



R Byler
65

*REPORT TO
JOINT ECONOMIC COMMITTEE
CONGRESS OF THE UNITED STATES*

FILE



**Survey Of Use By Federal
Agencies Of The Discounting
Technique In Evaluating
Future Programs** B-162719

*BY THE COMPTROLLER GENERAL
OF THE UNITED STATES*

JAN. 29, 1968

749882 / 1087831



COMPTROLLER GENERAL OF THE UNITED STATES
WASHINGTON, D.C. 20548

B-162719

January 29, 1968

Dear Mr. Chairman:

In accordance with your request of December 19, 1967, we are submitting our report on the results of our survey of use by Federal agencies of the discounting technique in evaluating future programs. Discounting is a technique which reduces the dollar value of future program costs and benefits by a compounded rate reflecting the cost of money. The discounting of future costs and benefits makes them comparable to present costs and benefits, i.e., comparable in terms of their present value.

In October 1967 we sent a list of questions concerning discounting practices to the heads of 23 Federal agencies. The agencies' replies to these questions are summarized in appendixes of this report. On the basis of the responses of the agencies, the following points are clear:

Although some Federal agencies do not use and do not plan to use discounting, the great majority of agencies view discounting as an increasingly important aid to decisionmaking.

Whether based on Treasury borrowing costs or other considerations, discount rates used in evaluating programs vary over an extremely wide range (3 to 12 percent).

It is possible that the wide disparity in agency practices and discount rates may produce a more serious misallocation of resources than would exist in the absence of discounting. In our opinion, the general acceptance of the technique of discounting by Federal agencies should be supplemented with improvements necessary to bring about consistency in and among agencies in discounting rates, techniques, and underlying concepts.

With respect to the discount rate, one school of thought holds that the rate should be determined by and be equal to the rate paid by the Department of the Treasury for borrowed money. Another school of thought holds that the rate should be determined by what is foregone, namely, the return that could have been earned in the private sector of the economy when the decision is made to commit resources to the public sector. Our survey revealed that some Federal agencies rely on their own interpretation of these schools of thought while others employ different criteria, including the Federal Reserve Board rediscount rate and agency borrowing cost.

The results of the survey, as shown in appendixes I and II, have been sent to the agencies for their consideration. A substantial amount of further study of specific problems and discussion of the problems with the agencies will be necessary if general guidelines establishing a standardized basis for discounting are to be promulgated.

This report also points out that, if the full costs of borrowing, including foregone taxes from the private sector, are considered, the difference between the various schools of thought is narrowed substantially. It therefore appears that there is a possibility of a satisfactory reconciliation of varying points of view regarding the rate or rates to be used. The report emphasizes that the important matter disclosed by our study is the inconsistency of present practices.

Because of the extreme variation in discount rates and techniques being used by the executive agencies for evaluating and justifying their programs and because there is strong impetus toward the use of the discounting technique by Federal agency adoption of planning-programming-budgeting systems, the Congress may wish to provide guidance to the executive agencies on this important topic.

We have prepared this report for the use of the Congress because of our belief that some measure of standardization regarding the use of

B-162719

the discounting technique is needed to enhance the quality and consistency of information concerning Federal programs which is presented to the Congress for its consideration.

Sincerely yours,

A handwritten signature in cursive script, reading "James P. Stacks". The signature is written in black ink and is positioned above the typed name and title.

Comptroller General
of the United States

The Honorable William Proxmire, Chairman
Joint Economic Committee
Congress of the United States

C o n t e n t s

	<u>Page</u>
INTRODUCTION	1
BACKGROUND	2
Explicit and implicit discount rates	3
Effect of changes in discount rates on benefit-cost ratios	5
Determination of discount rate	7
Discount rate for planning water and related land resources projects	8
RESULTS OF SURVEY	10
Summary of agency practices	10
Divergent agency views on discount rates	11
Significance of differing practices	13
Conclusions	15
Matter for consideration by the Congress	16
	<u>Appendix</u>
APPENDIXES	
Discount rates used by Federal agencies in the analysis of individual programs in fiscal year 1969	I 19
Federal agencies not using discounting in the analysis of individual programs in fiscal year 1969	II 24
Illustration of calculation of total cost to the Government of borrowed funds	III 25
Illustrative copy of a request for information concerning discounting sent to selected agencies	IV 29
Letter dated December 19, 1967, to the Comptroller General of the United States from the Chairman of the Joint Economic Committee	V 32

INTRODUCTION

The General Accounting Office has made a survey of the use by 23 selected Federal agencies of the technique of discounting in making evaluations of future programs. The nature of the discounting technique is described in the background section of this report.

Our survey was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67). The survey was performed in Washington, D.C., and was completed in December 1967.

We undertook this survey because of our belief that the rapid growth in program expenditures by the Government and the increasing complexity of Federal programs point up the need for responsible officials in the Government to make effective use of objective aids to decisionmaking. This report discusses one such aid--the technique of discounting--and describes its use by the Federal agencies included in our survey.

Our survey was directed primarily toward determining the extent to which the discounting technique is presently employed by Federal agencies and the extent to which those agencies not employing this technique plan to do so and toward identifying the discount rates currently in use by the agencies. We did not evaluate the appropriateness of the agencies' stated policies and practices as they were revealed to us, neither did we examine into the actual discounting techniques and practices followed by the agencies or into other policies and practices used by them when evaluating Federal programs.

An illustrative copy of a request for information concerning discounting sent to each of the selected agencies is attached as appendix IV. Our request for information and our survey did not cover information concerning water and related land resources programs for which recognition of uniform agency practice is contained in Senate Document 97 (see discussion on p. 8) or programs that come within the purview of Bureau of the Budget Circular A-76 entitled "Policies for Acquiring Commercial or Industrial Products and Services for Government Use."

BACKGROUND

The theory underlying the discounting technique is that benefits from Federal programs to be realized in the near future are valued more highly than benefits to be realized in the more distant future and that costs which must be incurred in the near future loom larger than costs that will be incurred in the more distant future. The discounting of future benefits and costs makes them comparable to present benefits and costs, i.e., to the present values of benefits and costs. The numerical standard used in making these intertemporal comparisons is called the discount rate.

Federal agency programs, like other programs, generally involve a series of annual costs and a flow of benefits over time. Calculation of the present values of costs and benefits through discounting makes possible a comparison of costs and benefits, usually expressed in terms of a ratio of benefits to costs, which gives consideration to the time periods in which benefits will be realized and costs incurred. Such comparisons (or ratios) are useful in evaluating programs and in choosing between alternative programs. Furthermore, the discounting technique can be helpful to the decisionmaker in those cases in which the benefits associated with programs cannot be measured in dollars. Here, the present values of the costs of the programs can be presented to the decisionmaker for his decision as to whether the perhaps dimly perceived benefits are worth their costs. The technique can also be helpful in making comparisons of the costs of programs that have equal benefits.

The present values of program benefits and costs will not usually be the only information decisionmakers need concerning benefits and costs. For example, there may often be value in tables which show the time-phased undiscounted costs and benefits in a manner that enables the decisionmakers to see the full impact of benefits and costs in each fiscal year.

EXPLICIT AND IMPLICIT DISCOUNT RATES

Discount rates are often explicit but in some cases they may be implicit. An explicit discount rate is a rate which is identified and used to calculate the present values of future benefits and costs. However, if in an analysis the assumed life of the program is different from the more probable life expected on the basis of experience or studies, then an implicit discount rate is actually being used.

The meaning of such an implicit discount rate can be illustrated by the following example in which a 10-year program life is used in an evaluation study but the most probable program life is 20 years. In order for the evaluation study based on 10 years to lead to the same conclusion as one based on 20 years, the present values must be equal in both cases.

In this example the net annual program benefits will continue beyond the 10-year program life assumed in the study. Since the net annual benefits in the eleventh year through the twentieth year are not recognized in the 10-year study an implicit discount rate is being used. In column A of the following table the total undiscounted values of program costs and benefits are shown for the assumed program life of 10 years. In column B the program costs and benefits for the most probable program life of 20 years are shown discounted at 8 percent--the discount rate that is required to equate the benefit-cost ratios in columns A and B. The implicit discount rate in this analysis which uses an assumed program life of 10 years (column A) is thus 8 percent.

	Undiscounted amounts	Present values	
		(A) Assumed 10-year life	(B) Most probable program life--20 years
(millions)			
Implicit discount rate			8.0%
Initial investment	\$10	\$10.0	\$10.0
Annual operating costs	1	10.0	9.82
Annual benefits	3	30.0	29.45
Ratio of present value of benefits to present value of total costs (benefit- cost ratio), rounded		1.5	1.5

Shown in the table below are the approximate discount rates, for a range of the most probable program lives, that would be implied by analyses in which explicit discounting is not used but in which the assumed program lives are shorter than the most probable program lives. The implicit discount rates in an actual case may be somewhat different, depending on the form of the cost or benefit streams over time.

Implicit Discount Rates in Percent

Most probable program life (years)	Assumed program life (years)					
	<u>1</u>	<u>5</u>	<u>10</u>	<u>15</u>	<u>20</u>	<u>25</u>
1	-	-	-	-	-	-
5	100	-	-	-	-	-
10	100	15	-	-	-	-
15	100	18	6	-	-	-
20	100	19	8	3	-	-
25	100	20	9	4	2	-

Benefit-cost ratios may be very sensitive to the explicit discount rate used in calculating the present value of costs and benefits. As shown in the following example, which involves a program with a probable life of 25 years that requires an initial investment of \$50 million, changes in the rate can turn what would appear to be an attractive program into an unattractive program and vice versa.

Initial invest- ment	Annual operating costs	Annual benefits	Ratios of benefits to cost		
			Undis- counted	Dis- counted at 3 percent	Dis- counted at 7 percent
(millions)					
\$50	\$12	\$16	1.14	1.08	0.98

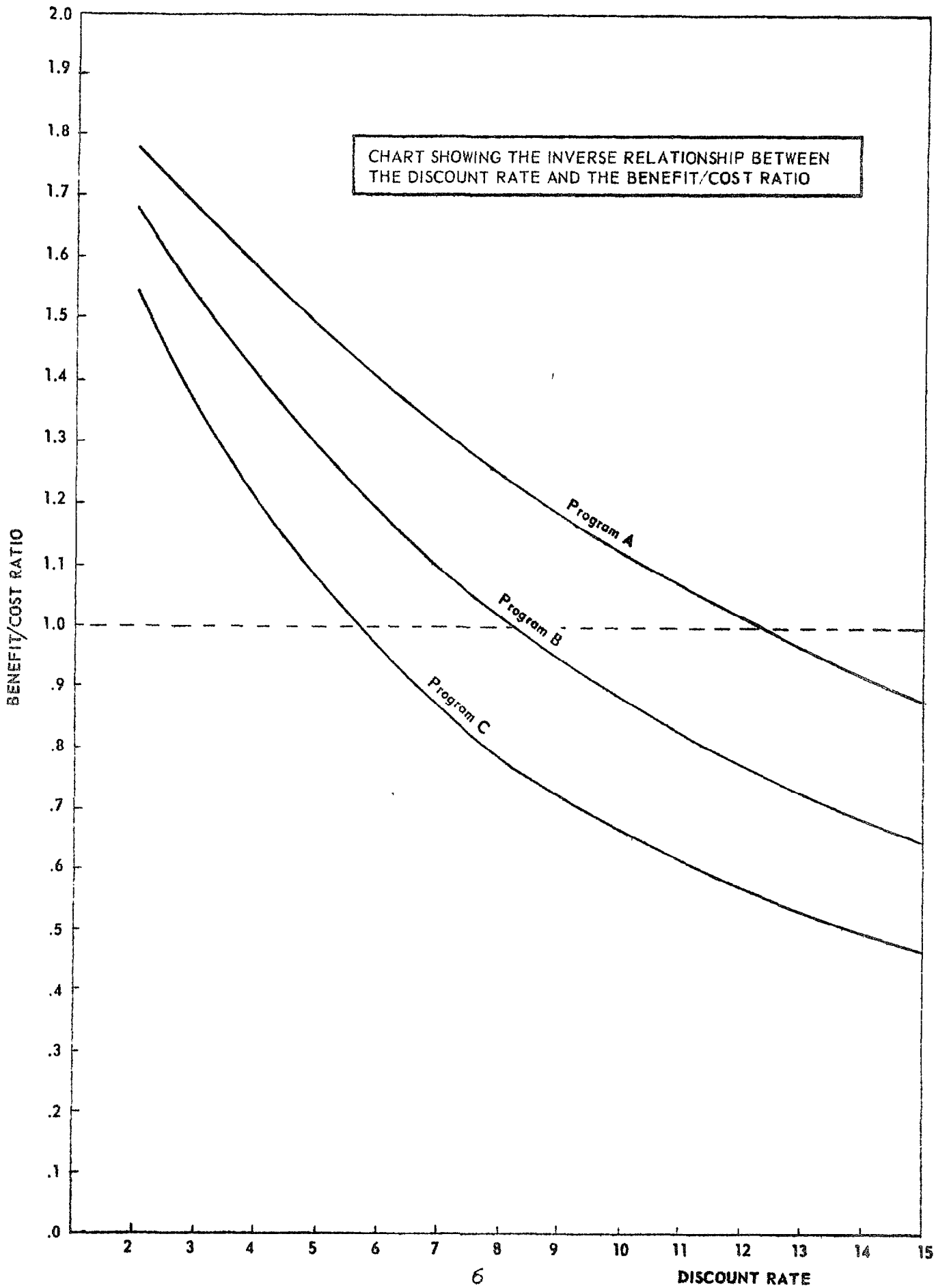
EFFECT OF CHANGES IN DISCOUNT RATES ON BENEFIT-COST RATIOS

The chart on page 6 shows the inverse relationship between discount rates (shown on the horizontal axis) and benefit-cost ratios (shown on the vertical axis) for three different programs which have constant annual benefits and constant annual operating costs. The three curves illustrate the effect of discounting on the benefit-cost ratios of the three hypothetical programs with differing lives, each of which, if undiscounted, would reflect a benefit-cost ratio of 2; that is, total undiscounted benefits for each program would be double the total undiscounted costs. With discounting, the favorable benefit-cost ratios deteriorate as higher discount rates are applied. For example, Program A has a benefit-cost ratio of about 1.7 at 3 percent, but only about 1.1 at 10 percent.

The curves drawn for these three hypothetical programs are probably typical of such curves for many programs; however, the curve for any particular program may be different because of the behavior of the program's benefits and costs. Such behavior would depend in part upon the assumed life of the program and the amount of initial investment cost relative to annual benefits and annual costs.

The chart on page 6 also illustrates that changes in the higher discount rates have less relative effect on benefit-cost ratios than do changes in the lower discount rates. Therefore, a greater absolute error or wider range of uncertainty or variation may be tolerated in the higher discount rates than in the lower discount rates. For example, an increase in the discount rate from 3 to 6 percent reduces the program B benefit-cost ratio by about 23 percent; whereas, an increase from 10 to 13 percent reduces the benefit-cost ratio by about 17 percent.

CHART SHOWING THE INVERSE RELATIONSHIP BETWEEN THE DISCOUNT RATE AND THE BENEFIT/COST RATIO



DETERMINATION OF DISCOUNT RATE

With respect to determination of the rate, one school of thought holds that the rate should be determined by and be equal to the rate paid by the Treasury in borrowing money. Another school of thought holds that the rate should be determined by what is foregone, namely, the return that could have been earned in the private sector of the economy when the decision is made to commit resources to the public sector. Proponents of both views agree that the use of different discount rates has an effect on financial judgments which is similar to charging different prices for, say, identical labor in different programs.

Neither school of thought provides clear guidance on the specific discount rate that should be used. Cost to the Treasury, for example, will vary, depending upon the definition applied, from 3 to 8 percent or more. The average rate of return in the private sector also varies depending upon historical periods selected and upon the weighting of the various segments of the private sector which are used in computing an average.

A discount rate of about 3.2 percent is the cost to the Treasury, if based upon the average rate payable on outstanding United States securities having a maturity of 15 years or more, as prescribed by Senate Document 97 (discussed below).

The rate of return that can be earned in the private sector is estimated by most researchers to be significantly higher than the cost of Government borrowing based on Senate Document 97. According to one researcher, the average rate of return in the private sector amounted to 15.4 percent for manufacturing companies and 4.1 percent for railroads in the years 1961-65.¹ These and other estimates of the same researcher are shown in the following table.

¹Prepared statement of Jacob A. Stockfish, Hearings before the Senate Subcommittee on Economy in Government of the Joint Economic Committee, Ninetieth Congress, on the Planning-Programming-Budgeting System: Progress and Potentials.

<u>Segment</u>	Annual average rate of return 1961-65 (percent)
Manufacturing	15.4
Electric utilities	9.3
Gas pipelines	8.6
Telephone	11.9
Railroads	4.1
Motor carriers (note a)	14.7
Oil pipelines	15.6
Airlines	8.2

^aAverage for 1961-64 only.

Therefore, if Senate Document 97 is used as the basis for the cost of Government borrowing, the difference between the two schools of thought is quite significant. If, on the other hand, Treasury borrowing costs are calculated on the basis of total costs to the Government, including corporate and individual income taxes foregone as a result of borrowing by the Government to finance programs, an estimate of between 7 and 8 percent results. (See illustrative calculation in app. III.) Thus, if Government costs are calculated on this basis, the practical importance of the difference between the two schools of thought is greatly reduced.

DISCOUNT RATE FOR PLANNING WATER
AND RELATED LAND RESOURCES PROJECTS

Senate Document 97 entitled "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources" (87th Cong., 2d sess.), which provides congressional guidance on discount rates under certain circumstances, states that the discount rates "shall be based upon the average rate of interest payable by the Treasury on interest-bearing marketable securities of the United States outstanding at the end of the fiscal year preceding such computation, which upon original issue, had terms to maturity of 15 years or more."

The document also states that "This procedure shall be subject to adjustment when and if this is found desirable as a result of continuing analysis of all factors pertinent to selection of a discount rate for these purposes."

Senate Document 97 was developed by the Secretary of the Army; the Secretary of Agriculture; the Secretary of Health, Education, and Welfare; and the Secretary of the Interior, and it was approved by President Kennedy on May 15, 1962. As indicated in the title, the document relates only to water and related land resources.

RESULTS OF SURVEY

SUMMARY OF AGENCY PRACTICES

In our survey of the use of the discounting technique, selected agencies were asked to respond to a questionnaire concerning the discount rates used, rationale for the rates chosen, and plans for future use by agencies which were not evaluating fiscal year 1969 programs on the basis of discounting.

The table below shows the agencies' plans for using the discounting technique.

Agency Plans for Using the Discounting Technique

<u>Agency</u>	<u>Discounting used in analysis of fiscal year 1969 programs</u>		<u>Discounting not used but plans are to use discounting in future</u>	
	<u>Yes</u>	<u>No</u>	<u>Yes</u>	<u>No</u>
Tennessee Valley Authority	X			
General Services Administration	X			
Department of Agriculture	X			
Department of Defense	X			
Office of Economic Opportunity	X			
Department of Transportation (Federal Aviation Administration)	X			
Department of Health, Education, and Welfare	X			
Atomic Energy Commission	X			
Agency for International Development	X			
Department of the Interior	X			
Federal Communications Commission		X	X	
Department of Housing and Urban Development		X	X	
Interstate Commerce Commission		X		X
National Science Foundation		X	X	
Federal Power Commission		X	X	
Export-Import Bank of Washington		X		X
Department of Labor		X	X	
Peace Corps		X	X	
Veterans Administration		X		X
Department of the Treasury		X		X
Post Office Department		X	X	
National Aeronautics and Space Administration		X	X	
Department of Commerce		X		X

As shown in the table, 10 of the 23 agencies queried report that discounting is used in making decisions. An additional eight agencies do not now use discounting but report that they plan to do so in the future. The remaining five agencies do not use discounting at the present time and do not state that they plan to do so in the future. However, two--Department of Commerce and Veterans Administration-- of these five agencies reported that some programs are evaluated in terms of periods of time which are shorter than the probable actual life of the programs--a procedure which involves implicit discounting. (See discussion of implicit discounting which begins on p. 3.)

Details of rates used by the agencies which use the discounting technique appear in appendix I.

Explanations of the plans of agencies which do not use the discounting technique appear in appendix II.

DIVERGENT AGENCY VIEWS ON DISCOUNT RATES

A divergence of opinion on discounting is reflected in agency practices. Some agencies use the Treasury cost of borrowing money as the discount rate while others use a rate based on the return on investment in the private sector of the economy. Still others employ different criteria to determine the agency's discount rate including the Federal Reserve rediscount rate and agency borrowing cost. The agencies included in our survey use discount rates which vary over an extremely wide range--from about 3 percent to 12 percent.

Within each school of thought there are important differences of opinion. Of those agencies which tie the discount rate to Treasury borrowing costs, one uses the estimated cost of new money to the Treasury, another uses the average cost of money to the Treasury, others use the cost prescribed by Senate Document 97 (about 3.2 percent at the time of our review).

One of those agencies which would tie the discount rate to the rate of return in the private sector uses a rate of

return on a safe investment and a slightly higher rate (3 percent and 5 percent) while another uses for some programs the rate representative of average capital returns in the private sector (presumed to be 12 percent) and for some programs permits the analyst to determine the rate on the basis of his judgment as to the nature of the program and the kind of analysis considered most meaningful.

Views are equally disparate in those agencies which report that discounting was not used in their analyses of individual programs for support of their fiscal year 1969 budget decisions. At one extreme is the view that decisions on programs should be made on the basis of first year costs and benefits--a procedure which implies a discount rate of 100 percent, since the future is ignored. At the other extreme is the view that decisions should be based on total undiscounted costs and benefits--a procedure which implies a discount rate of zero, since costs and benefits applicable to, say, the 20th year are treated as being as important as current costs and benefits.

SIGNIFICANCE OF DIFFERING PRACTICES

The fact that some agencies use discounting and some do not will tend to affect adversely the quality of decisions. This is illustrated in the following (hypothetical) cases.

Case A involves a program in an agency that does use discounting. Estimated costs and benefits of this program over its 25-year life are:

Initial investment costs	\$12,000,000
Annual operating costs	2,000,000
Annual benefits	3,000,000
Present value of total costs discounted at 4.5 percent	41,656,000
Present value of total benefits discounted at 4.5 percent	44,484,000
Benefit-cost ratio	1.07

Case B involves a program in a different agency which does not use discounting. Estimated costs and benefits of this program over its 25-year life are:

Initial investment costs	\$16,000,000
Annual operating costs	1,500,000
Annual benefits	2,500,000
Total costs	53,500,000
Total benefits	62,500,000
Benefit-cost ratio	1.17

On the basis of the benefit-cost ratio, the net value of program A is marginal. To the extent that benefit-cost ratios are considered significant by the decisionmakers, there would be a tendency to prefer program B rather than program A because total undiscounted benefits exceed total costs by a relatively wide margin, even though if program B were subjected to the rate of discount (4.5 percent) used for program A it would be much less attractive than program A (benefit-cost ratio of 0.97 compared with 1.07). Thus, the benefit-cost analyses for programs A and B would, if only the program A analysis used discounting, tend to bring about

a misallocation of resources since the results of the analyses would favor program B.

In the above example, the tendency to misallocate will, of course, increase with higher discount rates. The following table illustrates this tendency as the discount rate increases from zero to 10 percent.

<u>Benefit-cost ratio</u>	<u>Pro-gram A</u>	<u>Pro-gram B</u>	<u>Differ-ence</u>
Undiscounted	1.21	1.17	.04
Discounted at 4-1/2 per- cent	1.07	.97	.10
Discounted at 10 percent	.90	.77	.13

Differences in discounting practices (see app. I) in and among the agencies which do use discounting will tend to produce the same kind of misallocation. For example, a power-production program in the Tennessee Valley Authority (TVA) (life of 50 years) may have a benefit-cost ratio of 1.14 (if discounted at 4.5 percent), while in the Department of the Interior the same flow of costs and benefits would yield a ratio of 0.96 (if discounted at 6 percent) or only 0.58 if the project were felt to be risky (and for this reason discounted at 12 percent). Thus, even though both agencies use discounting, the fact that different rates are used tends to favor programs of the agency using the lower discount rate and thus a misallocation of resources could be the result.

Similarly, interagency differences in implicit discount rates in agencies that do not use explicit discounting (see app. II) tend to produce misallocation. As shown in the table on page 4, the implicit discount rate increases as the difference between the most probable (longer) actual life of a program and the period of time considered in evaluating the program increases. The Veterans Administration (VA), for example, evaluates programs on the basis of a 5-year period, while the most probable life of, say, a hospital is about 25 years. Thus, the implicit discount rate is about 20 percent. The Department of Commerce, on the other hand, evaluates some programs having a

most probable life of at least 11 years in terms of a 7-year period--a procedure which implies a discount rate of about 8 percent. Under these conditions, the benefit-cost ratio for a given stream of benefits and costs will be higher in the Department of Commerce than in the VA. To the extent decisions turn on the relationship between costs and benefits, the VA will be inclined to reject projects which would be promoted under the standards employed in the Department of Commerce. Hence, resources will tend to flow from VA projects to Department of Commerce projects.

CONCLUSIONS

Federal agencies that use the explicit discounting technique may be making good use of this tool in evaluating individual projects. The analyst who examines a given project in detail, develops the discount rate which he considers appropriate, and calculates the present value of benefits and costs is in a better position to make defensible recommendations than if his analysis ignored the time periods over which benefits will be realized and costs incurred.

In our opinion, however, there is a greater value for the discounting technique when the decisionmaker must choose between many competing projects and this calls for a common standard with justification for variations in the discount rate which may be appropriate in special circumstances. Although some agencies indicate that the discount rate is viewed as an aid in choosing between programs within an agency, there appears to be little recognition that the evaluation of Federal programs calls for a common yardstick for use by all agencies.

In our opinion, the general acceptance of the technique of discounting by Federal agencies should be supplemented with improvements necessary to bring about consistency in and among agencies in discounting rates, techniques, and underlying concepts. We believe such improvements are needed if this aid is to be of most effective use to the agencies, the Bureau of the Budget, and the Congress in its evaluation of agency programs submitted for consideration.

Obstacles to reform in this important area are many and varied. For example, the specific nature of decisions that must be made needs to be examined in order that criteria for evaluating discounting techniques, discount rates, and underlying concepts can meet the needs of the various decisionmakers. It is clear to us that some measure of standardization is needed to enhance the quality and consistency of information presented to the various decisionmakers for their consideration.

MATTER FOR CONSIDERATION BY THE CONGRESS

Both the case for discounting and the choice of discount rates have been subjects of dispute for years. However, the results of our survey of Federal agency practices suggest that the case for discounting is being accepted but that there is a significant difference of opinion among the agencies over discount rates. Because of the extreme variation in discount rates and techniques being used by the executive agencies for evaluating and justifying their programs and because there is strong impetus toward the use of the discounting technique provided by Federal agency adoption of planning-programming-budgeting systems, the Congress may wish to provide guidance to the executive agencies on this important topic.

APPENDIXES

DISCOUNT RATES USED BY FEDERAL AGENCIES IN THE
ANALYSIS OF INDIVIDUAL PROGRAMS IN FISCAL YEAR 1969

Agency	Programs	Rate (percent)	Rationale	
			Treasury borrowing cost	Other
Tennessee Valley Authority	Fertilizer munitions and development	4.5	X	
	Power supply and use	4.5 to 5.5		Cost of money to TVA (note 1)
General Services Administration	Facilities program	4.5		Estimated productivity of capital (note 2)
Department of Agriculture	Housing loans	4.875	X	(note 3)
	Water and sewer loans and grants	4.875	X	
	Rural electrification loans	4.875	X	
	Rural telephone loans	4.875	X	
	Rural renewal district loans	4.875	X	
	Rural conservation and development loans	4.875	X	
	Farm operating loans	4.875	X	
	Farm real estate loans	4.875	X	
Office of Economic Opportunity	Production efficiency	5.0	X	
	Job corps	3.0 and 5.0		"Rate or return on a safe investment and a slightly higher rate" (note 4)
	Upward bound	3.0 " 5.0		Same
Department of Transportation (Federal Aviation Administration)	Family planning program	5.0		Do.
	Facilities and basic systems	4.2		Federal Reserve rediscount rate
	Radar components	4.2		Same
	En route automation	4.2		Do.
Atomic Energy Commission	Enriched uranium production planning	5.0	X	
	Radioactive waste management planning	5.0	X	
	Value of special nuclear materials	5.0, 7.5, and 10.0	X	Use of 7.0 and 10.0 not explained
	Radiation pasteurization of meat	Government costs--5.0 Industry benefits--15.0	X	Rate used in industry
	Reactor development	5.0 to 9.0		6.0 and 7.0 typical of rate used by private utilities; 9.0 used to introduce a risk factor (note 5)
Department of Defense	41 shipyard projects	10.0		Time preference for current vs. future money sacrifices in private sector (note 6)
	14 air stations	10.0		Same
	18 other stations	10.0		Do.

APPENDIX I
Page 2

DISCOUNT RATES USED BY FEDERAL AGENCIES IN THE
ANALYSIS OF INDIVIDUAL PROGRAMS IN FISCAL YEAR 1969 (continued)

Agency	Programs	Rate (percent)	Rationale	
			Treasury borrowing cost	Other
Agency for International Development	Power plant in Afghanistan	8.0 (cost only)		Opportunity cost of money (note 7)
	Highway in Bolivia	12.0		Development on foreign exchange scarcity, opportunity costs, and other factors (note 8)
	Roads in Guyana	10.0		Same
	Roads in British Guiana	8.0		Do.
Department of the Interior	Utility program: Low risk	6.0		Representative returns on investment (note 9)
	Average	12.0		Average return in private sector (note 9)
	Energy and mineral development programs in which exploitation is a private function	12.0		Same (note 9)
	Aquatic living resources	3.1 and 6.0		No special explanation (note 10)
	Indian reservation resources development	3.1	X	Related to water or land resources, so S.D. 97 applies (note 11)
Department of Health, Education, and Welfare	Human investment programs (adult education, vocational rehabilitation, work experience)	0-8.0		(note 12)
	Individual diseases (tuberculosis, cancer, syphilis, arthritis, motor vehicle injury)	0-10.0		(note 12)
	Cost of illness	4.0 and 6.0		(note 12)
	Cancer control	4.0 " 6.0		(note 12)

The notes to appendix I appear on page 21.

NOTES TO APPENDIX I

1. The Tennessee Valley Authority (TVA) stated that its Power Supply and Use Program rates "are based on the expected costs of money which TVA must pay over the period of the evaluation. Since the power program is currently financed from earnings from the sale of power and from the sale of revenue bonds, the future cost of money varies with the proportion acquired from the different sources utilized as well as from changes in interest rates."
2. The General Services Administration (GSA) stated that in its facilities program the costs of alternatives were discounted to present value at 4.5 percent for 50 years, the estimated life of the buildings. GSA stated that the 4.5 percent rate was selected "as an estimate of the long term productivity value of capital" and was applied on the assumption that "the relationship between the costs of alternatives would hold over the life of the project under examination."
3. The Department of Agriculture stated that its analysts "often prefer to calculate internal rates of return for comparing investment-type programs, rather than use a benefit/cost ratio analysis which depends upon discounting." The "internal rate of return" is analogous to the "yields" of an investment. The procedure is to find the "internal rate" (the rate of discount) that equates the present value of the proceeds from an investment with the present value of the outlays on the investment.
4. The Office of Economic Opportunity advised us that the rates of 3 and 5 percent "were safely on the conservative side for estimates of this type," and that they represented a "rate of return on a safe investment and a slightly higher rate." The agency also advised us that these rates gave consideration to the secular growth in the price of quality-constant labor.

5. The Atomic Energy Commission stated that in its "reactor development studies, discount rates of 6 to 7 percent are illustrative of those used by investor-owned utilities. (Companion studies employ appropriate discount rates based on data from the Federal Power Commission applicable to public power systems.)" The 5 and 9 percent rates were used to determine the sensitivity of the reference value of 7 percent.
6. The Department of Defense stated that all the programs to which it applied the 10 percent discount rate were related to its military construction program. The discount rate was selected "to reflect the amount of time preference for current versus future money sacrifices that the public exhibits in nongovernmental transactions. The 10 percent rate is considered to be the most representative point within a range of plausible rates obtained from considering this public time preference."
7. The Agency for International Development stated that the cost of its Afghanistan power plant project was discounted at 8 percent, assumed to be the opportunity cost of money in that country. Benefits were not discounted since "it is assumed that the expected demand for power must be met." The computations were for a useful life of 39 years.
8. The Agency for International Development (AID) stated that the three Latin American roads projects were discounted for 20 years at the rates shown in the rate column of appendix I. Latin American roads projects, in general, are discounted to present value by AID at the opportunity cost of long-term capital "usually placed upwards of 8 percent and possibly ranging to 16 percent in some Latin American countries." AID analysts also compute the internal rate of return of such projects. The internal rate of return is described in note 3.
9. The Department of the Interior stated that no uniform or single discount rate had been applied in its major analyses outside the water and land resource area. The

selection of the discount rate generally had been left to the judgment of the analyst. But 6 percent, after taxes, is "considered to be representative of utility-type program in which risk is relatively low; 12 percent presumed to be representative of average capital returns in the private sector, etc." The time frame for analysis is varied from a long-term useful life concept to shorter periods of 20 years or less for programs oriented to the private sector or to short-term objectives. In the mineral resource area, the Department's general approach is to identify and compare internal rates of return as a means for ranking or establishing program priorities. The internal rate of return is described in note 3.

10. The Department of the Interior stated that in its aquatic resources programs "Alternative program levels and mixes were subjected to benefit-cost analysis using discount rates of 3-1/8 and 6 percent against benefit flows over 5, 10, and 15-year periods."
11. The Department of the Interior stated that, in its Indian-reservation resources development programs, comparative analyses of alternative programs "(irrigation, range development for livestock, dry-farming, timber production and industrial development) were based on an interest rate of 3-1/8 percent; however, the periods of analysis necessarily varied because of distinct program characteristics." This discount rate was selected in accordance with Senate Document 97 since the programs were related to water and land resources.
12. The Department of Health, Education, and Welfare stated that "We feel that discounting a future stream of dollars to present value is helpful, but we are uncertain what rate to set. We (use) several to see whether the difference is critical, for the specific purpose of the study. If it does not seriously disturb relative rankings we note this. If it does have a significant effect, we wish to inform the reader of the study of this."

APPENDIX II

FEDERAL AGENCIES NOT USING DISCOUNTING IN THE ANALYSIS OF INDIVIDUAL PROGRAMS IN FISCAL YEAR 1969

Agency comments

A. Agencies that plan to use discounting in future

Department of Housing and Urban Development	Discounting used in appraisal of fiscal year 1968 programs, with the rate determined by then-current Treasury borrowing costs. Agency has a strong interest in the development of policies for measuring the costs and benefits applicable to Federal programs.
Federal Power Commission	Analyses of Federal Power Commission programs, other than those involving water resources, are still in a preliminary stage; decisions on appropriate discount rate must await completion.
Federal Communications Commission	Detailed cost-benefit analyses will be made in the future when additional staff capability is developed.
Peace Corps	The evolution of planning-programming-budgeting systems in the Peace Corps has not reached the stage where discount rates are applied to costs and benefits.
National Science Foundation	Analyses have not been so sophisticated as to require discounting.
National Aeronautics and Space Administration	Agency has not attempted to express in terms of percentage discounts, the effect of future (total) costs and benefits although these economic factors are implicit in consideration of alternative programs and the assessment of priorities.
Department of Labor	Agency has considered discounting at length. Would tend to use a projected rate of growth in Gross National Product as representing the opportunity cost of financing socio-economic programs, with sensitivity analysis to indicate the effects of different rates and different time horizons. Manpower development assistance program evaluated in terms of cost in the first year, while the program will continue for 5 to 20 years.
Post Office Department	Agency has used discounting in past in its facility modernization program and in its lease-purchase reports to the Congress. Currently studying the incorporation of discounting concepts and practices on a wider scale.

B. Agencies that have no stated plans to use discounting or had no comments on their plans

Interstate Commerce Commission	Interstate Commerce Commission has no programs which lend themselves to the use of discount rates in measuring costs and benefits.
Veterans Administration	Useful life span of programs cannot be estimated in terms of duration based on a known or foreseeable termination point. Most programs, therefore, are evaluated on a 5-year projection basis.
Department of the Treasury	Programs are, in the main, continuing ones, and problems of efficiency relate primarily to the cost side; usually alternative costs for the same objective. This kind of comparison does not require use of a discount rate to evaluate future benefit streams. In those cases where procurement of capital equipment is involved, the benefits are generally large enough so that a simple payout period is all that is necessary.
Export-Import Bank of Washington	No comment.
Department of Commerce	Agency procedures involve appraisals of programs in terms of periods which are shorter than the estimated useful lives of the programs. The Economic Development Administration currently evaluates programs with 11 years' minimum lives in terms of the fiscal year 1967-74 period. The Environmental Science Services Administration evaluates 10- to 50-year programs in terms of 5 years. The Bureau of Standards evaluates indefinite (continuing) programs in terms of 5 years.

ILLUSTRATION OF CALCULATION OF TOTAL COST
TO THE GOVERNMENT OF BORROWED FUNDS

METHOD I

The current interest cost of borrowing long-term money is approximately 5 percent. The moving average rate specified by Senate Document 97 is currently about 3.2 percent. Therefore, a rate of interest approximately halfway between 5.0 and 3.2 could be used for initial consideration as the Government cost of borrowed money.

4.0%

Add to this cost:

1. Corporate taxes foregone by the Government if the average corporate return on investment is 12 percent before taxes¹, if the fraction of dollars borrowed by the Government which would have gone into corporate investment is 65 percent², and if the marginal corporate tax rate is 40 percent.

(.12) (.65) (.4)

3.1%

2. Personal taxes foregone by the Government if the average return on proprietorship, personal income-producing investments, etc., is such that the remaining 35 percent of money borrowed by the Government would have earned a 10-percent return for the persons taxed, and if such return would be taxed at a composite marginal rate of 30 percent.³

(.1) (.35) (.3)

1.0%

3. (a) Taxes foregone by the Government on dividends that would have been received by individuals from corporations if the composite marginal tax rate applicable to individuals is 30 percent, if the taxable dividends payout is 40 percent of corporate

profits after taxes, and if the assumptions as to corporate earnings and the marginal tax rate shown above under (1) are applicable. The marginal corporate tax rate is assumed to be 40 percent therefore 60 percent of corporate earnings is assumed available to the corporation for payment of dividends.

$$(.3) (.4) (.12) (.65) (.6) = .6\%$$

- (b) Personal taxes foregone by the Government if the corporate investment is financed by bonds rather than by corporate earnings, if corporate bonds carry an interest rate of 5 percent, if the fraction of dollars borrowed by the Government which would have gone into corporate investment is 65 percent, and if the composite marginal tax rate applicable to individuals is 30 percent.

$$(.05) (.65) (.3) = 1.0\%$$

- (c) Actual overall financing arrangements by corporations will generate tax revenues under both (a) and (b), therefore the cost to the Government may be assumed to be somewhere between .6 percent and 1.0 percent, say about

.8%

Subtract from this cost:

1. Income taxes collected on Government interest payments, if investment in bonds (see rate above of 4 percent) are divided between corporations and individuals in such a way that the tax rate is 35 percent.

$$(.04) (.35) \qquad \qquad \qquad \underline{-1.4\%}$$

Cost to Government 7.5%

METHOD II

On an aggregate basis, a similar result may be computed assuming a composite corporate and personal marginal tax rate of 50 percent⁴ and a taxable return of 10 percent on any money not borrowed by the Government.

(.5) (.1)	5.0%
Cost of Government borrowing (see explanation under Method I)	4.0%
Less taxes on Government bond interest (.04) (.35) (see explanation under Method I)	-1.4%
Cost to Government	7.6%

¹Various economists have examined rates of return before taxes in the private sector. Stockfish (see footnote on page 7), arrives at an average of 13.5 percent. Stiegler, National Bureau of Standards, determines a rate of 14 percent. Variations in this estimate result from consideration of differing time periods, weighting, etc. Our estimate of 12 percent used for this appendix is somewhat conservative in comparison with the recent experience noted by these economists.

²See Raymond Goldsmith's "Flow of Capital Funds in the Post-war Economy," National Bureau of Economic Research, 1965, where a table of gross capital consumption by major segments of the economy is shown. We are interested here in capital consumption for purposes of productive investment. Most household borrowing can be excluded as investment in consumption which would also result from payments by the Government to labor involved in Government programs. State and local capital consumption can be left out of this consideration. The corporate share of the remainder is approximately 65 percent.

³A table of marginal tax rates for various income levels is contained in a study done by the Institute for Defense Analyses for the Office of Economic Opportunity, as

summarized in "R-116, Federal Poverty Program, Assessment and Recommendations," January 1966. This document shows that the average marginal rate is approximately 30 percent for the higher income levels, from which personal income-producing investments tend to originate.

⁴This is a rough composite marginal rate for corporate and personal taxpayers that provides approximately for the separate estimates shown in 1, 2, and 3 for Method I.

Dear Mr. Secretary:

The General Accounting Office is making a study of the practices followed in the major Federal agencies in measuring the costs and benefits applicable to proposed Federal programs.

The examination of alternative means of achieving an agency's objectives is, of course, of central importance in the allocation of resources. Typically, the alternatives considered will differ with respect to the phasing of both costs and benefits over time. Determination of the relative merits of the alternatives, therefore, necessarily requires that costs and benefits be discounted.

It is clear that the choice of the preferred alternative turns to some extent on the explicit or implicit rate at which costs and benefits are discounted. It is equally clear that in the absence of general guidance on this subject a variety of quite different discounting practices have developed in the Federal agencies.

While different rates in different program areas may be appropriate, the absence of agreement on basic concepts, clearly reflected in the continuing disputes over basic policies, establishes a presumption that existing practices merit review.

It is with this thought in mind that we have prepared the enclosed questionnaire, which I ask you to complete and return by November 15, 1967. Cases involving water and related land resources are excluded, since these are handled under the rules set forth in Senate Document No. 97; similarly, cases involving make-or-buy decisions are excluded, since these are covered by Bureau of the Budget Circular No. A-76.

Any questions you may have should be addressed to Daniel B. Rathbun, Deputy Director for Systems Analysis, in our Office of Policy and Special Studies. (129-5309)

My intent at this point in time is simply to develop comprehensive and accurate data on existing discounting practices. The results will be tabulated and copies sent to you. The results will also be discussed with the leaders in the executive and legislative branches who have shown increasing interest in this subject and who have asked if a greater degree of standardization in evaluative practices would be beneficial.

Your cooperation will be appreciated.

Sincerely yours,

/s/ Elmer B. Staats
Comptroller General
of the United States

The Honorable
The Secretary of Housing and
Urban Development

THE USE OF DISCOUNT RATES IN
EVALUATING FEDERAL PROGRAMS

Instructions:

- A. Exclude water and related land resource programs and programs involving the acquisition of commercial or industrial products and services.
- B. If discounting practices of organizational components differ, please complete separate questionnaires for each component.
- C. Please return the completed questionnaire(s) to the Comptroller General by November 15, 1967.

1. Did you use a discount rate or rates in the analysis of fiscal year 1969 programs?

YES NO

2. If "yes" is checked, please identify (1) the fiscal year 1969 programs for which discount rates were used and (2) the rate or rates used in each case.

FISCAL YEAR 1969 PROGRAMS DISCOUNT RATE(S) USED

3. If "yes" is checked, please describe briefly the rationale employed in selecting rates.

4. If "no" in question No. 1 is checked, did your program evaluation procedures involve appraisals of alternative programs or systems in terms of periods which were shorter than the estimated useful lives of the programs or systems (e.g., a comparison of systems with estimated useful lives of 20 years on the basis of 5-year costs)?

YES NO

* 5. If "yes" is checked, please identify the programs or systems, the time period used in evaluating alternatives, and the estimated useful lives of the programs or systems.

<u>PROGRAM</u> <u>(SYSTEM)</u>	<u>DURATION</u> <u>OF PERIOD</u>	<u>ESTIMATED USEFUL LIFE</u> <u>OF PROGRAM (SYSTEM)</u>
-----------------------------------	-------------------------------------	--

APPENDIX V

WILLIAM PROXMIRE, WIS., CHAIRMAN
JOHN SPARKMAN, ALA.
J. W. FULBRIGHT, ARK.
HERMAN E. TALMADGE, GA.
STUART SYMINGTON, MO.
ABRAHAM RIBICOFF, CONN.
JACOB K. JAVITS, N.Y.
JACK MILLER, IOWA
LEN B. JORDAN, IDAHO
CHARLES H. PERCY, ILL.

JOHN R. STARK,
EXECUTIVE DIRECTOR

Congress of the United States

JOINT ECONOMIC COMMITTEE

(CREATED PURSUANT TO SEC. 8(a) OF PUBLIC LAW 804, 70TH CONGRESS)

WRIGHT PATMAN, TEX., VICE CHAIRMAN
RICHARD BOLLING, MO.
HALE BOGGS, LA.
HENRY S. REUSS, WIS.
MARTHA W. GRIFFITHS, MICH.
WILLIAM S. MOORHEAD, PA.
THOMAS B. CURTIS, MO.
WILLIAM B. WIDNALL, N.J.
DONALD RUMSFELD, ILL.
W. E. BROCK 3D, TENN.

JAMES W. KNOWLES,
DIRECTOR OF RESEARCH

December 19, 1967

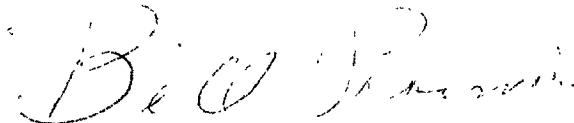
The Honorable Elmer B. Staats
Comptroller General of the United States
General Accounting Office
Washington, D. C.

Dear Elmer:

It has been called to my attention that the General Accounting Office has undertaken an examination of the use that Federal agencies make of discount rates and an evaluation of such programs. As you know, this is a subject in which we have a continuing interest; the issue was examined in the recent hearings before the Subcommittee on Economy in Government of the Joint Economic Committee, 90th Congress, 1st Session.

Since this work deals with actual practices in the Federal agencies, it would complement the material presented in these hearings. I would, therefore, appreciate it if you would make the results of your work available to the Joint Economic Committee as soon as possible.

Sincerely,



William Proxmire
Chairman