amount of such funding and the resulting outlays were adjusted to comply with that cap.

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health care programs and Social Security. And measured as a percentage of GDP, those outlays would be about 70 percent greater than they were at their highest point since at least 1940 (the first year for which the Office of Management and Budget reports such data).

The projected increase in net outlays for interest is the result of increasing interest rates and the rising amount of debt stemming from sustained deficits. In CBO's projections, the average interest rate on federal debt held by the public is 3.4 percent in 2025 and 3.6 percent in 2055. The increase in the average interest rate accounts for about a quarter of the rise in net interest costs over the 2025–2055 period.[14]

Revenues

In CBO's projections, revenues increase from 17.1 percent of GDP in 2025 to 18.2 percent of GDP in 2027. That increase is largely due to the scheduled expiration of certain provisions of the 2017 tax act. In 2028 and 2029, revenues decline in relation to the size of the economy, falling to 17.9 percent of GDP in 2029. But then they increase steadily over the 2030–2055 period, mainly because growth in income boosts individual income tax receipts. In every year after 2025, revenues measured as a percentage of GDP are higher than their average over the past 50 years.[15]

Projected Revenues

In CBO's projections, total revenues measured as a percentage of GDP grow by 2.2 percentage points over the next three decades, reaching 19.3 percent of GDP in 2055. That growth is mainly driven by an increase in individual income tax receipts, which amount to 10.9 percent of GDP in 2055—2.2 percentage points more than the 8.7 percent of GDP they equal in 2025 (see Figure 2-6).

Payroll taxes also increase as a percentage of GDP over the next three decades—by 0.1 percentage point, reaching 5.9 percent of GDP in 2055. Payroll taxes account for most of the revenues credited to the Hospital Insurance Trust Fund and the Social Security trust funds. (For a discussion of the Hospital Insurance Trust Fund, see Box 2-1 on page 22; for more about the Social Security trust funds, see Box 2-2 on page 24.)

The growth in receipts from individual income and payroll taxes is partially offset by declining receipts from corporate income taxes (measured in relation to the size of the economy). Such receipts fall by 0.5 percent of GDP over the next decade and remain at that lower level through the end of the projection period. Receipts from other, smaller sources increase by 0.4 percent of GDP, primarily because remittances to the Treasury from the Federal Reserve increase.

Factors Affecting Revenues

The projected increase over the next 30 years in total revenues measured as a percentage of GDP stems from several factors, including real bracket creep and scheduled changes to individual income tax provisions.

Real Bracket Creep. The income thresholds for the various tax rate brackets in the individual income tax system are indexed to increase with inflation (as measured by the chained consumer price index for all urban consumers, published by the Bureau of Labor Statistics). In CBO's projections, nominal income grows faster than prices, so more income is pushed into higher tax brackets even when the underlying distribution of income remains unchanged. Many other parameters of the tax system are also indexed for inflation, including the amounts of the standard deduction and the earned income tax credit. But certain parameters, such as the amount of the child tax credit, are fixed in nominal dollars and are not adjusted for inflation. The individual income tax system is thus not indexed for real growth (that is, growth beyond the rate of inflation). The process by which real growth pushes income into higher brackets and more taxpayers above the range of income in which they would be eligible for some credits is called real bracket creep. That phenomenon is the largest source of growth in total projected revenues over the next three decades.

If current laws generally remained unchanged, real bracket creep would continue to gradually boost taxes in relation to income, CBO projects, thereby increasing tax receipts by 1.5 percent of GDP over the 2025–2055 period. From 2026 (the first year after certain provisions of the 2017 tax act are scheduled to expire) to

14. For a description of the methods CBO used to determine the change in net interest costs attributable to primary deficits (that is, deficits excluding net outlays for interest) and to changes in the average interest rate, see Appendix A.

15. In general, the projections are based on the assumption that the rules for all tax sources (individual income taxes, corporate income taxes, payroll taxes, and other taxes) will change as scheduled under current law: The sole exception to that assumption is expiring excise taxes dedicated to trust funds. The Balanced Budget and Emergency Deficit Control Act of 1985 requires that CBO's baseline reflect the assumption that those taxes will be extended at their current rates. That law does not stipulate that the baseline include the extension of other expiring tax provisions, even if lawmakers have routinely extended them in the past.

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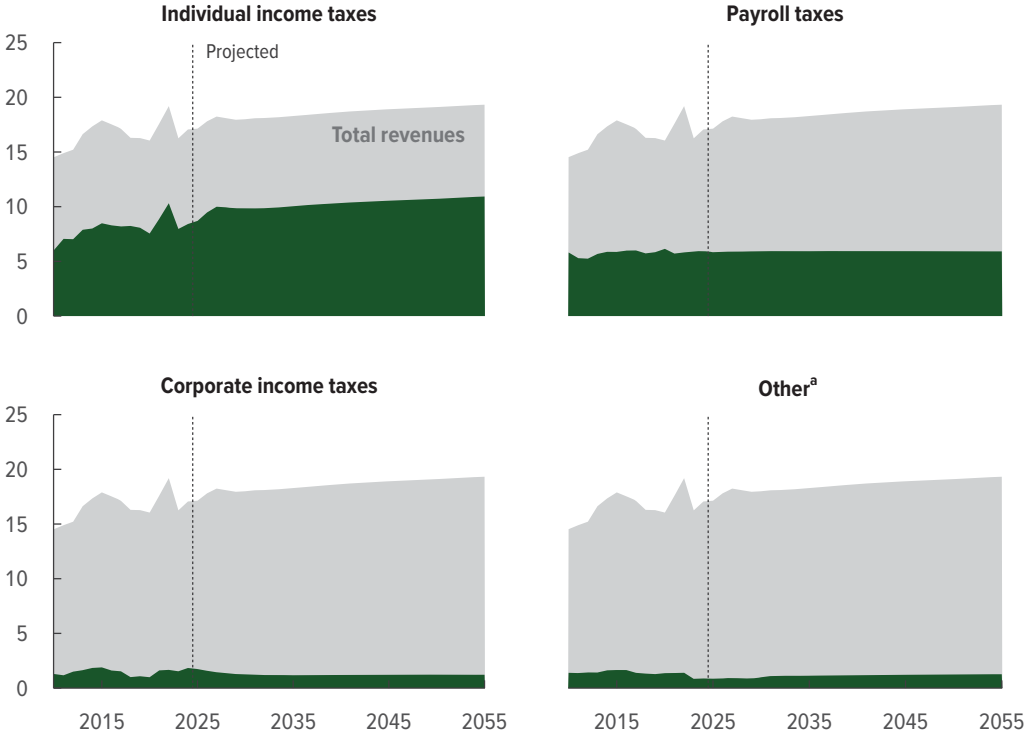
Figure 2-6.

Revenues, by Source

Percentage of GDP



Total revenues grow by more than 2 percent of GDP from 2025 to 2055 in CBO's projections. A decline in corporate income tax receipts, measured in relation to the size of the economy, is more than offset by growth in receipts from individual income taxes, which accounts for nearly all of the net increase. Revenues from payroll taxes and from other taxes also increase, but by a much smaller percentage of GDP.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

GDP = gross domestic product.

a. Consists of excise taxes, remittances to the Treasury from the Federal Reserve System, customs duties, estate and gift taxes, and miscellaneous fees and fines.

2055, the share of income in the highest income bracket (taxed at the top rate of 39.6 percent) would rise by 2 percentage points, and the share of income excluded from taxation (mostly because of exemptions and deductions) would fall by 3 percentage points (see Figure 2-7).[16]

Scheduled Changes to Individual Income Tax Provisions After 2025. Under current law, nearly all the provisions of the 2017 tax act that affect the individual income tax are scheduled to expire at the end of calendar year 2025. Those expirations would boost tax revenues in relation to income. Once in effect, the scheduled changes would lead to higher statutory tax rates, a smaller standard deduction, the return of personal exemptions, and a reduction in the child tax credit. Those changes would cause tax liabilities to rise beginning in calendar year 2026, pushing up receipts in fiscal year 2026 and beyond. CBO projects that in 2055, the scheduled expirations would boost individual income tax revenues, measured as a percentage of GDP, by 0.8 percentage points.

Other Factors. Several other factors affect projected revenues. On net, those factors cause revenues to decrease by 0.1 percent of GDP from 2025 to 2055.

One factor is the projected decrease in corporate income tax receipts, which fall from 1.7 percent of GDP in 2025 to 1.2 percent in 2035 in CBO's projections and then remain at roughly that level through 2055. The decline of 0.5 percent of GDP is attributable to scheduled changes in tax rules, increased claims of tax credits, and the fact that corporate profits grow more slowly than the overall economy.

Another factor causing revenues to decline is the projected growth in health care costs, which reduces revenues by

16. Congressional Budget Office, "How Income Growth Affects Tax Revenues in CBO's Long-Term Budget Projections" (June 2019), www.cbo.gov/publication/55368.

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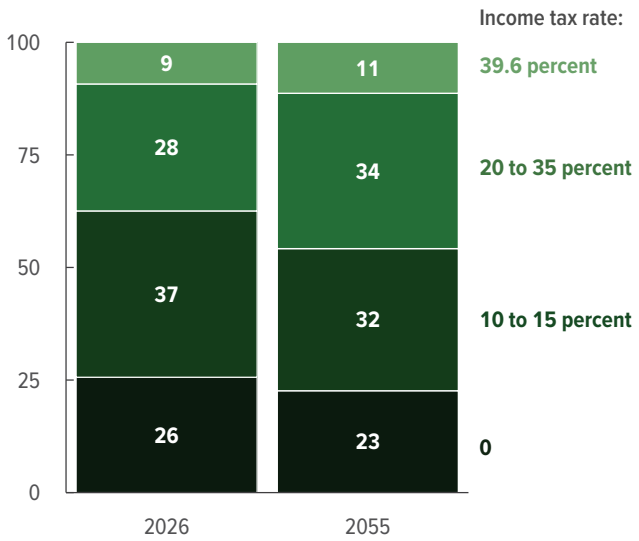
Figure 2-7.

Shares of Income Taxed at Different Rates Under the Individual Income Tax System



Most of the long-term growth in revenues in CBO's projections is due to changes in the shares of individual income taxed at different rates. As income rises faster than prices, more individual income is pushed into higher tax brackets. The share of income taxed at higher rates grows, and the share exempt from taxation shrinks.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

In this figure, income refers to adjusted gross income—that is, income from all sources not specifically excluded by the tax code, minus certain deductions. The income tax rate is the statutory rate specified under the individual income tax system. The lowest statutory tax rate is zero (because of deductions and exemptions).

This figure begins in 2026, the first year after certain provisions of the 2017 tax act are scheduled to expire, so that tax policies remain constant over the period.

0.4 percent of GDP over the next three decades in CBO's projections. The share of employees' compensation that is paid in the form of employment-based health insurance, which is generally not taxable, increases. Consequently, the share of employees' compensation that is paid in the form of wages and salaries, which are subject to income and payroll taxes, declines. That shift in compensation reduces taxable income—and thus revenues from both income and payroll taxes—in relation to GDP.

Partially offsetting those effects are two factors that cause revenues to rise. First, the Federal Reserve is projected to remit larger amounts to the Treasury. Those remittances, which are recorded as revenues, are near zero in 2025 but rise to 0.5 percent of GDP in 2055 in CBO's projections. The second, much smaller, factor is that earnings are projected to grow faster for higher-earning people than for other people in the long term, which would cause a larger share of earnings to be taxed at higher individual income tax rates. The resulting increase in individual income tax revenues would be largely offset by a decrease of nearly the same amount in payroll tax receipts.[17]

17. For additional information, see Brooks Pierce, *How Changes in the Distribution of Earnings Affect the Federal Deficit*, Working Paper 2021-12 (Congressional Budget Office, October 2021), www.cbo.gov/publication/57217.

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Chapter 3: Long-Term Demographic and Economic Projections

Overview

Demographic and economic trends are key determinants of the long-term budget outlook. By the Congressional Budget Office's estimate, the U.S. population will grow more slowly over the next 30 years than it did over the past 30 years. CBO projects that without immigration, the population would begin to shrink in calendar year 2033, in part because fertility rates are projected to remain below the rate necessary for a generation to replace itself. In addition, the average age of the population is projected to increase (a trend referred to as the aging of the population), primarily because of low fertility rates and a general decline in mortality rates.

The output of the U.S. economy—as measured by the nation's gross domestic product (GDP)—is also projected to grow more slowly over the next three decades than it did over the past three decades. That slowdown stems partly from CBO's projection that the labor force will expand at a slower pace through 2055 than it has over the past 30 years, mainly because of slower population growth and a declining rate of participation in the labor force. The projected slowdown in the growth of output also stems from a slower accumulation of capital in the economy because of increased federal borrowing to fund the budget deficits projected to occur under current law (see Chapter 1).

In CBO's economic projections, the annual rate of inflation slows in 2025 and 2026 and then remains consistent with the Federal Reserve's long-term goal of 2 percent. Over the 2025–2055 period, the interest rate on 10-year Treasury notes stays close to its average of the past 30 years. Projected interest rates reflect upward pressure from increases in federal borrowing and downward pressure from slowdowns in the growth of the labor force. CBO's economic projections account for the effects on the economy of deficits and of changes in taxes and spending scheduled to take place under current law.

The demographic projections in this report reflect information, laws, and policies as of November 15, 2024. The economic projections reflect developments in the economy as of December 4, 2024, as well as laws enacted and policy measures taken through that date. The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas. CBO is working to analyze those effects. (For a description of the specifications underlying these long-term projections, see Appendix A.)

Demographic Projections

The size and the age profile of the population affect the U.S. economy and the federal budget. For instance, the population's size and age structure largely determine the number of people in the labor force and thus affect GDP and federal tax revenues. Those demographic factors also affect federal spending—for example, the size of the population age 65 or older influences the number of beneficiaries of Social Security, Medicare, and Medicaid.

To estimate the size and structure of the population in future years, CBO projects rates of fertility, mortality, and net immigration (the number of people who enter the United States minus the number who leave). In CBO's projections, the U.S. population increases from 350 million people at the beginning of 2025 to 372 million at the beginning of 2055.[1] The average growth rate over that 30-year period—0.2 percent a year—is about one-quarter of the average annual rate seen over the past three decades (0.8 percent).

1. The measure of population that CBO uses in its demographic projections is the Social Security area population, which is relevant for estimating payroll taxes and benefits for Social Security. That population includes all residents of the 50 U.S. states and the District of Columbia, as well as civilian residents of U.S. territories. It also includes federal civilian employees and members of the U.S. armed forces living abroad and their dependents, U.S. citizens living abroad, and noncitizens living abroad who are eligible for Social Security benefits on the basis of their earnings while in the United States. For more information about CBO's population projections, see Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875.

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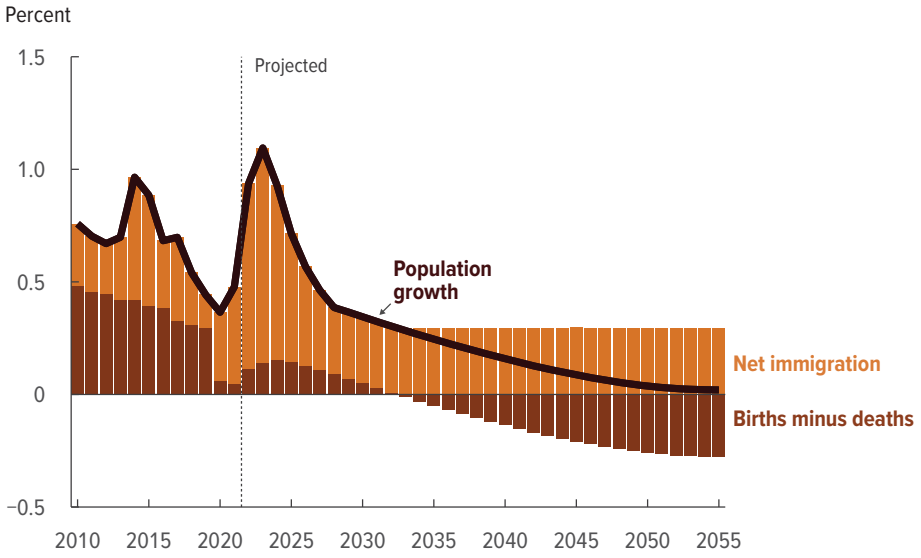
Figure 3-1.

Population Growth and Contributing Factors



By 2033, annual deaths exceed annual births in the United States in CBO's projections. After that, net immigration more than accounts for projected population growth; without immigration, the U.S. population would shrink after 2033.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

The population referred to in this figure is the Social Security area population, which includes all residents of the 50 U.S. states and the District of Columbia, as well as civilian residents of U.S. territories. It also includes federal civilian employees and members of the U.S. armed forces living abroad and their dependents, U.S. citizens living abroad, and noncitizens living abroad who are eligible for Social Security benefits on the basis of their earnings while in the United States.

In CBO's projections, population growth is increasingly driven by immigration, partly because the total fertility rate remains below the rate needed for a generation to replace itself.[2] Starting in 2033, the number of deaths begins to exceed the number of births, meaning that the U.S. population would shrink without immigration (see Figure 3-1).[3]

The share of the population age 65 or older is projected to increase over the coming decades, continuing a long-standing trend (see Figure 3-2). From 2015 to 2024, that share rose from 14.4 percent to 17.9 percent, driven mainly by the aging of members of the large baby boom generation that was born between 1946 and 1964. The percentage of the population age 65 or older continues to increase in CBO's projections, rising from 18.3 percent in 2025 to 21.2 percent in 2035 and 23.4 percent in 2055.

Economic Projections

The state of the U.S. economy in coming decades will affect the federal government's budget deficits and debt. Key to CBO's long-term budget projections are its projections of real GDP (nominal GDP adjusted to remove the effects of changes in prices), the labor force, inflation, and interest rates. Among other factors, CBO's economic forecast incorporates the effects of projected deficits on private investment and the effects of marginal tax rates (the percentage of an additional dollar of income that is paid in taxes) on the supply of labor and on saving by households and businesses.

CBO's long-term economic projections are extended versions of the 10-year baseline projections that the agency published earlier this year.[4] For a discussion of how the long-term economic projections have changed since March 2024, when CBO published its previous

2. The total fertility rate represents the average number of children that a woman would have if, in each year of her life, she experienced the birth rates observed or assumed for that year and if she survived her entire childbearing period (which CBO defines as ages 14 to 49).

3. For details about CBO's projections of fertility, mortality, and net immigration, see Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875.

4. The 10-year projections are described in Congressional Budget Office, *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

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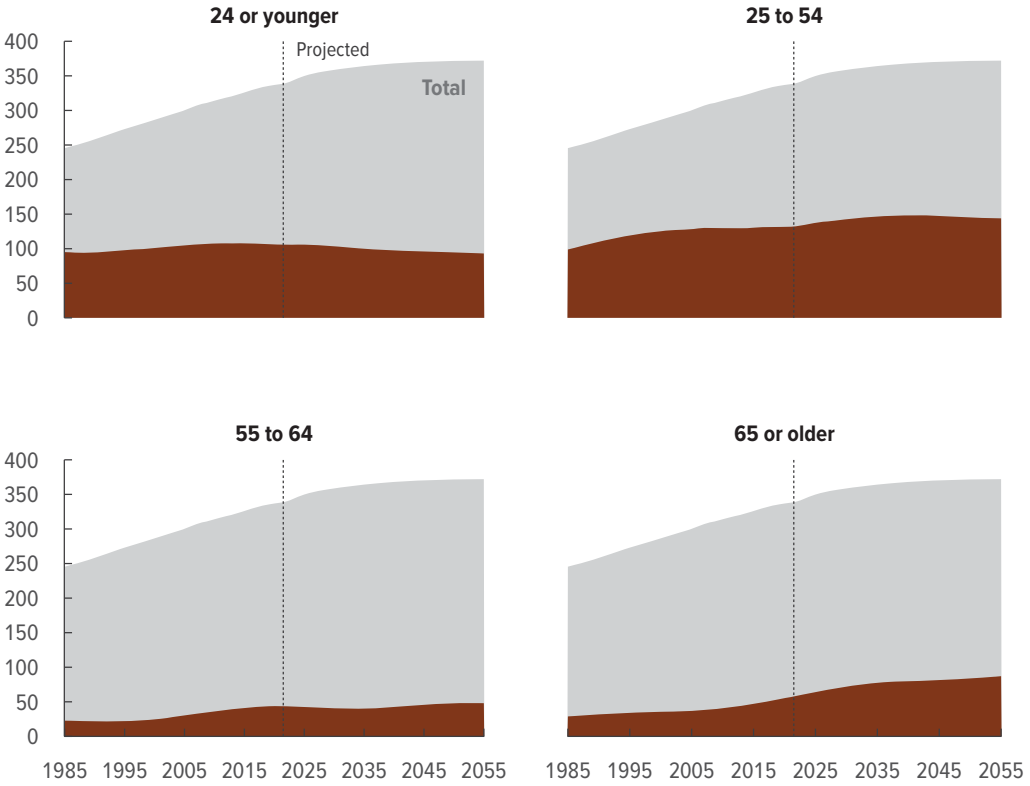
Figure 3-2.

Population, by Age Group

Millions of people



In CBO's 30-year projections, the number of people age 65 or older grows more quickly than the number of people ages 25 to 54. That difference affects the size of the labor force because people age 65 or older are less likely to work and are generally eligible for Social Security retirement benefits and Medicare. In addition, the number of people age 24 or younger declines in CBO's projections.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

The population referred to in this figure is the Social Security area population, which includes all residents of the 50 U.S. states and the District of Columbia, as well as civilian residents of U.S. territories. It also includes federal civilian employees and members of the U.S. armed forces living abroad and their dependents, U.S. citizens living abroad, and noncitizens living abroad who are eligible for Social Security benefits on the basis of their earnings while in the United States.

extended baseline projections, see Appendix B. For long-term projections of other economic factors—such as employment, capital accumulation, and productivity—see Appendix C.

Real GDP

In CBO's projections of economic output—which affect the agency's projections of revenues from income and payroll taxes—real GDP grows at an average rate of 1.6 percent a year through 2055. The growth of real GDP slows over that 30-year period, from an annual average of 1.8 percent in the first decade to 1.4 percent in the third decade (see Table 3-1).

That decline in the growth of real GDP reflects a projected decline in the growth of real potential GDP—the amount of real GDP that the U.S. economy could produce if labor and capital were employed at their maximum sustainable rates. In CBO's projections, real GDP is larger than real potential GDP (a difference known as the output gap) from 2025 to 2028. Real GDP grows more slowly through 2032 as it returns to its long-run relationship with real potential GDP, in which the total amount of real GDP is 0.5 percent smaller than real potential GDP.

The growth rates of real GDP and real potential GDP are projected to converge in 2032. After that, GDP is projected to be smaller than potential GDP by 0.5 percent, on average, through 2055. That projection reflects CBO's assessment that real GDP falls short of real potential GDP during and after economic downturns for

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Table 3-1.

Average Annual Values for Key Economic Variables That Underlie CBO's Extended Baseline Projections

Percent

	1995–2024	2025–2035	2036–2045	2046–2055	Overall, 2025–2055
Growth of GDP					
Real GDP	2.5	1.8	1.6	1.4	1.6
Real potential GDP[a]	2.4	2.0	1.6	1.4	1.7
Potential labor force[b]	0.8	0.6	0.2	0.1	0.3
Potential labor force productivity[c]	1.6	1.4	1.3	1.3	1.3
Real GDP per person	1.7	1.2	1.4	1.3	1.3
Nominal GDP (fiscal years)	4.7	3.9	3.7	3.5	3.7
Labor force growth	0.8	0.6	0.2	0.1	0.3
Labor force participation rate[d]	64.7	61.8	61.4	61.4	61.5
Inflation					
Growth of the PCE price index	2.1	2.0	2.0	2.0	2.0
Growth of the CPI-U	2.5	2.3	2.3	2.3	2.3
Growth of the GDP price index	2.2	2.0	2.0	2.0	2.0
Interest rates					
On 10-year Treasury notes					
Nominal rate	3.7	3.9	3.7	3.8	3.8
Real rate	1.2	1.6	1.5	1.5	1.5
On all federal debt held by the public (fiscal years)[e]	3.8	3.5	3.6	3.6	3.6

Data sources: Congressional Budget Office; Bureau of Economic Analysis; Bureau of Labor Statistics; Federal Reserve. See www.cbo.gov/publication/61187#data.

Real values are nominal values that have been adjusted to remove the effects of changes in prices.

The labor force consists of people age 16 or older in the civilian noninstitutionalized population who have jobs or are unemployed (available for work and either seeking work or expecting to be recalled from a temporary layoff). The civilian noninstitutionalized population excludes members of the armed forces on active duty and people in penal or mental institutions or in homes for the elderly or infirm.

CPI-U = consumer price index for all urban consumers; GDP = gross domestic product; PCE = personal consumption expenditures.

a. An estimate of the amount of real GDP that could be produced if labor and capital were employed at their maximum sustainable rates.

b. An estimate of how big the labor force would be if economic output and other key variables were at their maximum sustainable amounts.

c. The ratio of real potential GDP to the potential labor force. The sum of growth of the potential labor force and growth of potential labor force productivity is equal to growth of real potential GDP.

d. The percentage of the civilian noninstitutionalized population age 16 or older that is in the labor force.

e. The interest rate on all federal debt held by the public equals net interest payments in the current fiscal year divided by debt held by the public at the end of the previous fiscal year.

longer periods, and by larger amounts, than it exceeds real potential GDP during economic expansions.[5]

5. One recent study explains the existence of an average negative output gap (in which actual output is smaller than potential output) by examining asymmetric fluctuations in the unemployment rate. See Stéphane Dupraz, Emi Nakamura, and Jón Steinsson, "A Plucking Model of Business Cycles" (unpublished draft, April 2024), https://tinyurl.com/yvcb2emu. Also see Congressional Budget Office, *Why CBO Projects That Actual Output Will Be Below Potential Output on Average* (February 2015), www.cbo.gov/publication/49890.

Real Potential GDP

As part of its economic forecasting, CBO estimates how factors such as the supply and productivity of labor drive the growth of real potential GDP. That estimated output grew at an average rate of 2.4 percent a year from 1995 to 2024. In CBO's extended baseline projections, the growth of real potential GDP slows in the next 30 years—from an average of 2.0 percent a year over the next decade to an average of 1.4 percent a year over the 2046–2055 period—and averages 1.7 percent a year over the entire projection period. That projected slowdown

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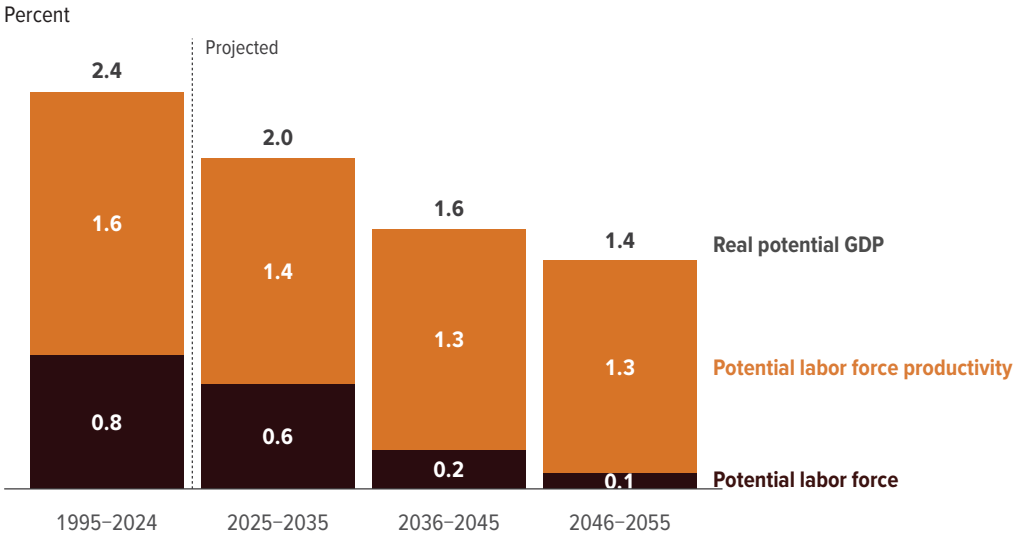
Figure 3-3.

Average Annual Growth of Real Potential GDP and Its Components



Real potential GDP is projected to grow more slowly from 2025 to 2055 than it has, on average, over the past 30 years. That decline is explained by slower projected growth in the size and productivity of the potential labor force.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

Real values are nominal values that have been adjusted to remove the effects of changes in prices.

Real potential GDP is an estimate of the amount of real GDP that could be produced if labor and capital were employed at their maximum sustainable rates. Its growth is the sum of the growth of the potential labor force and of potential labor force productivity. The potential labor force is an estimate of how big the labor force would be if economic output and other key variables were at their maximum sustainable amounts. Potential labor force productivity is the ratio of real potential GDP to the potential labor force.

The bars show average annual growth rates over the specified periods.

GDP = gross domestic product.

is attributable to slower growth in the two variables that determine the growth of real potential GDP:

- The potential labor force (an estimate of how big the labor force would be if economic output and other key variables were at their maximum sustainable amounts), and
- Potential labor force productivity (the ratio of real potential GDP to the potential labor force).

Potential Labor Force. The rate which the potential labor force expands each year is projected to slow in coming decades, from an average of 0.6 percent over the 2025–2035 period to 0.1 percent over the 2046–2055 period (see Figure 3-3). Much of the growth of the labor force over the next decade—especially in 2025 and 2026—results from projected increases in net immigration. (CBO's immigration projections are based on information available as of November 15, 2024.)

Over the next 30 years, the potential labor force grows at an average rate of 0.3 percent per year in CBO's projections. That growth is much slower than the average rate of 0.8 percent per year seen over the past 30 years. Most of the projected slowdown reflects slower population growth and the aging of the population.

Potential Labor Force Productivity. The productivity of the potential labor force is also projected to grow more slowly over the next three decades: at an average annual rate of 1.3 percent, down from an average of 1.6 percent over the past 30 years. In CBO's projections, potential labor force productivity increases by an average of 1.4 percent per year from 2025 to 2035 and by an average of 1.3 percent per year from 2046 to 2055.

Two key factors are largely responsible for the slower projected growth of potential labor force productivity: a slowdown in the accumulation of capital (such as structures and equipment, computer software and other intellectual property products, and residential housing) and slower growth of total factor productivity (TFP) in the nonfarm business sector. (TFP is the average real output per unit of combined labor and capital services.

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Its growth is defined as the growth of real output that is not explained by the growth of labor and capital.)

The accumulation of capital is projected to be slower over the next three decades than it was in the past, partly because increased federal borrowing is projected to reduce the resources available for private investment. Greater federal borrowing also tends to raise borrowing costs in both the public and private sectors by driving up interest rates. As a result, investment in capital used for the production of goods and services declines. (The effects of growing federal deficits and borrowing on CBO's economic projections are discussed in more detail at the end of this chapter.)

Total factor productivity in the nonfarm business sector is also expected to increase more slowly over the next three decades than it did over the past three decades. Whereas TFP grew by an average of 1.3 percent per year from 1995 to 2024, CBO projects that it will grow at an average rate of 1.0 percent per year through 2055. That slower growth is attributable to several projected changes, including a slowdown in the pace at which workers' educational attainment increases, declines in federal investment spending measured in relation to the size of the economy, and the effects of climate change on factors that affect production (see Appendix C for more details).[6]

Real GDP per Person

On a per-person basis, real GDP is expected to increase at an average annual rate of 1.3 percent over the 2025–2055 period—more slowly than the average annual growth rate of 1.7 percent seen over the past 30 years.[7] In CBO's projections, the annual growth of real GDP per person rises from an average of 1.2 percent over the first decade of the projection period to an average of 1.4 percent over the 2036–2055 period, as population growth slows more than growth of real GDP.

Nominal GDP

Nominal GDP (which includes the effects of inflation) affects CBO's projections of federal spending. The agency projects that nominal GDP will increase by 4.4 percent in 2025 and then grow more slowly over the next several years. That projected slowdown reflects a slowing of inflation—as measured by the change in the GDP price index—and of the growth of real GDP. Over the second and third decades of the projection period, the growth rate of nominal GDP reflects the projected growth of real potential GDP and projected inflation as measured by the GDP price index. At the end of that period, in 2055, nominal GDP is projected to grow by 3.4 percent.

The Labor Force

CBO's projections of the labor force affect the agency's projections of other economic variables, such as potential GDP.[8] For example, when the potential labor force grows more quickly, potential GDP increases faster than it would otherwise. And as the labor force expands, the amount of investment increases to equip new workers with capital (such as equipment or software) to use in production. That increase causes private capital to accumulate more quickly than it would otherwise, further boosting the growth of potential GDP.

Growth of the Labor Force. In CBO's projections, the labor force expands from 171 million people in 2025 to 185 million in 2055. The growth of the labor force slows over that 30-year period, averaging 0.6 percent a year from 2025 to 2035 and 0.1 percent a year from 2046 to 2055—much lower than the average growth rate of 0.8 percent a year seen over the past three decades.

The size and growth of the labor force depend on the number of people in different demographic groups and on the rates at which they participate in the labor market. For its economic projections, CBO uses its projections of the number of people in various demographic groups. Those population projections can be significantly affected by net immigration. For example, CBO projects that net immigration will increase the size of the overall population in

6. For more information about the effects of climate change on the economy, see Chad Shirley and William Swanson, *The Effects of Climate Change on GDP in the 21st Century*, Working Paper 2025-02 (Congressional Budget Office, February 2025), www.cbo.gov/publication/61186; and Congressional Budget Office, *The Risks of Climate Change to the United States in the 21st Century* (December 2024), www.cbo.gov/publication/60845.

7. To develop its projections of real GDP per person, CBO uses a measure called the resident population plus armed forces overseas. That measure of population includes U.S. residents and members of the armed forces on active duty stationed outside the United States but excludes military dependents, and other U.S. citizens, living abroad.

8. The labor force consists of people age 16 or older in the civilian noninstitutionalized population who have jobs or are unemployed (available for work and either seeking work or expecting to be recalled from a temporary layoff). The civilian noninstitutionalized population excludes members of the armed forces on active duty and people in penal or mental institutions or in homes for the elderly or infirm. The labor force participation rate is the percentage of the civilian noninstitutionalized population age 16 or older that is in the labor force.

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coming years and boost the share of people in age groups that have higher rates of labor force participation.

Labor Force Participation Rate. In CBO's projections, the total labor force participation rate drops over the next decade from 62.6 percent to 61.4 percent, remains fairly steady until 2050, and then declines again, equaling 61.2 percent in 2055. Over the 2025–2055 period as a whole, the participation rate averages 61.5 percent, much lower than the average rate of 64.7 percent seen over the past 30 years.

The projected decline in the labor force participation rate in the next decade continues a downward trend that began in the mid-2000s—a trend that has been driven mostly by the aging of the population. The effect of aging on the participation rate is more pronounced during the next decade, as baby boomers continue to retire, and again starting in 2050, as another large generation (people born between 1981 and 1996) retires. From 2035 to 2050, the impact of aging is fully offset by other factors that affect labor force participation in CBO's projections, such as increases in average educational attainment, keeping the labor force participation rate relatively stable.

To assess the importance of population aging in its projections of the labor force participation rate, CBO calculated what the rate would be in each year of the 30-year projection period if the age-and-sex composition of the population remained the same as it is in 2025. In that hypothetical scenario, the labor force participation rate would rise from 62.6 percent in 2025 to 63.9 percent in 2055, rather than falling to 61.2 percent. Without the aging of the population, the labor force participation rate would rise because educational attainment is projected to increase, on average, and people with higher levels of education generally participate in the labor force at a higher rate. Thus, CBO estimates that the aging of the population reduces the labor force participation rate by 2.7 percentage points by 2055. (In CBO's projections, other factors lessen the decline in the participation rate over the 2025–2055 period to 1.4 percentage points.)

Inflation

General increases in prices affect interest rates and thus interest payments on federal debt. Inflation also affects federal tax revenues and spending by altering income, the parameters of the various tax rate brackets in the federal income tax, and cost-of-living adjustments for certain benefits, such as Social Security. CBO projects several measures of inflation, which focus on changes in the prices of consumer goods and services or in the prices of all goods and services that contribute to GDP.

Personal Consumption Expenditures Price Index. One measure of change in consumer prices is the growth rate of the price index for personal consumption expenditures (PCE), which encompasses a broad range of goods and services. The Federal Reserve sets an explicit goal of 2 percent for the long-term average rate of inflation as measured by the PCE price index. In CBO's projections, the PCE price index grows at rates that are consistent with that goal from 2027 to 2055.

Consumer Price Index. A second measure of change in consumer prices is the consumer price index for all urban consumers (CPI-U). In CBO's projections, CPI-U inflation averages 2.3 percent per year over the 2025–2055 period. That average rate is consistent with the relationship between the CPI-U and the PCE price index during the two decades before the coronavirus pandemic, when CPI-U inflation was 0.3 percentage points higher than PCE inflation, on average. CBO projects that CPI-U inflation will resume that relationship in 2026 and maintain it for the rest of the 30-year projection period.[9]

GDP Price Index. In CBO's projections, the prices of goods and services that contribute to GDP—as measured by the GDP price index—increase at an average rate of 2.0 percent a year over the 2025–2055 period. That average rate is consistent with the relationship between the GDP and PCE price indexes over the past 30 years. In the long term, GDP inflation and PCE inflation are roughly equal.

Interest Rates

CBO projects a set of interest rates that affect the federal budget, including rates on various securities issued by

9. Another measure of inflation is the chained consumer price index for all urban consumers (chained CPI-U). Many tax parameters are adjusted for changes in the chained CPI-U. Historically, inflation as measured by the chained CPI-U has been about 0.25 percentage points lower, on average, than inflation as measured by the CPI-U. CBO's projections reflect that average difference between the two measures. The chained CPI-U tends to grow more slowly than the traditional CPI-U for two reasons. First, it uses a formula that better accounts for households' tendency to substitute goods and services with similar but cheaper alternatives when prices rise. Second, the chained CPI-U is less affected than the CPI-U by statistical bias related to the limited amount of price data that the Bureau of Labor Statistics has available to compute the indexes.

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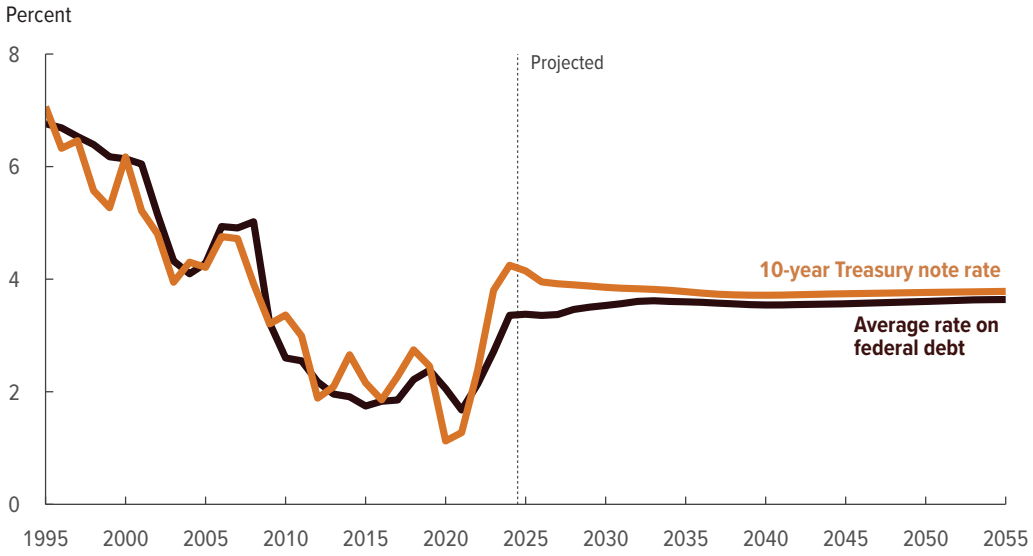
Figure 3-4.

Average Interest Rates on Federal Debt and on 10-Year Treasury Notes



In CBO's 30-year projections, the interest rate on 10-year Treasury notes and the average rate on federal debt held by the public remain close to the averages seen over the past three decades. CBO expects continued downward pressure on interest rates because of slower growth of the labor force, roughly offset by upward pressure on interest rates because of growing federal debt.

Data sources: Congressional Budget Office; Federal Reserve. See www.cbo.gov/publication/61187#data.

Data are for fiscal years. The average interest rate on all federal debt held by the public equals net interest payments in the current year divided by debt held by the public at the end of the previous year.

the Department of the Treasury and rates on special-issue Social Security bonds.

Rate on 10-Year Treasury Notes. In CBO's projections for the 2025–2055 period, the interest rate on 10-year Treasury notes averages 3.8 percent—similar to the 3.7 percent average recorded over the past three decades. The interest rate on 10-year Treasury notes remains roughly flat over the 30-year projection period, averaging 3.9 percent in the first decade and 3.8 percent in the third decade (see Figure 3-4).

The real interest rate on 10-year Treasury notes (calculated by subtracting the percentage increase in the consumer price index from the nominal yield on those notes) is projected to average 1.5 percent over the 2025–2055 period. That rate is 0.3 percentage points higher than the average from 1995 to 2024. (Since 2008, the real interest rate on 10-year Treasury notes has averaged 0.1 percent.)

Factors Affecting Interest Rates. In CBO's assessment, interest rates are largely determined over the long run by structural factors, including demographic trends, people's saving and investment behavior, and the amount of federal debt. Changes in several of those factors have caused real interest rates in the United States to trend downward since the early 1980s.[10]

CBO expects continued downward pressure on interest rates through 2055 because of changes such as slower growth of the labor force, more private domestic and foreign savings available for investment, and slower growth of total factor productivity, relative to their averages over the past three decades. A slowdown in the growth of the labor force and an increase in the total amount of savings available for investment tend to boost the amount of capital per worker in the long run, reducing the return on capital and thus the return on government bonds and other investments.[11] Slower growth of TFP also reduces the return on capital and results in lower interest rates, all else being equal.

10. Edward N. Gamber, *The Historical Decline in Real Interest Rates and Its Implications for CBO's Projections*, Working Paper 2020-09 (Congressional Budget Office, December 2020), www.cbo.gov/publication/56891.

11. For more information about the relationship between the growth of the labor force and interest rates, see Congressional Budget Office, *How Slower Growth in the Labor Force Could Affect the Return on Capital* (October 2009), www.cbo.gov/publication/41325.

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That downward pressure is expected to be roughly offset by upward pressure on interest rates from two other changes: increases in federal debt and in capital income. In CBO's projections, federal debt equals a larger percentage of GDP over the 2025–2055 period than it did, on average, over the past 30 years. When federal debt grows, interest rates tend to go up, raising the cost of borrowing and in turn reducing private investment.[12] That reduction in investment tends to decrease the amount of capital per worker and further increase interest rates and the return on capital over time. In addition, capital income is expected to make up a larger percentage of total income, on average, over the projection period than it did over the past 30 years. In CBO's estimation, having a larger share of income accrue to owners of capital would directly increase the return on capital and thus raise interest rates.

Average Rate on Federal Debt Held by the Public. The interest rate on 10-year Treasury notes tends to be higher than the average interest rate on all federal debt held by the public. The reason is that the average term to maturity of federal debt has been less than 10 years since the 1950s, and interest rates on shorter-term debt are generally lower than those on longer-term debt (which is more risky for investors). In CBO's projections, the average interest rate, by fiscal year, on all federal debt held by the public is 3.6 percent over the 2025–2055 period—0.2 percentage points less than the average interest rate on 10-year Treasury notes.

Rate on Special-Issue Social Security Bonds. The two trust funds that finance the Social Security program (the Old-Age and Survivors Insurance Trust Fund and the Disability Insurance Trust Fund) hold special-issue bonds. In CBO's projections, the interest rate on those bonds averages 2.6 percent through 2035—the year after which the combined balance of the two trust funds is projected to be exhausted. Because interest rates have been low for most of the past decade and are expected to rise, that projected average rate for all bonds held by the Social Security trust funds is lower over the next decade than the projected average interest rate on newly issued bonds. In CBO's projections, the interest rate on newly issued bonds held by the Social Security trust funds equals the rate on 10-year Treasury notes.

Effects of Federal Tax and Spending Policies on CBO's Economic Projections

CBO's economic projections incorporate the effects of the growing federal budget deficits and borrowing projected to occur under current law. Increases in federal borrowing reduce the amount of resources available for private investment and put upward pressure on interest rates, further reducing private investment in capital assets. As a result, economic output is smaller in the long term than it would be otherwise—especially in the last two decades of CBO's 30-year projections. Less private investment also reduces the amount of capital per worker, making workers less productive and leading to lower wages. Those lower wages reduce people's incentive to work and, consequently, lead to a smaller supply of labor.

CBO's economic projections also incorporate the effects of changes in federal tax policies that are scheduled to occur under current law, including the expiration of certain provisions of the 2017 tax act.[13] The expiration of those provisions is scheduled to increase tax rates on individuals' income at the end of 2025.

Even without those rate increases, more income is typically pushed into higher tax brackets over time as income rises faster than inflation. That trend, known as real bracket creep, results in higher effective marginal tax rates on income from labor and capital.[14] Higher marginal tax rates on labor income reduce people's after-tax wages and weaken their incentive to work. Likewise, higher marginal tax rates on capital income weaken people's incentives to save and invest, thereby reducing the stock of capital and in turn decreasing labor productivity. In CBO's projections, that reduction in labor productivity puts downward pressure on wages. All told, less private investment and a smaller labor supply reduce economic output and income in CBO's extended baseline projections.

12. For more information about interest rates and federal debt, see Andre R. Neveu and Jeffrey Schafer, *Revisiting the Relationship Between Debt and Long-Term Interest Rates*, Working Paper 2024-05 (Congressional Budget Office, December 2024), www.cbo.gov/publication/60314.

13. For more information, see Congressional Budget Office, "How the Expiring Individual Income Tax Provisions in the 2017 Tax Act Affect CBO's Economic Forecast" (December 2024), www.cbo.gov/publication/60986.

14. For more information about the effects of real bracket creep on CBO's long-term projections, see Congressional Budget Office, "How Income Growth Affects Tax Revenues in CBO's Long-Term Budget Projections" (June 2019), www.cbo.gov/publication/55368.

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Appendix A: Policy Specifications, Modeling, and Methods

The Congressional Budget Office's long-term budget projections, often referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which reflect a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

Policy Specifications

CBO's extended baseline projections give lawmakers a benchmark against which to measure the effects of policy options or proposed legislation. The projections are not predictions of budgetary outcomes. Rather, they represent the agency's assessment of future spending, revenues, deficits, and debt under the following policy specifications (the first three of which CBO is required by law to incorporate in its baseline projections):

- Current laws affecting revenues and spending generally remain unchanged;
- Some programs—for example, the Supplemental Nutrition Assistance Program—are nevertheless extended after their authorizations lapse;
- Spending on Medicare and Social Security continues as scheduled regardless of the amounts in those programs' trust funds; and
- Discretionary spending follows CBO's 10-year baseline projections through 2035 and then transitions (over a five-year period) to grow at the same rate as nominal gross domestic product (that is, GDP without any adjustment to remove the effects of inflation).

The long-term budget projections in this report are based on the demographic, economic, and 10-year budget projections that CBO published in January 2025. The demographic projections reflect information, laws, and policies as of November 15, 2024. The economic projections reflect laws, policies, and economic developments as of December 4, 2024. The budget projections include the effects of legislation enacted as of January 6, 2025.[1] The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas.

For a summary of the policy specifications about outlays and revenues that underlie CBO's extended baseline projections, see Table A-1.[2]

Models Used to Produce the Extended Baseline

To develop the extended baseline projections, the agency uses a modeling approach that combines the following components:

- A *demographic model*, which is used to project the size of the population and its composition in terms of age and sex;
- A set of *economic forecasting models*, which are used to make baseline projections of economic variables;
- A set of *models for projecting revenues* from each major source;
- A *microsimulation model* that is used to project Social Security outlays beyond CBO's standard 10-year projection period; and

1. Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875, *Additional Information About the Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/61135, and *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

2. For more information about the specifications in law that CBO is required to incorporate in its baseline projections, see Congressional Budget Office, *CBO Explains the Statutory Foundations of Its Budget Baseline* (May 2023), www.cbo.gov/publication/58955.

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Table A-1.

Policy Specifications Underlying CBO's Extended Baseline Projections

	Policy specification
	Outlays
Social Security	As scheduled under current law[a]
Medicare	As scheduled under current law through 2035; thereafter, spending depends on the estimated growth rates of the number of beneficiaries, health care costs per beneficiary, and potential GDP per person, as well as on the estimated additional cost growth for Medicare (which is projected separately for Parts A, B, and D and moves smoothly to a rate of 0.1 percent, 0.2 percent, and 0.6 percent, respectively, by 2055)[a]
Medicaid	As scheduled under current law through 2035; thereafter, spending depends on the estimated growth rates of the number of beneficiaries, health care costs per beneficiary, and potential GDP per person, as well as on the estimated additional cost growth for Medicaid (which is projected to move smoothly to a rate of 0.6 percent by 2055)
Children's Health Insurance Program	As projected in CBO's baseline through 2035; thereafter, spending remains constant as a percentage of GDP
Premium tax credits and related spending[b]	As scheduled under current law through 2035; thereafter, spending depends on the estimated growth rates of the number of beneficiaries and potential GDP per person, as well as on the estimated additional cost growth for private health insurance premiums (which is projected to move smoothly to a rate of 0.6 percent by 2055)
Other mandatory spending	Refundable tax credits are as scheduled under current law through 2055; all other mandatory spending is as scheduled under current law through 2035 and, thereafter, is assumed to decline as a percentage of GDP at roughly the same annual rate at which it declines from 2032 to 2035 in CBO's baseline
Discretionary spending	As projected in CBO's baseline through 2035; thereafter, following a five-year transition period, discretionary spending grows at the same rate as nominal GDP
	Revenues
Individual income taxes	As scheduled under current law
Payroll taxes	As scheduled under current law
Corporate income taxes	As scheduled under current law
Excise taxes	As scheduled under current law[c]
Estate and gift taxes	As scheduled under current law
Other sources of revenues	As scheduled under current law through 2035; thereafter, receipts from other revenue sources remain constant as a percentage of GDP

Data source: Congressional Budget Office.

The extended baseline projections follow the agency's 10-year baseline budget projections and then extend most of the concepts underlying those projections for an additional 20 years.

For CBO's most recent 10-year baseline projections, see Congressional Budget Office, *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

Additional cost growth is the amount by which the growth rate of nominal health care spending per person (adjusted to remove the effects of demographic changes) exceeds the growth rate of potential GDP per person. Potential GDP is the maximum sustainable output of the economy.

GDP = gross domestic product.

a. Reflects the assumption that full benefits would be paid as scheduled under current law, regardless of the amounts in the program's trust funds.

b. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

c. The exception to the current-law assumption applies to expiring excise taxes dedicated to trust funds. The Balanced Budget and Emergency Deficit Control Act of 1985 requires that CBO's baseline reflect the assumption that those taxes would be extended at their current rates. That law does not stipulate that the baseline include the extension of other expiring tax provisions, even if they have been routinely extended in the past.

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- A *long-term budget model* and an *interest rate model*, which are used to project all federal outlays other than those for Social Security beyond the 10-year projection period and to calculate deficits and debt in those years.[3]

Method for Assessing Causes of Growth in Spending on the Major Health Care Programs

One of the main drivers of growing deficits is rising spending on the government's major health care programs—that is, outlays for Medicare, Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending.[4] To assess how additional cost growth and the aging of the population would affect spending on the major health care programs, CBO produced estimates of such spending in 2055 under the following four scenarios:

- **Scenario 1:** The age distribution of the population remains unchanged after 2025, and additional cost growth is held at zero—that is, rather than exceed the growth of potential GDP per person as it does in CBO's projections, nominal health care spending per person (adjusted to remove the effects of demographic changes) grows at the same rate as potential GDP per person. (Potential GDP is an estimate of the amount of GDP that could be produced if labor and capital were employed at their maximum sustainable rates.)
- **Scenario 2:** The age distribution of the population changes as it does in CBO's demographic projections, and there is no additional cost growth.
- **Scenario 3:** The age distribution is held constant after 2025, and additional cost growth occurs as it does in CBO's projections.
- **Scenario 4:** The age distribution of the population and additional cost growth follow CBO's projections. (This is the scenario underlying the extended baseline.)

To estimate the effects of aging alone on spending on the major health care programs, CBO compared such spending under Scenarios 1 and 2. To estimate the effects of additional cost growth alone on spending on the major health care programs, the agency compared such spending under Scenarios 1 and 3. CBO estimated the interaction between those two effects by comparing spending on the major health care programs under Scenario 4 with the sum of the effects of aging alone and the effects of additional cost growth alone. The agency then allocated that estimate of the interaction proportionally between the two factors.

Method for Assessing Causes of Growth in Net Spending on Interest

To separate the changes in net interest costs attributable to primary deficits (that is, deficits excluding net outlays for interest) from those due to changes in the average interest rate on federal debt, CBO produced estimates of net interest costs after 2024 under the following four scenarios:

- **Scenario 1:** The average interest rate does not change, and there are no primary deficits adding to the amount of federal debt held by the public.
- **Scenario 2:** The average interest rate on federal debt does not change, and primary deficits are equal to those in CBO's budget projections.
- **Scenario 3:** The average interest rate on federal debt is the same as it is in CBO's projections, and there are no primary deficits adding to the amount of federal debt.
- **Scenario 4:** The average interest rate on federal debt and primary deficits are the same as they are in CBO's projections.

To estimate the effect of primary deficits on net interest costs, CBO compared interest costs under Scenarios 1 and 2. To estimate the effect that the change in the average interest rate on federal debt has on net interest costs, the agency compared interest costs under Scenarios 1 and 3. Finally, the agency used the relative size of those two estimates to allocate the total increase in net interest costs in Scenario 4 (CBO's baseline projections) proportionally between those two factors.

3. For information about CBO's demographic model, see Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875. For details about modeling the baseline projections of economic variables, see Robert W. Arnold, *How CBO Produces Its 10-Year Economic Forecast*, Working Paper 2018-02 (Congressional Budget Office, February 2018), www.cbo.gov/publication/53537; and Robert Shackleton, *Estimating and Projecting Potential Output Using CBO's Forecasting Growth Model*, Working Paper 2018-03 (Congressional Budget Office, February 2018), www.cbo.gov/publication/53558. For information about CBO's methods for projecting revenues and for projecting the average interest rate on federal debt, see Congressional Budget Office, *CBO Explains How It Develops the Budget Baseline* (April 2023), www.cbo.gov/publication/58916, and *The 2022 Long-Term Budget Outlook* (July 2022), Appendix D, www.cbo.gov/publication/57971, respectively.

4. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

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Appendix B: Changes in CBO's Long-Term Economic Projections Since March 2024

Overview

Compared with the 30-year economic projections that the Congressional Budget Office published last year, the agency's current projections show slower average annual growth of real gross domestic product (GDP) from calendar year 2025 to 2054 (the final year of the previous long-term projection period).[1] CBO's current projections also show slower growth of real potential GDP over the latter part of the projection period, a smaller labor force by 2054, little change in the outlook for inflation, and generally lower interest rates.[2]

Changes in GDP Projections

The growth of real GDP, which affects CBO's projections of revenues from income and payroll taxes, is projected to be slower over the next 10 years than the agency projected last year. In CBO's current projections, real GDP grows at an average rate of 1.8 percent a year over the next decade, lower than the 2.0 percent average rate projected last year (see Figure B-1).

That revision mainly results from lower projections of the growth of private investment and consumer spending. CBO reduced its projection of real private investment in structures because of an upward revision to data about the past growth of prices for structures. Compared with last year's projections, the average growth of investment prices has risen more than the growth of nominal investment, causing the growth of real investment to be lower than CBO projected last year. CBO also reduced its projection of the growth of real consumer spending over the next decade, largely because it projects stronger growth in individual income tax receipts and weaker growth in asset prices than it did last year, which would leave consumers with less disposable income and wealth to finance consumption. In addition, recent data show that real GDP grew more slowly in 2024 than CBO projected last March.

The agency's projections of real GDP growth from 2035 to 2044 have not changed since last year. But its projections of real GDP growth over the 2045–2054 period are lower than last year's projections by an average of 0.2 percentage points per year. CBO projects that starting in 2033, real GDP will grow at the same rate as real potential GDP.

CBO is projecting similar growth of real potential GDP over the next two decades as it did last March, but slower growth over the 2045–2054 period. Real potential GDP is now projected to increase at an average rate of 1.4 percent a year from 2045 to 2054, down from last year's projected average growth rate of 1.6 percent. That decrease reflects a reduction in CBO's projections of population growth.

Real GDP per person is now projected to grow more slowly over the next decade, more quickly over the second decade of the projection period, and at much the same pace over the third decade as CBO projected last March.[3] The agency now projects that real GDP per person will increase at an average rate of 1.2 percent a year from 2025 to 2034, down from last year's projection of 1.4 percent average annual growth. The reduction in the projected growth of real GDP per person over the next decade reflects the decrease in CBO's projection of the growth of total real GDP over that period.

From 2035 to 2044, real GDP per person is projected to grow by 1.4 percent a year, on average, up from last year's projected average rate of 1.3 percent. That increase occurs

1. Real GDP is nominal GDP that has been adjusted to remove the effects of changes in prices. CBO's previous projections were published in Congressional Budget Office, *The Long-Term Budget Outlook: 2024 to 2054* (March 2024), www.cbo.gov/publication/59711.

2. Real potential GDP is an estimate of the amount of real GDP that could be produced if labor and capital were employed at their maximum sustainable rates.

3. To develop its projections of real GDP per person, CBO uses a measure called the resident population plus armed forces overseas. That measure of population includes U.S. residents and members of the armed forces on active duty stationed outside the United States but excludes military dependents, and other U.S. citizens, living abroad.

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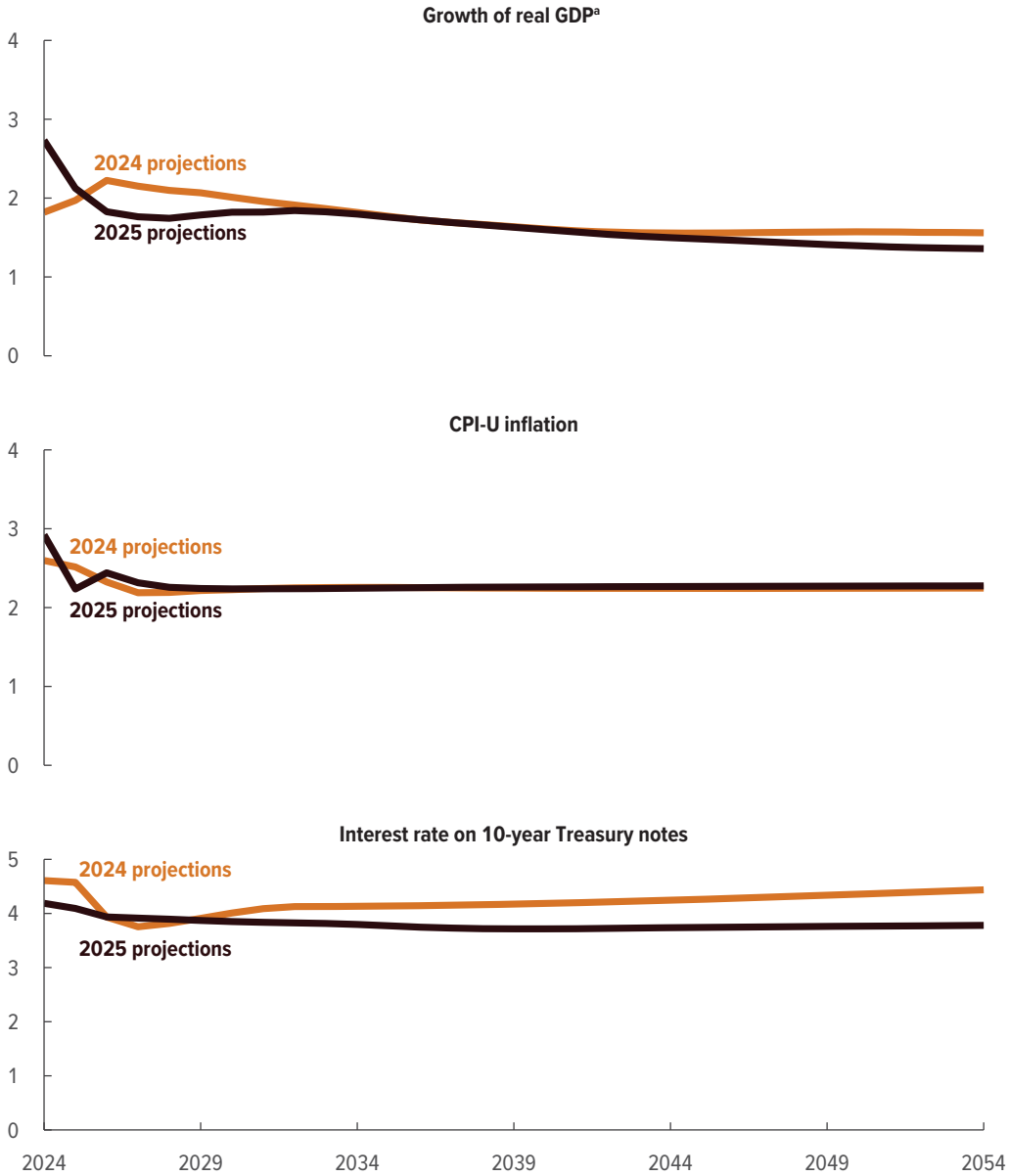
Figure B-1.

CBO's 2024 and 2025 Projections of Selected Economic Variables

Percent



CBO's long-term projections of real GDP growth—which affect its projections of revenues from income, payroll, and corporate taxes—are slightly lower over the first and third decades of the projection period than they were last year.

The agency's projections of CPI-U inflation—which affect its projections of spending on Social Security and other benefit programs with cost-of-living adjustments—are roughly the same as last year's.

Projections of the average nominal interest rate on 10-year Treasury notes—a key factor in CBO's projections of the federal government's net interest costs—are lower in most years of the projection period than they were last year.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

CPI-U = consumer price index for all urban consumers; GDP = gross domestic product.

a. Real GDP is nominal GDP that has been adjusted to remove the effects of changes in prices.

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because although CBO's projection of real GDP growth over that period is similar to last year's, its projection of population growth is slower. For the 2045–2054 period, CBO's projection of the growth of real GDP per person is similar to last year's projection. The reason is that downward revisions to projections of the growth of real GDP and the population during that decade offset one another.

Nominal GDP is projected to grow more slowly, on average, over the first and third decades of the projection period, and about the same in the second decade, as CBO forecast last March. In the agency's current projections, nominal GDP grows at an average rate of 3.9 percent per fiscal year over the 2025–2034 period, down from an average of 4.0 percent in last year's projections. That difference is attributable to downward revisions to CBO's projections of the growth of real GDP, slightly offset by increases in projections of the growth of the GDP price index. (To project nominal GDP growth, CBO first projects real GDP growth and then adjusts those values by using its projections of the growth of the GDP price index to incorporate the effects of inflation.)

Over the second decade of the projection period, nominal GDP is projected to grow at an average rate of 3.7 percent per fiscal year, similar to last year's projection. For the 2045–2054 period, however, CBO projects that nominal GDP will grow by an average of 3.5 percent per year, down from the 3.6 percent rate projected in March 2024. That decrease reflects the agency's current expectation of slower growth of real GDP during that period.

The level of GDP is higher in this year's projections than in last year's projections by 1.5 percent, on average, over the next 30 calendar years. That difference is mainly attributable to revised, newly released data indicating that GDP was larger in 2024 than CBO estimated last March.

Changes in Labor Force Projections

Projections of the size of the labor force depend on projections of the population categorized by age, sex, and education, as well as on projections of those groups' rates of participation in the labor force.[4] CBO now projects that the labor force will expand more quickly over the next decade, but more slowly over the 2045–2054 period, than it forecast last year. Those changes are driven by revisions to CBO's projections of the labor force participation rates of various groups and changes to the size and composition of the population.

Growth of the Labor Force

In CBO's current projections, the labor force grows slightly faster over the next decade, roughly the same over the following decade, and more slowly over the 2045–2054 period than CBO projected last year. The slight increase to projected labor force growth in the next decade stems from upward revisions to CBO's projections of population growth during that period. Conversely, CBO now projects slower population growth from 2035 to 2054 than it did last year. That change offsets changes that increase the labor force participation rate in the second decade of the projection period, leaving labor force growth during that decade roughly unchanged from last year's projections.

Over the third decade, significantly slower population growth than CBO projected last year more than offsets upward revisions to projections of the labor force participation rate, reducing the growth of the labor force. The labor force is now projected to increase at an average rate of 0.1 percent a year over the 2045–2054 period, down from 0.2 percent in last year's projections (see Figure B-2).

Labor Force Participation Rate

In CBO's current projections, the rate of participation in the labor force is similar to last year's projections over the next decade but higher than those projections over the following two decades (see Figure B-2). The agency projects a participation rate of 61.4 percent in 2034, the same as in last year's projections. But it projects higher participation rates than it did last year for the rest of the 30-year period: 61.4 percent in 2044, up from 60.9 percent; and 61.3 percent in 2054, up from 60.7 percent.

The upward revisions to the labor force participation rate in the second and third decades of the projection period reflect a change in CBO's forecasting method. Last year, CBO projected participation rates for different groups of the population—categorized by age, sex, and education—on the basis of past trends in family structure,

4. The labor force consists of people age 16 or older in the civilian noninstitutionalized population who have jobs or are unemployed (available for work and either seeking work or expecting to be recalled from a temporary layoff). The labor force participation rate is the percentage of the civilian noninstitutionalized population age 16 or older that is in the labor force. The civilian noninstitutionalized population excludes members of the armed forces on active duty and people in penal or mental institutions or in homes for the elderly or infirm.

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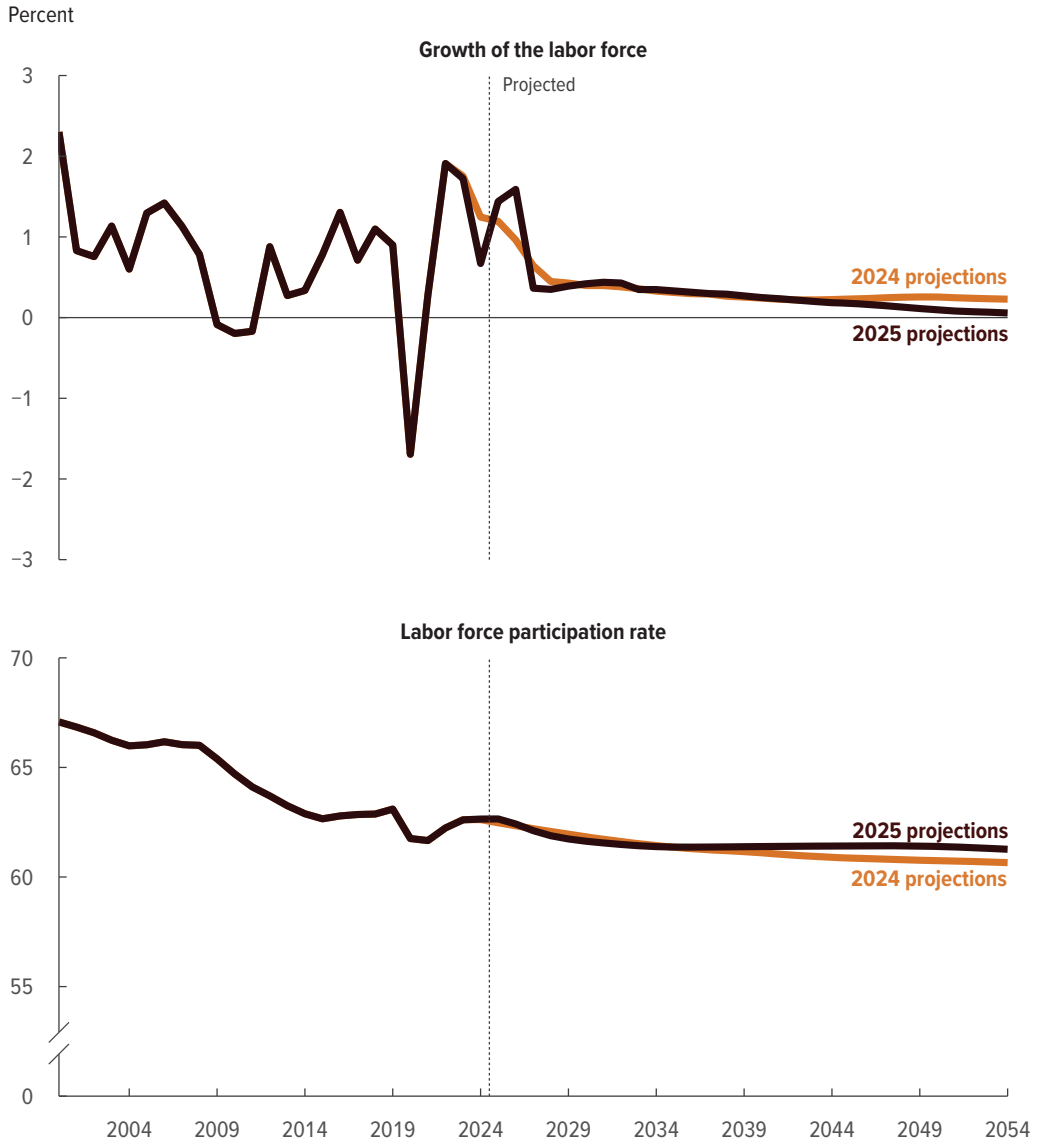
Figure B-2.

CBO's 2024 and 2025 Projections of the Labor Force



In this year's projections, the labor force grows at roughly the same pace as CBO projected last year through 2044. After that, the labor force grows more slowly in this year's projections than in last year's projections because of slower projected growth of the population.

CBO's current projections of the overall rate of participation in the labor force are similar to last year's projections over the next decade but higher than those projections over the following two decades.

Data sources: Congressional Budget Office; Bureau of Labor Statistics. See www.cbo.gov/publication/61187#data.

The labor force consists of people age 16 or older in the civilian noninstitutionalized population who have jobs or are unemployed (available for work and either seeking work or expecting to be recalled from a temporary layoff). The labor force participation rate is the percentage of the civilian noninstitutionalized population age 16 or older that is in the labor force. The civilian noninstitutionalized population excludes members of the armed forces on active duty and people in penal or mental institutions or in homes for the elderly or infirm.

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tax rates, and wages for each group.[5] This year, CBO estimated the most recent trend in the participation rate for each group and held it constant over the projection period.[6] As a result, in this year's projections, changes in the overall rate of labor force participation result entirely from changes in the age, sex, and educational composition of the population. In CBO's assessment, demographic changes are the most important factors driving the long-term projection of the labor force participation rate. The current method, which relies only on population projections, reflects the effects of demographic changes and does not rely on projections of additional factors, which can add to the uncertainty of the projections.

Trends in the composition of the population are responsible for keeping the projected labor force participation rate relatively constant from 2034 to 2050 and then reducing it. In CBO's current projections, the aging of the population puts less downward pressure on the labor force participation rate in the second and third decades of the projection period than it does in the first decade, while increases in educational attainment continue to boost the participation rate. Those two effects roughly balance each other out from 2034 to 2050, causing the labor force participation rate to remain fairly stable over those years instead of declining, as in the previous projections. After 2050, the labor force participation rate is projected to fall as the large generation of people born in the 1980s reaches retirement age. Last year, CBO projected that the participation rate would keep declining over the whole projection period, because factors other than the composition of the population, such as family structure, put additional downward pressure on the projection.

Changes in Inflation Projections

After 2026, CBO's projections of inflation—whether measured by growth in the consumer price index for all urban consumers (CPI-U), in the personal consumption expenditures (PCE) price index, or in the GDP price index—are similar to last year's projections. In 2025, however, CPI-U inflation is expected to be slightly lower than CBO forecast last year (see Figure B-1 on page 44).

Changes in Interest Rate Projections

CBO has lowered its projection of the nominal interest rate on 10-year Treasury notes over the next three decades (see Figure B-1 on page 44). Downward revisions to the nominal 10-year rate are smaller in the first decade of the projection period than in the third decade, averaging roughly 0.2 percentage points from 2025 to 2034 and roughly 0.6 percentage points from 2045 to 2054. On average for the entire 30-year period, CBO lowered its projection of the nominal 10-year rate to 3.8 percent from the 4.2 percent projected last year.[7] That revision largely results from changes to the agency's method for forecasting interest rates on Treasury securities.

This year, CBO forecast the long-run difference (or spread) between interest rates on long-term and short-term Treasury securities by using the relationship between the interest rate on long-term Treasury securities, the expected interest rate on short-term Treasury securities, and the expected rate of inflation from the mid-1950s to the present. Previously, CBO projected that the spread between those interest rates over the long run would roughly equal the average spread seen since the early 1980s. However, for much of that historical period, the expected rate of inflation was much higher than the Federal Reserve's goal of 2 percent. CBO's new method accounts for the changes in long-run inflation expectations that have occurred in the past several decades.

The new method reduced CBO's projection of the long-run spread between rates on long- and short-term Treasury securities. If everything else is unchanged, the smaller estimated spread over the projection period than the historical average spread used last year lowers the projected interest rate on 10-year Treasury notes by roughly 0.6 percentage points in the last two decades of the projection period.

The downward revision to the rate on 10-year Treasury notes because of CBO's new forecasting method is partly offset by an upward revision to the agency's projection of short-term interest rates (whose expected path influences long-term rates). That upward revision results from changes to CBO's projections of economic variables other

5. Specifically, last year CBO assigned specific factors (such as family structure) to each group, projected the factors, and forecast the labor force participation rate for each group by drawing on the historical relationship between the factors and that group's labor force participation rate.

6. CBO expects to publish additional information about its new method later this year.

7. CBO made roughly the same changes to its projections of interest rates on newly issued bonds held in the Social Security program's trust funds.

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than interest rates. The agency currently projects that, on average, the rate of private saving in the United States will be lower, and capital income as a share of total income will be higher, than previously projected. Both of those changes increase short-term interest rates if everything else is unchanged. In addition, CBO expects that, on average, the growth rate of the labor force and the ratio of federal debt to GDP will be lower than previously projected. Both of those changes reduce short-term interest rates if everything else is unchanged. In all, the changes result in an upward revision, on average, to CBO's projection of short-term interest rates over the 2025–2054 period.

The upward revision to short-term interest rates diminishes over the projection period. The downward revisions to projections of labor force growth and of federal debt as a percentage of GDP increase over time. By the final decade of the projection period, their effects on short-term interest rates roughly offset the effects of a lower projected rate of private saving and higher projections of capital income as a share of total income.

Like the average nominal interest rate on 10-year Treasury notes, the average real rate on those notes (which CBO calculates by subtracting the percentage increase in the CPI-U from the notes' nominal yield) is lower in this year's projections. The real 10-year rate is now projected to average 1.5 percent over the 2025–2054 period instead of the 1.9 percent projected last year.

The average nominal interest rate on all federal debt held by the public is projected to be higher through 2042 than CBO forecast last year: 3.5 percent instead of 3.3 percent. From 2043 to 2054, that rate is projected to be lower than CBO projected last year: 3.6 percent instead of 3.7 percent.

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Appendix C: CBO's Projections of Additional Economic Factors

Overview

The Congressional Budget Office develops its assessment of the long-term outlook for the federal budget using its projections of economic factors over the next three decades.[1] The projections presented in this report are consistent with the economic forecast for calendar years 2025 to 2035 that CBO published in January 2025.[2] Those projections reflect the assumption that current laws governing federal taxes and spending generally remain unchanged.

Projections of federal budgetary outcomes depend on many economic factors, some of which are discussed in Chapter 3. This appendix describes CBO's long-term projections of other economic factors, which are closely related to its projections of gross domestic product (GDP), inflation, and interest rates. Those additional factors include several labor market outcomes—such as unemployment, hours worked, and earnings—and factors related to capital accumulation and productivity.

CBO's projections of those factors reflect its assessment of various economic and demographic developments as well as its estimates of the effects of the Federal Reserve's monetary policy and the federal government's tax and spending policies on economic activity. (The projections reflect developments in the economy and laws and policies that were in place as of December 4, 2024.)

Labor Market Outcomes

In addition to the growth of the labor force and the rate of labor force participation (described in Chapter 3), CBO projects the unemployment rate, the average and total number of hours that people work, and various measures of workers' earnings. The agency regularly updates those projections to account for revisions to historical data, reassessments of economic and demographic trends, and changes to its analytical methods.

Unemployment Rate

In CBO's projections, the unemployment rate generally rises through 2028 and then declines through 2055.[3] The unemployment rate averages 4.4 percent over the next decade and 4.1 percent over the third decade of the projection period (see Table C-1). From 2032 to 2055, the unemployment rate remains roughly 0.2 percentage points higher than the noncyclical rate of unemployment (the unemployment rate resulting from all sources except changes in aggregate demand). That difference is consistent with the projected gap of 0.5 percent between actual GDP and potential GDP (the maximum sustainable output of the economy).

CBO's projection of the noncyclical rate of unemployment declines for most of the 30-year projection period—from an average of 4.2 percent over the first decade to 3.9 percent over the third decade. That slow decline reflects continuing shifts in the composition of the workforce toward older and more educated workers, whose unemployment rates tend to be lower (when they participate in the labor force), and away from younger and less educated workers, whose unemployment rates tend to be higher.

Average Weekly Hours Worked

Given current laws and past long-term trends, CBO expects growth in the average number of hours worked per week to rise over the next decade from its current historical low and then resume its previous downward trend from 2035 to 2055. In 2055, the average worker in the nonfarm business sector is projected to work roughly one-quarter of an hour more per week than such a worker does today.

1. Those long-term economic projections are included in the supplemental data posted along with this report at www.cbo.gov/publication/61187#data.

2. Congressional Budget Office, *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

3. The unemployment rate is the percentage of people in the labor force who are not working but are available for work and are either seeking work or expecting to be recalled from a temporary layoff. The labor force consists of people age 16 or older in the civilian noninstitutionalized population who have jobs or are unemployed (available for work and either seeking work or expecting to be recalled from a temporary layoff). The civilian noninstitutionalized population excludes members of the armed forces on active duty and people in penal or mental institutions or in homes for the elderly or infirm.

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Table C-1.

Average Annual Values for Additional Economic Variables That Underlie CBO's Extended Baseline Projections

Percent

	1995–2024	2025–2035	2036–2045	2046–2055	Overall, 2025–2055
Unemployment					
Unemployment rate[a]	5.6	4.4	4.2	4.1	4.2
Noncyclical rate of unemployment[b]	4.8	4.2	4.0	3.9	4.0
Growth of average weekly hours worked	-0.1	0.1	*	*	*
Growth of total hours worked	0.8	0.5	0.2	0.1	0.3
Earnings as a share of compensation	81.5	82.3	82.1	81.8	82.0
Growth of real earnings per worker	1.1	1.3	1.1	1.0	1.1
Growth of total factor productivity[c]	1.3	1.0	1.1	1.1	1.0
Growth of labor productivity (real GDP per hour worked)	1.7	1.3	1.3	1.3	1.3

Data sources: Congressional Budget Office; Bureau of Labor Statistics. See www.cbo.gov/publication/61187#data.

Real values are nominal values that have been adjusted to remove the effects of changes in prices.

GDP = gross domestic product; * = between -0.05 percent and 0.05 percent.

a. The percentage of people in the labor force who are not working but are available for work and are either seeking work or expecting to be recalled from a temporary layoff.

b. The rate of unemployment resulting from all sources except changes in aggregate demand.

c. Total factor productivity is the average real output per unit of combined labor and capital services.

In CBO's projections, growth in the average number of hours worked declines from 2035 to 2055 because of increases in the effective tax rate on labor income.[4] Effective tax rates on individuals' income rise because of real bracket creep—a trend in which, as people's income grows faster than inflation, more of their income is pushed into higher tax brackets. When people face higher tax rates, their returns from working decline, leading them to work fewer hours, on average.

Total Hours Worked

CBO projects that the total number of hours worked per year will increase at an average annual rate of 0.3 percent over the next 30 years—more slowly than the 0.8 percent average growth rate seen over the past three decades. The growth of total hours worked averages 0.5 percent per year over the next decade and 0.1 percent per year over the third decade of the projection period. That growth is projected to slow mainly because the labor force is expected to expand more slowly in the future than it has over the past 30 years. (The total number of hours worked is calculated using projections of the growth of the labor force, average weekly hours worked, and unemployment.)

Earnings as a Share of Compensation

Workers' total compensation consists of earnings (which include wages and salaries but exclude proprietors' income) and nonwage compensation (such as employers' contributions for health insurance, for pensions, and for government social insurance programs). Since 1960, the share of total compensation paid in the form of wages and salaries has declined—from 91 percent in that year to an average of 82 percent over the past decade—mainly because employer's contributions for health insurance have increased more quickly than total compensation.[5] CBO anticipates that the cost of health insurance will grow slightly more rapidly than wages and salaries over the next 30 years. As a result, in CBO's projections, the share of compensation that workers receive as earnings slowly declines over that period, from 83 percent in 2024 to 82 percent in 2055.

Real Earnings per Worker

Real earnings (employees' wages and salaries and proprietors' income, adjusted to remove the effects of changes in prices) per worker are projected to grow by an average of 1.1 percent a year over the 2025–2055 period—the same

4. The effective tax rate is the ratio of taxes paid to a given tax base. For individual income taxes and for payroll taxes paid by employees, the effective tax rate is typically expressed as the ratio of taxes paid to a taxpayer's adjusted gross income.

5. For more discussion about CBO's projections of the various components of income, see Congressional Budget Office, *How CBO Projects Income* (July 2013), www.cbo.gov/publication/44433.

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growth rate they averaged over the past 30 years. CBO's projections of real earnings per worker are based on its projections of total factor productivity (the average real output per unit of combined labor and capital services) in the nonfarm business sector, capital per worker, the growth of real wages, and the amount of nonwage compensation.

Distribution of Earnings

In CBO's projections, the share of earnings accruing to high earners increases over the next 30 years, and the share accruing to lower earners declines accordingly. That process occurs more slowly than it did in the past, however. The share of earnings accruing to workers in the top 10 percent of the earnings distribution increases by an average of 0.1 percentage point per year from 2025 to 2055. That growth is slower than it was from 1978 to 2023 (the most recent year for which data are available), when the share of earnings accruing to workers in the top 10 percent of the distribution grew by 0.2 percentage points per year, on average.

The way in which earnings are distributed across the population affects revenues from income taxes as well as from payroll taxes (particularly those for Social Security). Income taxes are affected by the distribution of earnings because of the progressive rate structure of the individual income tax: People with lower income pay a smaller percentage of their earnings in taxes than people with higher income do.

Payroll taxes for Social Security are affected by the distribution of earnings because those taxes are levied on covered earnings up to a maximum annual amount ($176,100 in 2025).[6] As earnings have grown more for high earners than for others, the share of covered earnings subject to Social Security payroll taxes has fallen from 90 percent in 1983 to 84 percent in 2023 (the most recent year for which data are available). In CBO's projections, the portion of covered earnings subject to Social Security payroll taxes declines from 83 percent in 2025 to 81 percent in 2055, reducing revenues from those taxes.

Changes in CBO's Projections of Labor Market Outcomes Since March 2024

Some of this year's long-term projections of labor market outcomes are similar to the ones CBO published in March 2024, in its previous *Long-Term Budget Outlook*.[7] For example, CBO's projection of the growth of real earnings per worker through 2054 (the final year covered by the March 2024 projections) is roughly the same as last year's projection.

Other projections differ:

- The unemployment rate and the noncyclical rate of unemployment are slightly lower, on average, in this year's projections than they were in last year's projections. Those revisions reflect a change in CBO's method for estimating the noncyclical rate of unemployment. The new method improves on the earlier method by incorporating information about the growth of wages and prices and long-term trends in labor productivity.[8]
- Total hours worked grow slightly more slowly over the next 30 years in the current projections than they did in last year's projections, mainly because of downward revisions to CBO's forecast of the growth of the labor force over the next three decades.
- Earnings make up a larger share of compensation from 2035 to 2054 in CBO's current projections than they did in last year's projections. That increase reflects slower projected growth in employers' contributions for health insurance.
- To reflect recent data, CBO lowered its projection of the share of earnings accruing to workers at the very top of the earnings distribution and increased its projection of the share of earnings accruing to other workers.

Capital Accumulation and Productivity

Like outcomes in the labor market, capital accumulation and increases in the average real output per unit of combined labor and capital services (total factor productivity, or TFP) directly affect CBO's projections of the growth of economic output. The accumulation of productive capital helps production grow from one year to the next.

6. Social Security benefits accrue only on covered earnings up to that maximum taxable amount. Covered earnings are those received by workers in jobs subject to Social Security payroll taxes. Most workers pay payroll taxes on their earnings, although a small number of workers are exempt (mostly those in state or local government jobs or in the clergy). Earnings above the maximum taxable amount are also exempt from Social Security payroll taxes.

7. Congressional Budget Office, *The Long-Term Budget Outlook: 2024 to 2054* (March 2024), www.cbo.gov/publication/59711.

8. CBO's new method for estimating the noncyclical rate of unemployment takes account of wage growth and inflation as well as many other factors, including trends in labor productivity, energy prices, and export prices. The method uses those factors to identify the past noncyclical rates of unemployment for specific demographic groups. CBO projects the total noncyclical rate by applying those groups' projected shares of the labor force to their noncyclical rates of unemployment at the beginning of the projection period. CBO expects to publish more information about the new method later this year.

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In the nonfarm business sector, TFP growth contributes directly to the growth of output. Increases in TFP have been the biggest contributor to the growth of potential output in past decades, and they continue to be the main driver of such growth in CBO's projections.

Increases in the productivity of labor, which is measured by real GDP per hour worked, reflect the growth of real GDP that is not attributable to the growth of total hours worked. Thus, labor productivity includes the contributions of capital accumulation and TFP to real GDP growth.

Capital Accumulation

In CBO's projections, private capital accumulates in the nonfarm business sector more quickly over the next 10 years than it does over the second and third decades of the projection period. In that sector, capital services (the flow of productive services from the stock of capital assets) grow at an average rate of 2.3 percent a year over the next decade. By the third decade of the projection period, that average growth falls to 1.8 percent a year.

The accumulation of private capital mainly depends on the growth of factors such as private saving, international flows of capital, federal borrowing, the labor force, and TFP. In CBO's projections, private saving and inflows of foreign investment are larger relative to GDP, on average, than they were over the past 30 years. Those two factors increase the speed of capital accumulation over the next 30 years compared with the past 30 years. That increase, however, is more than offset by three other factors:

- An increase in federal borrowing as a percentage of GDP, which pushes up interest rates, thereby reducing the growth of both private investment and the stock of private capital;
- A slowdown in the growth of the labor force, which slows capital accumulation by decreasing the demand for capital to equip new workers; and
- A deceleration in the growth of total factor productivity.

Total Factor Productivity

In CBO's projections, TFP grows by an average of 1.0 percent a year from 2025 to 2055. That rate is 0.3 percentage points lower than the average annual rate of growth since 1950 and 0.2 percentage points lower than the average rate since 1990.

CBO's analysis of historical trends in TFP growth suggests that projections for the next few decades should place greater weight on the slower growth in recent years than on the faster growth in the more distant past. Thus, although CBO projects that TFP growth will accelerate moderately from its recent, unusually slow pace, the growth rate in the agency's projections is less than the long-term historical average.

Labor Productivity

Given projected slowdowns in the accumulation of capital and the growth of TFP, the growth of potential labor force productivity (the ratio of real potential GDP to the potential labor force) slows in CBO's projections—from an average of 1.4 percent a year over the first decade of the projection period to 1.3 percent over the third decade.[9] The growth of labor productivity (real GDP per hour worked) is projected to maintain a similar pace over the next 30 years, averaging 1.3 percent in each of the next three decades.

Changes in CBO's Projections of Capital Accumulation and Productivity Since March 2024

CBO's projections of capital accumulation over the last two decades of the projection period are lower now than they were last year because the agency has reduced its projection of real investment. As a result, CBO now projects that capital services in the nonfarm business sector will grow at an average annual rate of 2.0 percent over the 2025–2054 period, instead of the 2.1 percent rate projected last year. CBO lowered its projection of real private investment in structures because of an increase to the projected growth of prices for those structures. The average growth of investment prices has risen more than the growth of nominal investment, causing the growth of real investment to be lower than it was in last year's projections. Since last year, CBO has also reduced its projections of the growth of the labor force over the last two decades of the projection period. That change leads to lower projections of private investment by reducing the number of workers to equip with capital.

TFP is now projected to grow more slowly, on average, over the next three decades than CBO projected last year. The agency's projections of TFP growth depend mainly on a weighted historical average over the past 25 years. That historical average is lower than it was last year because it includes fewer observations from the late 1990s, an era when productivity grew sharply.

9. The potential labor force is an estimate of how big the labor force would be if economic output and other key variables were at their maximum sustainable amounts.

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CBO's long-term projection of the growth of real GDP per hour worked is slightly lower than it was last year. The reason is that downward revisions to the projected growth of capital services were mostly offset by downward revisions to the growth of total hours worked in the agency's current projections.

Factors Affecting Capital Accumulation and Productivity

In CBO's view, the long-term growth of the nation's stock of private capital (which results from private investment) will be driven by the growth of the labor force, private saving, international flows of direct foreign investment and financial capital, and federal borrowing. Private saving tends to move in the same direction as growth of the labor force, and both private saving and international flows of capital tend to move in tandem with the rate of return on investment (a rate that measures the extent to which investment in the stock of capital results in a flow of income).

In the agency's view, increased federal borrowing decreases the amount of funds available for private investment and puts upward pressure on interest rates. Higher interest rates reduce the growth of business investment by making it more costly for companies to borrow money to expand their productive capacity. Higher interest rates also reduce the growth of residential investment by raising mortgage rates.

Total factor productivity is projected to grow more slowly, on average, over the next 30 years than it has over the past 30 years for several reasons. One is that CBO expects improvements in labor quality (an overall measure of workers' skills that accounts for educational attainment and work experience) to slow over the next three decades, on average. The workforce is likely to become more experienced as improvements in health and increases in life expectancy lead people (particularly highly educated people) to continue working past the ages at which previous generations retired. However, those gains in experience are projected to be more than offset by slowdowns in the growth of overall educational attainment. Improvements in labor quality are implicitly included in CBO's measure of TFP.

Another factor that reduces CBO's projection of TFP growth is a projected decline in the federal government's spending as a percentage of GDP on physical capital (such as transportation infrastructure and water and power projects), on education and training, and on research and development. Such investment spending produces income and other benefits (such as higher productivity and greater efficiency) for private businesses. In CBO's projections, federal discretionary spending is smaller as a percentage of GDP over the next decade than it was in past decades. If federal investment generally remained unchanged as a share of discretionary spending, and if discretionary spending declined as a percentage of GDP, federal investment would also decline relative to GDP. In CBO's assessment, such a reduction in federal investment would dampen the growth of TFP.[10]

Climate change also affects the agency's projections of TFP growth in future decades. Drawing on studies of the historical relationship between regional output and regional temperature, and on projections of future conditions, CBO has projected that, on net, climate change will cause real GDP in 2055 to be 0.9 percent smaller than it would be if climatic conditions remained stable after 2024.[11] CBO adjusts its projection of the long-term trend of TFP to be consistent with that change in GDP. The projected 0.9 percent reduction in real GDP represents the average of a wide range of possible outcomes and does not reflect all the ways in which climate change, future technological advances, or adaptation could affect economic output.

10. For more details about how CBO estimates the economic effects of federal investment, see Congressional Budget Office, *Effects of Physical Infrastructure Spending on the Economy and the Budget Under Two Illustrative Scenarios* (August 2021), www.cbo.gov/publication/57327, and *The Macroeconomic and Budgetary Effects of Federal Investment* (June 2016), www.cbo.gov/publication/51628.

11. Last year, CBO estimated that climate change would reduce real GDP at the end of the projection period by 0.4 percent. For details about the method CBO used for those estimates, see Evan Herrnstadt and Terry Dinan, *CBO's Projection of the Effect of Climate Change on U.S. Economic Output*, Working Paper 2020-06 (Congressional Budget Office, September 2020), www.cbo.gov/publication/56505; and Congressional Budget Office, "Technical Information About How CBO Models the Effects of Climate Change on Output in Its Long-Term Economic Projections" (September 2021), www.cbo.gov/publication/57421. The agency has since updated its estimate of the effects of climate change on real GDP. For more information on those updated estimates, see Chad Shirley and William Swanson, *The Effects of Climate Change on GDP in the 21st Century*, Working Paper 2025-02 (Congressional Budget Office, February 2025), www.cbo.gov/publication/61186; and Congressional Budget Office, *The Risks of Climate Change to the United States in the 21st Century* (December 2024), www.cbo.gov/publication/60845.

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Appendix D: Changes in CBO's Long-Term Budget Projections Since March 2024

Overview

The long-term budget projections in this report are based on the demographic, economic, and 10-year budget projections that the Congressional Budget Office published in January 2025. The demographic projections reflect information, laws, and policies as of November 15, 2024. The economic projections reflect laws, policies, and economic developments as of December 4, 2024. The budget projections include the effects of legislation enacted as of January 6, 2025.[1] The projections do not reflect the effects of administrative actions taken or judicial decisions made after those respective dates, including actions and decisions affecting immigration, tariffs, and other policy areas.

CBO's current budget projections for the 2025–2054 period differ from the projections the agency published in March 2024.[2] The differences are attributable to changes in law, changes in the agency's demographic and economic projections, and the availability of more recent data.[3]

In CBO's current projections:

- Spending measured as a percentage of gross domestic product (GDP) is 0.2 percentage points lower, on average, over the 2025–2054 period than it was in last year's projections.
- Revenues are 0.4 percent of GDP higher, on average, over that period than they were in last year's projections.
- Debt held by the public rises from 100 percent of GDP in 2025 to 154 percent in 2054 (see Figure D-1). Such debt is lower than the agency projected last year by 2 percent of GDP in 2025 and by 12 percent in 2054.
- Total deficits measured as a percentage of GDP are generally larger through 2033 and smaller thereafter than they were in last year's projections. They are smaller over the 2025–2054 period than previously estimated by 0.5 percent of GDP, on average. Primary deficits (that is, total deficits excluding net outlays for interest) are smaller than projected last year by 0.3 percent of GDP, on average.

This past January, CBO published budget projections for the 2025–2055 period. The agency's current long-term projections differ from those earlier projections, which did not constitute a full update and were developed using a simplified approach for estimating spending on Social Security beyond 2035.

In the current projections, federal debt held by the public amounts to 156 percent of GDP in 2055. In the January 2025 projections, such debt totaled 154 percent of GDP in that year.

Changes in Projected Spending

In CBO's current projections, noninterest spending is 0.1 percent of GDP higher, on average, than it was in last year's projections; such spending is higher through 2037 but is about the same thereafter. (Noninterest spending is spending on mandatory and discretionary programs combined.) That initial increase in relation to last year's projections is the result of higher projections of spending on Medicaid and other health-related programs (excluding Medicare) and of discretionary spending that are partially offset by lower projections of spending on

1. Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875, *Additional Information About the Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/61135, and *The Budget and Economic Outlook: 2025 to 2035* (January 2025), www.cbo.gov/publication/60870.

2. Congressional Budget Office, *The Long-Term Budget Outlook: 2024 to 2054* (March 2024), www.cbo.gov/publication/59711. Because most of last year's projections ended in 2054, this appendix generally makes comparisons through that year.

3. For changes in CBO's economic projections since 2024, see Appendix B and Appendix C of this report. For changes in projections of demographic factors since January 2024, see Congressional Budget Office, *The Demographic Outlook: 2025 to 2055* (January 2025), www.cbo.gov/publication/60875. For details about how CBO's budget projections for 2025 to 2034 have changed since June of last year, see Congressional Budget Office, *The Budget and Economic Outlook: 2025 to 2035* (January 2025), Appendix A, www.cbo.gov/publication/60870.

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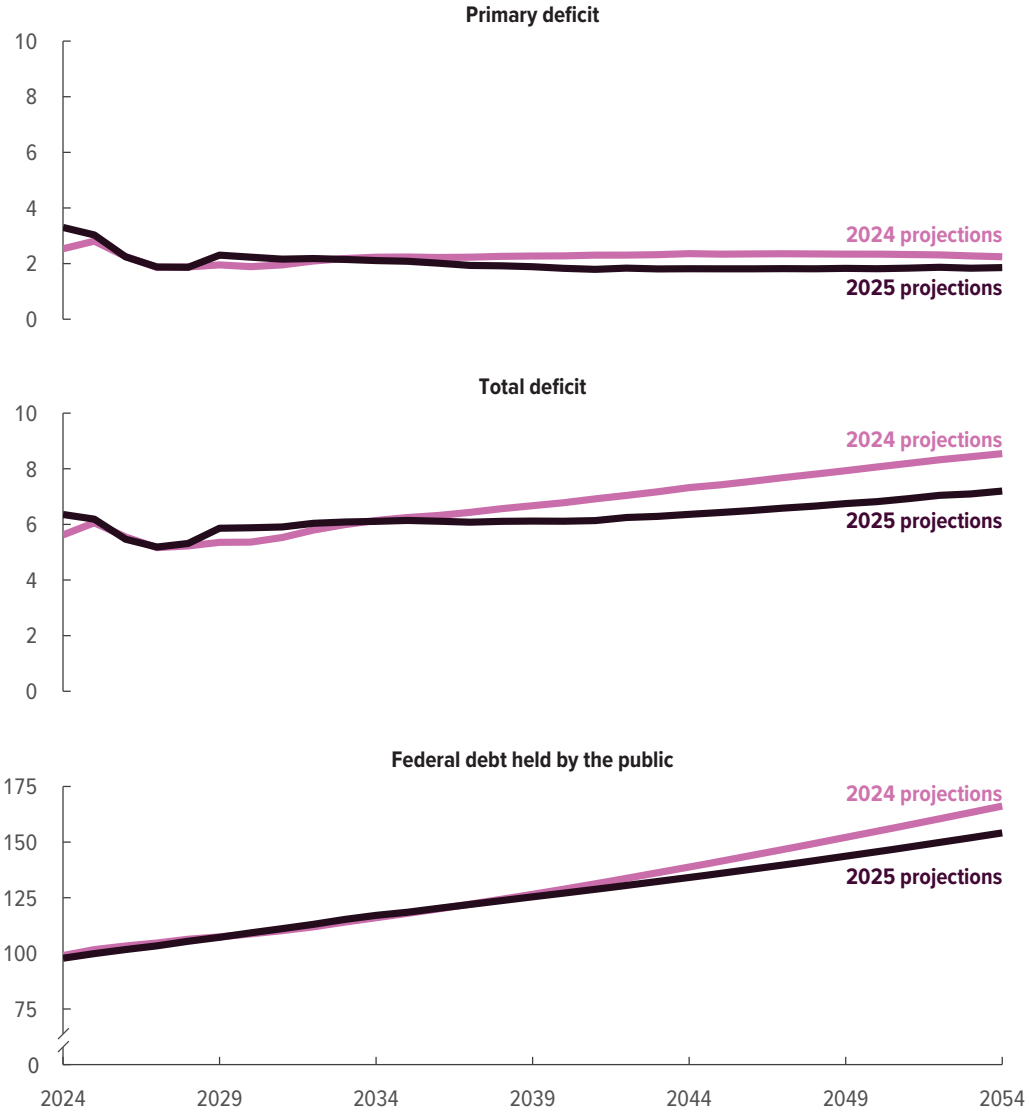
Figure D-1.

CBO's 2024 and 2025 Projections of Deficits and Federal Debt Held by the Public

Percentage of GDP



In CBO's current projections, primary deficits measured as a percentage of GDP are 0.2 percentage points smaller, on average, over the 2025–2054 period than they were in last year's projections.

CBO's current projections of total deficits are generally larger through 2033 but smaller in subsequent years.

Measured as a percentage of GDP, federal debt is now projected to be smaller, on average, over the 2025–2054 period than CBO previously projected.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

CBO's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which conform to a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

In this figure, deficits were calculated by subtracting revenues from outlays; thus, positive values indicate deficits.

Primary deficits exclude net outlays for interest.

GDP = gross domestic product.

Medicare and other mandatory programs. In the later years of the projection period, when projected Medicaid spending is about the same in this year's projections as in last year's, the reduction in Medicare spending fully offsets the increases in discretionary spending. Spending on Social Security in this year's projections is about the same as in last year's.

Total spending measured as a percentage of GDP is higher through 2037 than it was in last year's projections and lower thereafter. Net outlays for interest are generally higher through 2036 than previously projected and lower thereafter (see Figure D-2).

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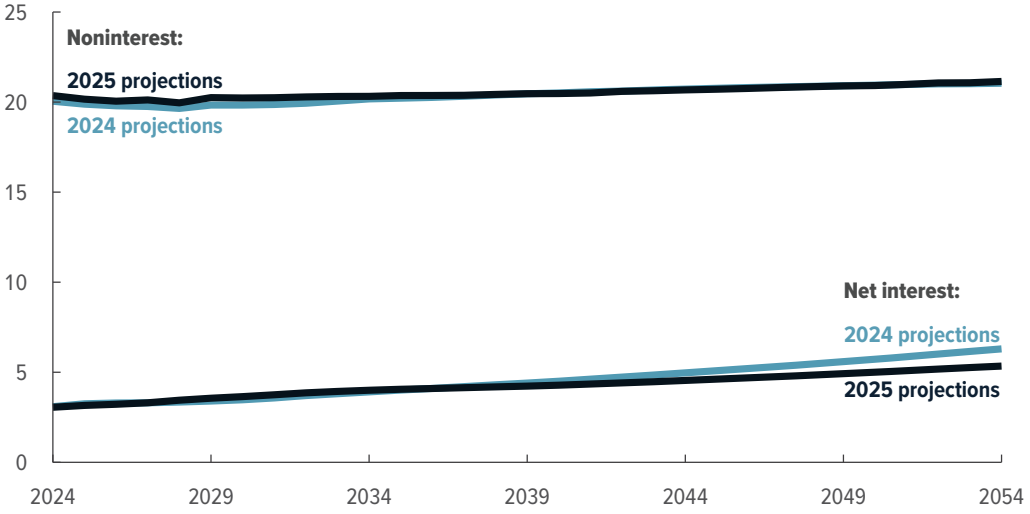
Figure D-2.

CBO's 2024 and 2025 Projections of Outlays

Percentage of GDP



In CBO's current projections, noninterest spending measured in relation to GDP is higher through 2037 than it was in last year's projections and about the same thereafter.

Net outlays for interest, measured as a percentage of GDP, are lower, on average, over the 2025–2054 period than they were in last year's projections.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

CBO's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which conform to a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

GDP = gross domestic product.

Mandatory Spending

Mandatory spending consists of outlays for most federal benefit programs—including the major health care programs and Social Security—and outlays for certain other payments to people, businesses, nonprofit institutions, and state and local governments.[4] Such outlays are generally governed by statutory criteria and are not normally constrained by the annual appropriation process.

In CBO's current projections, mandatory spending amounts to 14.0 percent of GDP in 2025 (0.1 percentage point more than it was in last year's projections) and 16.0 percent in 2054 (0.2 percentage points less than projected last year). Such spending is now higher than previously estimated through 2032 and lower thereafter (see Table D-1).

Medicare. Measured in relation to GDP, spending on Medicare over the 2025–2054 period is 0.3 percentage points lower, on average, than projected last year. Such spending is now lower in every year of the projection period by amounts that generally increase over time. Medicare spending now averages 4.3 percent of GDP over the 2025–2054 period, totaling 3.1 percent of GDP in 2025 and 5.1 percent in 2054. In CBO's March 2024 projections, such spending averaged 4.6 percent of GDP over that same period and totaled 3.2 percent and 5.4 percent of GDP in 2025 and 2054, respectively.

Current projections of Medicare spending are lower than last year's projections for three reasons.

- CBO lowered its projections of Medicare enrollment after improving the model it uses to develop those projections. The improvements included removing foreign-born people who are not eligible for Medicare benefits from the enrollment projections.
- The agency reduced its projections of growth in the amounts that Medicare pays to clinical laboratories to better reflect the amounts paid in recent years.
- CBO's latest economic forecast includes downward revisions to the producer price index for prescription drugs, which reduced expected growth in payments to hospitals, skilled nursing facilities, and other providers.

4. Spending on the major health care programs consists of outlays for Medicare (net of premiums and other offsetting receipts), Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchased by individuals and small employers.

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Table D-1.

CBO's 2024 and 2025 Projections of Revenues, Outlays, Deficits, and Federal Debt Held by the Public in Selected Years

Percentage of GDP

	2025	2036	2046	2054
Revenues				
Individual income taxes				
2024 projections	8.6	9.6	10.0	10.3
2025 projections	8.7	10.1	10.6	10.9
Payroll taxes				
2024 projections	5.9	5.9	5.9	5.8
2025 projections	5.8	5.9	5.9	5.9
Corporate income taxes				
2024 projections	1.7	1.3	1.4	1.4
2025 projections	1.7	1.2	1.2	1.2
Other[a]				
2024 projections	0.8	1.2	1.3	1.3
2025 projections	0.9	1.1	1.2	1.3
Total revenues				
2024 projections	**17.1**	**18.0**	**18.5**	**18.8**
2025 projections	**17.1**	**18.4**	**18.9**	**19.3**
Outlays				
Mandatory				
Social Security				
2024 projections	5.3	5.9	5.8	5.9
2025 projections	5.2	6.0	5.9	6.0
Major health care programs[b]				
2024 projections	5.5	6.9	7.9	8.3
2025 projections	5.8	6.8	7.7	8.1
Other[c]				
2024 projections	3.1	2.4	2.2	2.0
2025 projections	3.0	2.4	2.1	1.9
Subtotal, mandatory				
2024 projections	13.9	15.3	15.9	16.2
2025 projections	14.0	15.2	15.7	16.0
Discretionary				
2024 projections	6.0	4.9	4.9	4.9
2025 projections	6.1	5.2	5.1	5.1
Net interest				
2024 projections	3.3	4.1	5.2	6.3
2025 projections	3.2	4.1	4.7	5.3
Total outlays				
2024 projections	**23.1**	**24.4**	**26.0**	**27.3**
2025 projections	**23.3**	**24.5**	**25.4**	**26.5**

Continued

Medicaid and Other Health-Related Programs. Measured as a percentage of GDP, combined outlays for Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending are greater over the 30-year projection period than CBO estimated last year. (Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act.) Mainly driven by projected spending on Medicaid, the increases are larger earlier in the projection period and decline over time. In CBO's current projections, spending on Medicaid amounts to 2.2 percent of GDP in 2025 and 2.5 percent in 2054. In the agency's March 2024 projections, such spending equaled 1.9 percent and 2.5 percent of GDP for those years, respectively.

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Table D-1. Continued

CBO's 2024 and 2025 Projections of Revenues, Outlays, Deficits, and Federal Debt Held by the Public in Selected Years

Percentage of GDP

	2025	2036	2046	2054
Total deficit (-)[d]				
2024 projections	**-6.1**	**-6.3**	**-7.5**	**-8.5**
2025 projections	**-6.2**	**-6.1**	**-6.5**	**-7.2**
Federal debt held by the public				
2024 projections	**102**	**120**	**144**	**166**
2025 projections	**100**	**120**	**138**	**154**
Addendum:				
Noninterest spending				
2024 projections	19.9	20.3	20.8	21.0
2025 projections	20.2	20.4	20.8	21.1
Primary deficit (-)[d,e]				
2024 projections	-2.8	-2.2	-2.3	-2.2
2025 projections	-3.0	-2.0	-1.8	-1.9

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

CBO's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which conform to a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

GDP = gross domestic product.

a. Consists of excise taxes, remittances to the Treasury from the Federal Reserve System, customs duties, estate and gift taxes, and miscellaneous fees and fines.

b. Consists of outlays for Medicare (net of premiums and other offsetting receipts), Medicaid, the Children's Health Insurance Program, and premium tax credits and related spending. Premium tax credits subsidize the purchase of health insurance through the marketplaces established under the Affordable Care Act. Related spending is spending to subsidize health insurance provided through the Basic Health Program and to stabilize premiums for health insurance purchases by individuals and small employers.

c. Includes the refundable portions of the earned income tax credit, the child tax credit, and the American Opportunity Tax Credit.

d. When outlays exceed revenues, the result is a deficit. Values in this row were calculated by subtracting outlays from revenues; thus, negative values indicate deficits.

e. Excludes net outlays for interest.

CBO increased its projections of spending on Medicaid because enrollment in the program and costs per enrollee were greater than expected in 2024. The costs were higher than expected because of a reported decrease in the average health status of Medicaid enrollees after the continuous eligibility put in place during the coronavirus pandemic was fully wound down during 2024. CBO expects that beginning in 2026 (when payment rates start to reflect the decrease in average health status), higher costs per enrollee will lead to higher-than-previously-projected payment rates for health plans that manage care for Medicaid enrollees.[5]

Social Security. Spending on Social Security is about the same in CBO's current projections as in last year's. Such spending averages 5.8 percent of GDP over the 2025–2054 period, unchanged from last year's projections.

Other Mandatory Programs. Current projections of spending on mandatory programs other than Social Security and the major health care programs are generally lower in relation to GDP than last year's projections of such spending. Several factors, including increases in projected outlays for clean vehicle and energy-related tax credits, boosted the current projections. But those factors were more than offset by others. One offsetting factor is greater GDP in this year's projections, attributable to revised and newly released data indicating that GDP was greater in 2024 than CBO estimated last March. (An increase in GDP reduces any given

5. For more details, see Congressional Budget Office, *The Budget and Economic Outlook: 2025 to 2035* (January 2025), Appendix A, www.cbo.gov/publication/60870.

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amount of spending measured as a percentage of GDP.) Another factor is decreased projections of outlays in some areas of the budget, including outlays for deposit insurance and the Supplemental Nutrition Assistance Program.

Discretionary Spending

CBO now projects that, measured as a percentage of GDP, outlays for discretionary programs will be larger over the next three decades than the agency estimated last March.[6] Those larger outlays contribute to greater projected noninterest spending through 2037. In the agency's current projections, discretionary spending averages 5.3 percent of GDP over the 2025–2054 period, up from 5.1 percent in last year's projections.

In accordance with provisions of the Balanced Budget and Emergency Deficit Control Act of 1985 (Public Law 99-177), CBO's projections of funding for discretionary programs generally reflect the assumptions that funding in the current year (in this case, 2025) includes an extension of the funding provided in the current continuing resolution through the end of the fiscal year, and that funding in future years is equal to the amount provided for the current year with increases for inflation.

CBO's current estimate of discretionary spending in 2025 is higher than last year's, and that higher estimate flows through to future years in the projection period. The largest contributor to that increased estimate for 2025 was the emergency supplemental appropriations for disaster relief provided in the American Relief Act, 2025 (P.L. 118-158). In addition, that law continued through March 14, 2025, the discretionary funding provided for 2024 by the Consolidated Appropriations Act, 2024 (P.L. 118-42), and the Further Consolidated Appropriations Act, 2024 (P.L. 118-47). That increased amount of discretionary funding exceeded the amount reflected in CBO's March 2024 projections.

Some of the projected increase in discretionary spending for 2025 was offset by a reduction in projected funding to comply with the cap that was in place for defense programs in 2025 when CBO's current projections were finalized. (The Fiscal Responsibility Act of 2023, P.L. 118-5, established caps on most defense and nondefense discretionary funding for 2024 and 2025. Supplemental emergency appropriations are not subject to those caps.)[7]

Net Interest Spending

CBO's current projections of net outlays for interest over the 2025–2054 period are lower by 0.3 percent of GDP, on average, than last year's projections.[8] Such outlays now total 3.2 percent of GDP in 2025 (0.1 percentage point less than previously projected) and 5.3 percent in 2054 (1.0 percentage point less than previously projected). Net outlays for interest are generally greater through 2036 than CBO projected last March. But from 2037 to 2054, they are less than previously projected because estimates of the average interest rate on federal debt and of the amount of federal debt held by the public are lower in those years. (For a discussion of the changes in the long-term projections of interest rates, see Appendix B.)

Changes in Projected Revenues

In CBO's current projections, federal revenues measured as a percentage of GDP are higher over the entire 30-year projection period than they were in the agency's March 2024 projections—by an average of 0.4 percentage points (see Figure D-3). Projected revenues are now higher by 0.1 percentage point in 2025 and 0.5 percentage points in 2054. The overall increase in projected revenues is largely driven by increased estimates of receipts from individual income taxes—the largest source of revenues—in the current projections.

Measured in relation to GDP, projected receipts from individual income taxes are higher by an average of 0.5 percentage points over the projection period. That increase is due to higher projections of asset values, which increase expected distributions from taxable retirement accounts as a percentage of GDP, and lower projections of mortgage interest, which is deductible for taxpayers who itemize their deductions. Payroll tax receipts are higher than previously projected by less than 0.1 percentage point, on average. Corporate income tax receipts are lower than previously projected by 0.1 percentage point, on average. Receipts from other revenue sources,

6. Discretionary spending encompasses outlays for an array of federal activities that are funded through or controlled by appropriations. That category includes most defense spending and spending for many nondefense activities, such as elementary and secondary education, housing assistance, international affairs, the administration of justice, and highway programs.

7. For a more detailed explanation of the caps established by the Fiscal Responsibility Act of 2023, see Congressional Budget Office, *The Budget and Economic Outlook: 2024 to 2034* (February 2024), Box 1-1, www.cbo.gov/publication/59710.

8. In the federal budget, net outlays for interest consist of the government's interest payments on federal debt, offset by interest income that the government receives.

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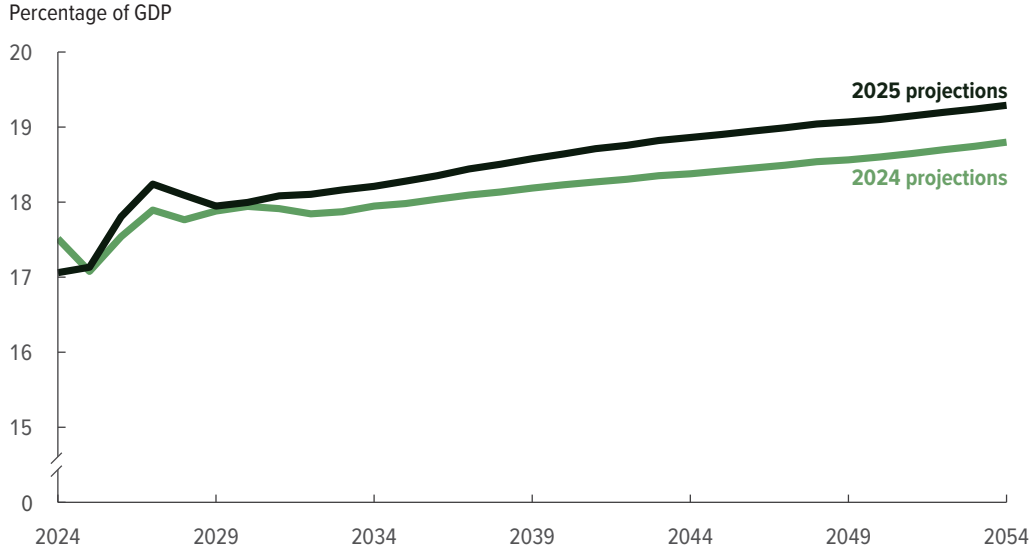
Figure D-3.

CBO's 2024 and 2025 Projections of Revenues



In CBO's current projections, federal revenues measured in relation to GDP are higher throughout the 2025–2054 period than they were in last year's projections.

Data source: Congressional Budget Office. See www.cbo.gov/publication/61187#data.

CBO's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections (which conform to a set of assumptions specified in law) and then extend most of the concepts underlying those projections for an additional 20 years.

GDP = gross domestic product.

including remittances from the Federal Reserve, are lower by less than 0.1 percentage point.[9]

Changes in Projected Debt and Deficits

As a result of the changes to CBO's projections of spending and revenues, total debt held by the public, measured as a percentage of GDP, is now projected to be smaller through 2029, then larger through 2036, and smaller thereafter. In the current projections, debt held by the public increases from 100 percent of GDP in 2025 to 154 percent in 2054; last year, CBO projected that it would increase from 102 percent of GDP in 2025 to 166 percent in 2054.

The same changes to spending and revenues underlying the changes in projected debt from 2025 to 2054 also affected CBO's projections of deficits. In the current projections, the total deficit for 2025 equals 6.2 percent of GDP, 0.1 percentage point larger than projected last year. In 2054, the total deficit is 7.2 percent of GDP, 1.3 percentage points smaller than last year's projection. The larger total deficit in 2025 is attributable to higher noninterest spending in this year's projections (net interest costs are slightly lower and revenues are about the same in 2025). In later years, total deficits are smaller because primary deficits are smaller and interest costs are lower than CBO previously projected. Those reduced primary deficits are driven by a projected increase in revenues that outweighs the projected increase in noninterest spending.

Measured in relation to GDP, primary deficits over the 2025–2054 period are smaller, on average, in CBO's current projections than in the projections published last March. Primary deficits now average 2.0 percent of GDP over that period, down from the 2.2 percent of GDP they averaged in last year's projections. Those smaller primary deficits reflect increases in projected revenues (which were 0.4 percentage points higher, on average, over the period) that are greater than the increases in projected noninterest spending (which was 0.1 percentage point higher, on average).

9. In CBO's current projections, tax receipts measured in nominal dollars are higher than in last year's projections because the agency increased its projections of factors that boost the size of the economy, including wages and salaries. (Nominal dollars are dollars that have not been adjusted to remove the effects of inflation.) Because those factors increase GDP as well as revenues, they affect tax receipts measured as a percentage of GDP less than they affect receipts measured in nominal dollars.

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Changes in Long-Term Budget Projections Since January 2025

CBO last published long-term budget projections in January 2025.[10] Those projections and the ones presented here are based on the agency's current economic and budget projections for 2025 to 2035 and incorporate its long-term projections of the population, the economy, and revenues—none of which have changed since January. The long-term projections of spending on Social Security that CBO released in January were prepared using a simplified approach that the agency regularly uses between full updates. The projections in this report, however, constitute a full update.

In January, CBO projected that federal debt held by the public would reach 154 percent of GDP in 2055. Such debt is now projected to reach 156 percent of GDP in that year. In the agency's current projections, average spending on Social Security over the 2025–2055 period increased by less than 0.1 percentage point, leading to an increase, also of less than 0.1 percentage point, in net outlays for interest.

10. Congressional Budget Office, "Long-Term Budget Projections" (supplemental material for *The Budget and Economic Outlook: 2025 to 2035*, January 2025), www.cbo.gov/data/budget-economic-data#1.

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About This Document

This volume is one of a series of reports on the state of the budget and the economy that the Congressional Budget Office issues each year. CBO's long-term budget projections, referred to as the extended baseline, follow the agency's 10-year baseline budget projections and then extend most of the concepts underlying those projections for an additional 20 years. In keeping with CBO's mandate to provide objective, impartial analysis, the report makes no recommendations.

Overseen by Molly Dahl and prepared with guidance from Robert Arnold (a consultant to CBO), Devrim Demirel, Edward Harris, Joseph Kile, John McClelland, Jaeger Nelson, and Julie Topoleski, the report is the work of many analysts at CBO. Molly Dahl prepared the executive summary and wrote Chapter 1 with contributions from Aaron Betz, Daniel Fried, Jaeger Nelson, and Jeffrey Schafer. Molly Dahl wrote Chapter 2 in collaboration with Kathleen Burke and with contributions from Alia Abdelkader, Joseph Anderson, Xinzhe Cheng, and Madeleine Fischer. Aaron Betz wrote Chapter 3 with contributions from Daniel Crown, Edward Gamber, Chandler Lester, Jeffrey Schafer, and Byoung Hark Yoo. Molly Dahl compiled Appendix A. Aaron Betz authored Appendix B and Appendix C with contributions from Daniel Crown, Edward Gamber, Chandler Lester, James Pearce, Jeffrey Schafer, Chad Shirley, William Swanson, and Byoung Hark Yoo. Molly Dahl authored Appendix D with contributions from Joseph Anderson, Barry Blom, Kathleen Burke, Xinzhe Cheng, Sarah Sajewski, and Robert Stewart.

Austin Barselau, Cornelia Hall, Katherine Kim, Noah Meyerson, Eamon Molloy, Hudson Osgood, Aaron Pervin, Dan Ready, Lara Robillard, Sarah Sajewski, Julia Sheriff, Delaney Smith, Robert Stewart, Carolyn Ugolino, and Noah Zwiefel contributed to the analysis in this report with guidance from Christina Hawley Anthony, Barry Blom, Chad Chirico, Elizabeth Cove Delisle, Sean Dunbar, Alexandra Minicozzi, Sam Papenfuss, Asha Saavoss, and Emily Stern.

The long-term budget simulations were coordinated and prepared by Joseph Anderson along with Alia Abdelkader, Xinzhe Cheng, Daniel Crown, and Madeleine Fischer.

Edward Harris, John McClelland, Molly Saunders-Scott, and Joshua Shakin coordinated the revenue simulations, which were prepared by Kathleen Burke, Dorian Carloni, Nathaniel Frentz, Bilal Habib, Jack Lynch, Shannon Mok, Daniel Page, James Pearce, Kevin Perese, Kurt Seibert, Jennifer Shand, Molly Sherlock, Naveen Singhal, Ellen Steele, Emma Uebelhor, and James Williamson.

Robert Arnold (a consultant to CBO), Devrim Demirel, Sebastien Gay, and Jaeger Nelson coordinated the macroeconomic projections, which were prepared by Nicholas Abushacra, Joyce Bai, Aaron Betz, Daniel Crown, Daniel Fried, Edward Gamber, Ron Gecan, Mark Lasky, Chandler Lester, Kyoung Mook Lim, Michael McGrane, Christine Ostrowski, and Jeffrey Schafer.

Molly Dahl, Kathleen FitzGerald, Xiaotong Niu, Sam Papenfuss, and Julie Topoleski coordinated the population projections, which were developed by Daniel Crown with contributions from Jeremy Crimm, Rebecca Heller, Delaney Smith, and Katherine Starkey.

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Mark Doms and Jeffrey Kling reviewed the report. Valuable comments were provided by Ann E. Futrell, Evan Herrnstadt, Kyoung Mook Lim, Shannon Mok, John Seliski, Molly Sherlock, Emily Stern, and James Williamson, and that work was coordinated by Michael Fialkowski.

Christine Bogusz, Christine Browne, Scott Craver, Christian Howlett, Bo Peery, and Caitlin Verboon edited the report, and R. L. Rebach created the graphics and prepared the text for publication. Madeleine Fischer coordinated the fact-checking of the report with contributions from Nicholas Abushacra, Margot Berman, Jodi Capps (a consultant to CBO), Alexander Gniewecki, Jada Ho, Jack Lynch, Daniel Page, Natalia Reyes, Youstiena Shafeek, Noah Swart, Emma Uebelhor, Grace Watson, and Griffin Young. Nicholas Abushacra, Daniel Crown, Natalia Reyes, and Noah Swart prepared the supplemental information files. The report is available at www.cbo.gov/publication/61187.

CBO seeks feedback to make its work as useful as possible. Please send comments to communications@cbo.gov.

Phillip L. Swagel
Director
March 2025

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Docket No. 20250029-GU – PGS Rate Case

2025 Settlement Agreement Major Elements Comparison

¶	Major Public Interest Element	Original Request	Rebuttal Request (As Applicable)	Settlement Term
¶2	**Cost of Capital** *AFD*	11.1% ROE Midpoint 10.1% – 12.1% Range 54.7% Equity Ratio 7.57% Weighted Average Cost of Capital	No Changes	10.3% ROE Midpoint 9.3% – 11.3% Range 54.7% Equity Ratio (***Same***) 7.18% Weighted Average Cost of Capital
¶3(a)	**2026 Test Year Revenue Increase** *AFD/ECO&ENG*	$96,857,794 Net Revenue Increase $6,733,295 CI/BSR Revenue Adjustment $103,591,089 Total Revenue Requirement Increase	$86,416,819 Net Revenue Increase $6,733,295 CI/BSR Revenue Adjustment (***Same***) $93,150,114 Total Revenue Requirement Increase The $10,440,975 reduction includes removal of $5,858,210 in Natural Gas Facilities Relocation Cost, as discussed in ¶10(a).	$60,000,000 Net Revenue Increase $6,733,295 CI/BSR Revenue Adjustment (***Same***) $66,733,295 Total Revenue Requirement Increase Net Revenue Increase includes removal of Natural Gas Facilities Relocation Cost.
¶3(b)	**2027 Subsequent Year Adjustment** *AFD/ECO&ENG*	$26,709,076 Net Revenue Increase Does not include CI/BSR Revenue Adjustment	No Changes	$25,000,000 Net Revenue Increase Does not include CI/BSR Revenue Adjustment (***Same***)
¶3(c)	**2028 Pressure & Capacity Improvements Base Rate Increase** *ENG*	PGS was in the process of developing a comprehensive plan, due to increased back-up residential generator use, to outline system capacity issues in each of its service areas, proposed solutions, projected timeline, and implementation strategy. No dollar value Net Revenue Increase requested.	No Changes	PGS may file limited proceeding for base rate increase no earlier than January 1, 2028, for certain projects to address certain projects in capacity improvement plan. Up to $5,000,000 Net Revenue Increase allowed.
¶4	**Revenue Allocation and Rate Design** *ECO*	PGS proposed a new customer/demand cost of service methodology and revenue allocation for small diameter mains; medium and large diameter mains allocated on traditional peak and average capacity allocation. 2026 Tariffs included: Reduction of Residential Rates to 2 Classes Changes to Miscellaneous Service Charges 2027 tariffs proposed to be filed in September 2026 for Commission approval to be effective January 2027.	No Changes	Negotiated Revenue Allocation as reflected in revised Exhibit B; reflects compromise between PGS's and FIPUG's testimonies. 2026 Tariffs provided in Attachment C; Reduction of Residential Rates to 2 Classes (***Same***) Miscellaneous Service Charges as proposed. (***Same***) 2027 tariffs proposed to be filed no later than July 31, 2026, for Commission approval to be effective January 2027.
¶5(b)	**Rider CI/BSR** *ECO/ENG*	Continue implementation of Rider CI/BSR to replace legacy assets.	No Changes	Continue implementation of Rider CI/BSR. (***Same***) However, for the settlement period, PGS will not transfer Rider CI/BSR revenue requirements into base rates, outside of the current revenue adjustment, until its next general base rate case, and will not seek new project categories or recovery of PPP replacement costs associated with the Tampa Downtown project included in its Initial Rate Case Filing through the Rider CI/BSR.
¶6	**Storm Accrual, Reserve, and Damage Cost Recovery** *ENG*	$380,000 Storm Reserve Accrual $3,800,000 Storm Reserve Target	No Changes	$380,000 Storm Reserve Accrual (***Same***) $3,800,000 Storm Reserve Target (***Same***) Interim storm costs 60 days from filing

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2025 Settlement Agreement Major Elements Comparison

¶7	**Depreciation** *ECO/AFD*	Existing depreciation and amortization rates are used to determine the depreciation expenses and reserves. PGS proposed a new subaccount for WAM system software, increasing the amortization period from 15 to 20 years, and reflecting a $717,633 reduction to WAM amortization expense for test year, if approved.	No Changes	For the Settlement period, depreciation rates and amortization periods are those that are currently in effect. (***Same***) New subaccount for WAM software included, along with an increase to 20 year amortization period. (***Same***) PGS is not required to file a depreciation study during the Term of the Settlement Agreement. It shall file a depreciation study synchronized with its next general base rate increase request.
¶9	**Federal and/or State Corporate Income Tax Changes** *AFD*	N/A	N/A	Includes procedural provisions for addressing changes to existing tax laws similar to those seen in past settlements. In the event of relevant tax law changes, the procedural provisions provide for changing base rates and for any interim (i.e., time in between law change and base rate change) tax effects to be collected/refunded through the conservation clause.
¶10(a)	**Natural Gas Facilities Relocation Cost Removal** *IDM*	N/A	Remove $5,858,210 from 2026 Net Revenue Request Reflects removal of facilities relocation costs, which will be addressed for recovery in a future proceeding (Natural Gas Facilities Relocation Cost Recovery Clause). The rate base reduction effect on the 2026 revenue requirement is $4,205,920 in investment, and $1,652,290 million in associated depreciation/property taxes.	Facilities relocation cost recovery to be addressed in a future proceeding. (***Same As Rebuttal***)
¶10(b)	**AMI Pilot** *ENG*	Requested continuation of AMI Pilot due to delay as a result of TECO upgrading its AMI network. Delayed pilot launch to third quarter of 2025 to align with completion of TECO's platform upgrades.	No Changes	Approves continuation of AMI pilot as proposed in original request. (***Same***)
¶10(c)	**Economic Development Expenses** *AFD*	$388,740 Economic Development Expenses	No Changes	$388,740 Economic Development Expenses. (***Same***) Subsequent years are limited to the greater of $388,740 escalated for customer growth since 2026 or 95% of the expenses incurred, as long as it does not exceed the lessor of 0.15% of gross annual revenues or $3 million.
¶10(d)-¶10(g)	**Other Accounting Treatments (Parent Debt Adjustment, MGP, TIMP, Software)** *AFD/ENG*	Parent Debt Adjustment: $2.967 million Manufactured Gas Plant (MGP): continue existing $1.0 million amortization Transmission Integrity Management Program (TIMP): Continue reserve accounting treatment, treat difference as regulatory asset, with levelized expense of $2.7 million. Software: record non-capitalizable software costs as regulatory asset and amortize over five years.	No Changes	Parent Debt Adjustment: $2.967 million (***Same***) MGP: continue existing $1.0 million amortization (***Same***) TIMP: Continue reserve accounting treatment, treat difference as regulatory asset, with levelized expense of $2.7 million. (***Same***) Software: record non-capitalizable software costs as regulatory asset and amortize over five years. (***Same***)

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Peoples Gas System, Inc.
Docket No. 20250029-GU
Exhibit No. PGS-2

PEOPLES GAS SYSTEM, INC.

PRE-FILED TESTIMONY AND EXHIBIT

CHANGES AND CORRECTIONS

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A. Identified in Depositions

During the depositions conducted in this proceeding, Peoples Gas System, Inc. ("Peoples" or the "company") identified the following corrections to the prefiled Direct Testimony and Exhibits of company witnesses:

1. Direct Testimony of Eric Fox:

Page 6, Line 21:	Replace "2026" with "2024"
Page 24, Line 20:	Replace "641" with "855"

2. Direct Testimony of John Taylor:

Page 30, Lines 7 through 9:	Remove "This relationship highlights how customer expansion drives mains investment rather than being driven solely by peak demand or annual usage."

3. Direct Testimony of Luke Buzard:

Page 3, Line 14:	Insert "and Docket No. 202500051-GU" after "20230023-GU"
Page 53, Lines 7 through 10:	Remove "All new customers since July 1, 2025, and existing customers without 12 months of usage as of July 1, 2025, will automatically be placed in the RS-2 Billing Class."
Page 53, Lines 18 through 23:	Remove "As stated above, new residential customers will not be added to the RS-1 billing class subsequent to July 1, 2025. Only those customers that existed in RS-1 prior to July 1, 2025 will remain in RS-1 unless their annual consumption review requires a reclassification into RS-2."
Page 35, Line 10:	Replace "does" with "has"
Page 60, Lines 16 and 20:	Replace "Supply" with "Service"

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4. Timothy O'Connor:

Direct Testimony Page 47, Lines 21 and 22:

Replace "damage prevention supervisor" with "supervisor"

Exhibit No. TO-1, Document No. 6:

- FERC Account 887: Number of Positions Filled should be "1" and Number of Positions Unfilled should be "1"
- Total Number of Positions Filled: Replace "54" with "55"
- Total Number of Positions Unfilled: Replace "24" with "23"

5. Donna Bluestone:

Direct Testimony Page 19, Line 6: Replace "Twenty-one" with "Twenty"

Direct Testimony Page 19, Line 11: Replace "19" with"20"

Exhibit No. DB-1 Document No. 3, Page 1 of 1:

- 2023 Rate Case Approved Positions Filled: Replace "101" with "102"
- Total Positions: Replace "121" with "122"

6. Andrew Nichols:

Exhibit No. AN-1, Document No. 1, Page 3 of 8:

- Remove the third row from the bottom referencing MFR C-32, Transactions with affiliate companies.

Exhibit No. AN-1, Document No. 10, Page 2 of 2:

- Footnote ** Replace "Document No. 3 to Exhibit No. JED-1" with "Document No. 9 to Exhibit No. AN-1"

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B. Change of Business Address

The company relocated its corporate offices after its petition and direct testimony was filed. This change of business address was reflected in the prefiled rebuttal testimonies of Helen Wesley, Luke Buzard, Christian Richard, Jeff Chronister, and Andrew Nichols; however, not all of Peoples' witnesses filed rebuttal testimony. The business address in the prefiled direct and rebuttal testimony of Peoples witnesses Wesley, Buzard, Richard, Chronister, Nichols, Bluestone, O'Connor, and Washington should be 3600 Midtown Drive, Tampa, Florida 33607.

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