ECONOMIC ANALYSIS OF PUBLIC INVESTMENT DECISIONS: INTEREST RATE POLICY AND DISCOUNTING ANALYSIS

HEARINGS

BEFORE THE

SUBCOMMITTEE ON ECONOMY IN GOVERNMENT

OF THE

JOINT ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

NINETIETH CONGRESS

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JULY 30, 31, AND AUGUST 1, 1968

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ECONOMIC ANALYSIS OF PUBLIC INVESTMENT DECISIONS: INTEREST RATE POLICY AND DISCOUNTING ANALYSIS

TUESDAY, JULY 30, 1968

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ECONOMY IN GOVERNMENT
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The Subcommittee on Economy in Government met, pursuant to notice, at 10:05 a.m., in room 1202, New Senate Office Building, Hon. William S. Moorhead (member of the subcommittee) presiding in the temporary absence of Hon. William Proxmire, chairman of the subcommittee.

Present: Representative Moorhead and Senators Proxmire and Jordan.

Also present: John R. Stark, executive director; Robert H. Haveman, economist; and Douglas C. Frechtling, minority economist.

Representative MOORHEAD (presiding). The Subcommittee on Economy in Government of the Joint Economic Committee will come to order. Before we begin I would like, without objection, to make the announcement of these three hearings, and schedule of witnesses, an official part of the record.

(The information follows:)

SATURDAY, JULY 27, 1968.

CONGRESS OF THE UNITED STATES JOINT ECONOMIC COMMITTEE

SUBCOMMITTEE ON ECONOMY IN GOVERNMENT

Senator William Proxmire (D-Wis.), Chairman of the Joint Economic Committee and its Subcommittee on Economy in Government, announced Friday that the Administration will make public its position on the appropriate interest rate for evaluating public projects at the subcommittee's hearings next week.

The Wisconsin Senator said that Secretary of the Interior Udall will discuss the proposed regulation in his testimony before the Subcommittee on July 30th.

Chairman Proxmire said: "The rate of interest used in evaluating projects is of tremendous importance in determining whether or not such projects are economically feasible. Obviously, an unrealistically low rate can give a distorted value to a proposed project.

"The President, in his 1969 Budget Message, noted that the Water Resources Council was then in the process of developing 'a more appropriate interest rate to be applied in formulating and evaluating water projects. The revised rate . . . will be higher than the rate now in use for project evaluation.'

"The Subcommittee is most interested in the recommendation of the Council. We have followed this matter for a long time and are convinced that the interest rate used in discounting benefits and costs must be significantly higher if the Nation is to efficiently allocate its resources.

"The Subcommittee is looking forward to Secretary Udall's statement on this matter and his description of the reasoning which lies behind this change. The Secretary will be accompanied by Mr. Henry Caulfield of the Water Resources Council.

"In addition to Secretary Udall, the Subcommittee will hear prominent academic economists and analysts in the leading agencies on the development of Planning-Programming-Budgeting methods. We should learn a great deal about both the appropriate concepts and techniques for discounting as well as the problems which the agencies are facing in implementing PPB procedures."

The hearings on "Economic Analysis of Public Investment Decisions: Consistent Interest Rate Policy for Discounting Analysis" are scheduled for July 30 and 31 and August 1. Senator Proxmire noted that the hearing scheduled for Tuesday, July 30, will be held in room 1202, New Senate Office Building, instead of in the Capitol as previously announced. The remaining days of the hearings scheduled for July 31 and August 1 will be held in room S–407, the Capitol.

HEARINGS ON CONSISTENT DISCOUNTING PROCEDURES FOR PUBLIC EXPENDITURE ANALYSIS

July 30 and 31 and August 1, 1968

Tuesday, July 30—10:00 a.m.—Room 1202, New Senate Office Building

Interest Rate Policy for Evaluating Water Resource Investments

Stewart L. Udall, Secretary of the Interior and Chairman, Water Resources Council
Henry P. Caulfield, Jr., Executive Director, Water Resources Council
Fred S. Hoffman, Assistant Director, Bureau of the Budget

Wednesday, July 31—10:00 a.m.—Room AE–1, The Capitol (S–407)

Interest Rate Policy for Public Expenditure Analysis—Concept and Measurement

Otto Eckstein, Professor of Economics, Harvard University
Arnold Harberger, Professor of Economics, University of Chicago

Thursday, August 1—10:00 a.m.—Room AE–1, The Capitol (S–407)

Discounting Procedures and Interest Rate Policy in Federal Departments and Agencies

Alain C. Enthoven, Assistant Secretary of Defense (Systems Analysis) and Laurence E. Lynn, Deputy Assistant Secretary of Defense (Systems Analysis)
M. Cecil Mackey, Assistant Secretary for Policy Development, Department of Transportation
Robert A. Levine, Assistant Director for Research, Plans, Programs & Evaluation, Office of Economic Opportunity

Representative MOORHEAD. Today, we begin the first of 3 days of hearings on the question of consistent interest rate and discounting procedures in the analysis of public expenditures. These sessions climax the series of hearings which the committee has held dealing with questions of interest rate policy and discounting procedures in the various branches of the Federal Government.

This problem is an important one in the context of the establishment by the President of the planning-programing-budgeting system in all agencies of the Federal Government. It is especially pertinent in this time of rapidly increasing demands on the Federal budget, combined with congressional budget cutting. It is only through competent benefit-cost and cost-effective analysis that Congress can rationally choose among alternatives rather than apply the crude and wasteful meat ax to the Federal budget.

Today, we have three witnesses who are knowledgeable on the question pertaining to interest rate and discounting policies, especially as they apply to the benefit-cost analysis in the water resources agencies.

We welcome Mr. Kenneth Holum, Assistant Secretary of the Interior, who will present the statement of Secretary Udall as Chairman of the Water Resources Council. We regret that Secretary Udall was unable to free his calendar so as to discuss these matters with us this morning.

Accompanying Assistant Secretary Holum is Henry Caulfield, Jr., Executive Director of the Water Resources Council, who will discuss some of the conceptual issues of interest rate policy and the rationale of supporting the Council's proposed revision of the interest rate regulation.

Following their testimony, Mr. Fred Hoffman, Assistant Director of the Bureau of the Budget, will describe for us the Bureau's position on the interest rate question and advise us of the efforts of the Bureau in assisting the agencies to adopt appropriate discounting procedures.

Tomorrow we will hear the testimony of two prominent economists, and on Thursday, representatives of three Federal agencies will discuss with us interest rate and discounting procedures.

Before hearing the formal statements of today's witnesses, I would like to commend the Water Resources Council and the executive offices of the President for the proposed new interest rate regulations. Without question, this is in the President's words, "a more appropriate interest rate to be applied in formulating and evaluating water projects."

As all of you recognize, the Joint Economic Committee has followed this matter closely and is convinced that the interest rate used in discounting benefits and costs must be raised from the three and a quarter percent rate currently in use if the Nation is to allocate its resources properly.

I think this morning we will hear the statement of all three witnesses before subjecting any of them to questions.

Senator, do you want to make any statement?

Senator JORDAN. No.

Representative MOORHEAD. Then we will hear from Assistant Secretary Holum first.

Mr. Secretary?

STATEMENT OF SECRETARY OF THE INTERIOR STEWART L. UDALL, CHAIRMAN OF THE WATER RESOURCES COUNCIL, AS PRESENTED BY KENNETH HOLUM, ASSISTANT SECRETARY

Mr. HOLUM. Secretary Udall regrets very much that because of his busy schedule during this closing week of the Congress, he is not able to be with you personally. I am happy to have the opportunity to come before you this morning to present his statement—and it is his statement, because I am not a member of the Water Resources Council, although I serve as his representative on the Council of Representatives of the Water Resources Council. It has not been a very big job because he attends all the meetings of the Water Resources Council personally, but I do represent him on that Council of Representatives.

Therefore, with your permission, I will read Secretary Udall's statement to you:

Application of Economic Criteria and Discounting Procedures in Evaluating Public Expenditures

I welcome the opportunity to testify before this Subcommittee on Economy in Government of the Joint Economic Committee on the subject of the application of economic criteria and counting procedures in evaluating public expenditures. I have followed with interest the hearings of the subcommittee held in September last year on the planning-programing-budgeting systems and in January this year on the interest rate guidelines for Federal decisionmaking, with particular reference to the survey conducted by the General Accounting Office.

My interest in this subject is keen because of my responsibility as Secretary of the Interior and the deep involvement of the water resources programs of my Department with economic evaluation. I am also interested because of my role as Chairman of the Water Resources Council and the statement in the January 29, 1968, budget message of the President that "the Water Resources Council is developing a more appropriate interest rate to be applied in formulating and evaluating water projects."

It is apparent that as Secretary of the Interior and as Chairman of the Water Resources Council my responsibility, as well as my concern, is considerable. However, the responsibility and concern are not newly acquired or discovered. Indeed, we in the Federal agencies concerned with the use of water and related land resources can take pride, and even boast a bit, at our many years of experience with economic analysis as a positive tool for shaping the scale and pace of water resources development related to economic demands and social objectives. This experience dates at least from the Flood Control Act of 1936, which provided for the authorization of Federal activities in regard to navigation and flood control "if the benefits to whomsoever they may accrue are in excess of estimated costs * * *."

Under the impetus of that act the Corps of Engineers, the Bureau of Reclamation, and the Soil Conservation Service negotiated the tripartite agreement in 1939 relating to uniform evaluations. The Federal Power Commission joined in 1943. These actions began the long continuing effort in the executive branch to reach common ground on the concepts and rules of the game and to sharpen the analytical tools. The Federal Inter-Agency River Basin Committee was formed in 1946 and developed the first "Green Book," which was published in 1950 under the title "Proposed Practices for Economic Analysis of River Basin Projects." This publication was followed by Bureau of the Budget Circular A–47 in December 1952 as the evaluation standards by which that agency would review proposed Federal and federally assisted projects before submission to the Congress. The Green Book was then revised in 1958 by the Inter-Agency Committee on Water Resources. Discounting provisions were incorporated in each of these documents.

In October 1961, President Kennedy requested those Cabinet officers who would comprise the Water Resources Council to be authorized by the then proposed Water Resources Planning Act, to develop

an "up-to-date set of uniform standards for the formulation and evaluation of water resources projects" and he asked me to be chairman of this ad hoc council. Henry Caulifield, who is to testify after me on this subject, was chairman of the interdepartmental staff committee that provided necessary staff assistance. That committee drafted the present policies, standards, and procedures which in their final form, were approved by the President on May 15, 1962. In this form, together with a statement by Senator Anderson, who was then chairman of the Senate Committee on Interior and Insular Affairs, they were published as Senate Document No. 97 of the 87th Congress, second session, and still constitute the basic framework for project and basin analyses. They are regarded as of landmark quality in benefit-cost analysis by most scholars and practitioners in this field. The Water Resources Council, the formal statutory successor to the ad hoc council formed in October 1961, is actively concerned with problems in the application of the evaluation standards and with their further improvement.

This quick recitation of the history of the use of economic analysis in water and related land resource use and development is only a reminder that the water resources agencies have not only been pioneers in this realm but have championed it as well. Our efforts in this regard, as well as the magnitude and significance of the water development programs and projects, have attracted the attention of many university scholars and other students of analytical and policy processes. This attention is welcomed and encouraged, for as recently as 15 years ago few academic economists and other scholars were concerned with water resources. Now, however, an entire field of resource economics has developed with a considerable number of well-established scholars. These scholars have helped the agencies in the project evaluation tasks. Indeed we have a most healthy exchange with the various university water resources study programs. We have invited scholars to advise us; we have helped finance some of their studies; and we have sent staff personnel to study under them and to participate in seminars with them. We have been participants at many of the meetings of the professional economics, public administration, and planning societies as panelists on benefit-cost discussions. We know this exchange has been mutually fruitful.

I believe there is no other Government program that exceeds us in this endeavor to use economics. In order for a project to be authorized and to be funded for construction, it is necessary not only to undergo the usual Bureau of the Budget review and to meet the critical examination of the congressional substantive and appropriations committees but also to face interagency comments and to pass benefit-cost analysis. In addition to these procedural requirements and tests and the usual scrutiny by the interest groups, we also must pass the searching appraisal of the jury of our economic and resource peers in the universities. The numerous articles in the scholarly journals and books in the academic press on the subject of water and resources planning and evaluation manifest this close attention.

It is well to acknowledge, however, that benefit-cost analysis is not a foolproof device nor a precision instrument. Its usefulness and essentiality are without doubt, but its imperfections and inadequacies should not go unmentioned. Many scholars have warned that it can be mis-

leading. Usually their remarks are directed toward the presumption that all benefits can be known, measured, and quantified equally. It is true that water and related land resources projects provide many benefits of a commodity or goods and services nature, more or less readily evaluated in private market terms. But in many instances the projects provide much more than goods and services. They provide also, in increasing instances, for the protection and preservation of the quality of the environment. Note the emphasis on water quality control for instance with its intangible as well as tangible benefits. Note also the enhancement of fish and wildlife, the contributions to aesthetics and the amenities, and the many recreational opportunities created by water and related land projects and programs. These benefits have generally been underestimated, partly because of the lack of explicit private market prices or values to represent them and partly because the projects have been justified on other grounds, with these latter benefits given only incidental accounting. The significance of these kinds of benefits may well outweigh the more traditional benefits in the future.

Furthermore, water resource projects are being accorded a renewed positive role in regional economic development. In this regard, because of the need for population shifts and changing attitudes and values to manifest themselves, tangible benefits may be long deferred and consideration must be given to interim uses which, hopefully, will yield to more compelling uses in the future. One can no longer look solely at projected goods and services based upon past trends as the basis for planning in areas of unemployed or underemployed human and other resources. The ecological and environmental effects and contributions must be evaluated, and the social goals as well as the economic implications, must be appraised.

Scholars are already referring to the "new economics of resources" to describe the situation. Dr. Nathaniel Wollman of the University of New Mexico uses this term as the title of an article in the fall 1967 issue of Daedalus, the Journal of the American Academy of Arts and Sciences. The entire issue is entitled "America's Changing Environment" and it presents a series of searching articles. Professor Wollman says, in regard to the "new economics" that it applies to "bridging the esthetic gap—by developing new methods of analysis that will show us how to incorporate into a measured system the direct sensual responses that up to now have figured solely as intuitively valued side conditions. For what is now measurable, the old economics is good enough."

Furthermore, he says that "if we accept the solutions offered by existing market forces we shall probably waste and misuse part of our resources. This conclusion rests upon the probability that there is a bias in the 'old economics' in favor of underestimation rather than overestimation of needs met by nonmarketed goods and services."

So here we have the disinterested scholar expressing his analytical insight and concern with the benefit-cost analysis situation when based only upon tangible values. The view that benefit estimation has been understated has been expressed also by the congressional committees concerned with water resources development. This subcommittee, in fact, at the January hearings on the interest rate survey of the Comptroller General, heard such views expressed. Mr. Chairman, I believe you commented to that effect during the discussions at that time.

The Senate Committee on Interior and Insular Affairs has expressed similar views in its Report No. 1234 on S. 3058, a bill to amend the Water Resources Planning Act to increase the authorization of appropriations to the Water Resources Council to administer the act.

Of particular concern—

The committee states—

is the impact of water resource development upon other economic and social objectives of the Nation. The committee feels that the present interpretation of Senate Document 97 results in benefit analyses which place little or no emphasis upon the indirect and secondary effects of projects. As a result, projects are being formulated and proposed which optimize the value to the direct beneficiaries and neglect the impact, both beneficial and detrimental, upon other sectors of the economy and society. To facilitate more valid consideration of investments in water resource development in relation to other Federal programs, the economic analyses of projects should reflect the broadest scope of potential benefits and costs which will result from the implementation of proposals. The committee believes that the promulgation of a new discount formula should appropriately be made a part of a reconsideration and restatement of principles, standards, and procedures for economic analyses of Federal water and related land resource projects.

The Senate Public Works Committee, in its Report No. 1342 on S. 3710, the 1968 authorizations for rivers and harbors flood control and multiple-purpose projects, has also expressed concern over benefit estimation. The committee states that project evaluations "should accurately reflect all primary direct and indirect benefits as well as the secondary benefits as provided in Senate Document 97." It goes on to say:

The committee is greatly concerned with this matter and feels that any increase in the discount interest rate should appropriately give attention to reconsideration and restatement of principles, standards, and procedures for economic analyses of Federal water and related land resource projects.

The Public Works and Appropriations Committees of the House of Representatives state the same case in House Report No. 1549 and House Report No. 1709, respectively.

These comments and apprehensions suggest that special care should be taken in the adoption of any new formula for the setting of interest rates. The action of the Water Resources Council last Friday in publishing a proposed new formula is to invite comments from all concerned: from the Congress, from the States and local governments, from industry, conservation groups, the general public as well as from academic economists and other scholars.

There is little or no substitution for water and its associated resources. Projects and programs in this field provide for national and regional growth, for employment and for family and social stability, for us the living as well as those who will come long after we are gone. Our goal should be to accomplish both full production and the full life * * * a continuing national prosperity that will include prosperity of the human spirit. The material forces and shortrun economic considerations—that have tried to cast doubt upon the wisdom of dams such as Grand Coulee and Hoover with their very long-term benefits, that have permitted the deterioration of the natural environments, and that have ignored ecological change and the strong desires of numerous people for the graces and beauties of the out of doors—should not be the final determinants of a program's worth.

My remarks are not a plea to abandon or dilute economic analyses. Our record is clear and very good indeed on the application of economics to planning and design, including the use of discounting of benefits and costs. The Water Resources Council, and all of its members, intend to continue in this regard and to improve our analyses, taking into account all the help that is offered to us.

Last Friday, as I have said before, the Council published in the Federal Register a notice of its proposal for a new interest rate formula in connection with the formulation and evaluation of Federal and federally assisted water and related land resources projects. Copies of that proposal are available for you here today. Mr. Henry P. Caulfield, Jr., the Executive Director of the Council, will give the background and details of this proposal. As you may know, he is a professional economist by training and has a fine reputation as a scholar in the resources field as well. He also has a rich experience in Federal water and related land resources programs.

With these remarks I must close. I thank you for the courtesy and attention you have shown me and for the opportunity to discuss this most significant question with you.

Thank you.

Representative MOORHEAD (presiding). Mr. Secretary, we thank you and Secretary Udall.

Without objection, we will now call upon Mr. Henry Caulfield.

STATEMENT OF HENRY P. CAULFIELD, JR., EXECUTIVE DIRECTOR, WATER RESOURCES COUNCIL

Mr. CAULFIELD. Thank you, Mr. Chairman.

I will read my statement. I would like to say, first, that the notice that appeared in the Federal Register last week, and the proposed regulation, are attached to my statement.

Representative MOORHEAD. Without objection, they will be made part of the record. (See p. 15.)

Mr. CAULFIELD. Thank you, sir.

PROPOSED NEW DISCOUNT RATE FOR USE IN THE FORMULATION AND EVALUATION OF WATER AND RELATED LAND RESOURCE PLANS

I am very grateful for this opportunity to appear before the Joint Economic Committee to explain the Water Resources Council's proposed new formula for the determination of the discount rate in the context of principles, standards, and procedures that now guide the formulation and evaluation of Federal and federally assisted water and related land resource plans. Much has been said before the Joint Economic Committee during the past year about the need to use interest rates or discount rates in the evaluation of Federal programs generally, and about the discount rate formula now in use for many years in the evaluation of water resource development projects. In this connection, many references have been made to "Senate Document 97." Thus I believe it important that the record of these hearings include testimony by Federal officials concerned with water and related land resources matters, and specifically about Senate Document 97 and its provision for the use of discount rates.

Chairman Udall has already noted the provision of the Flood Control Act of 1936 which initiated explicit benefit-cost analysis of water resource projects, the many years of painstaking development, testing and use of evaluation standards that then ensued, and the call by President Kennedy in October 1961 for an "up-to-date set of uniform standards" that resulted in Senate Document 97, published in May 1962.

Senate Document 97, 87th Congress

The Council's proposed new formula for the determination of discount rates, published last Friday, July 26, would become, in effect, an amendment to Senate Document 97. Thus it is important to note, first, its full title, what the document is, and its major provisions.

Its formal title is "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources." With this long title, quite understandably, "Senate Document 97" has become its popular title.

It is an executive branch document, in the nature of an interdepartmental agreement approved by the President, that was published by the Senate. It was never adopted by the Senate.

As of the day of adoption its provisions have governed, insofar as they are consistent with law and other applicable regulations, all formulation, evaluation and review of water and related land resource plans by the Departments of the Army, Agriculture, the Interior and Health, Education, and Welfare; and, by his letter of approval, President Kennedy made these provisions applicable to the Bureau of the Budget in its review of projects and programs.

"The basic objective in the formulation of plans," the document states, "is to provide the best use, or combination of uses, of water and related land resources to meet all foreseeable short- and long-term needs." Full consideration is to be given to each of the following subobjectives "and reasoned choices made between them when they conflict":

Development of water and related land resources, as part of national economic development, for:

—Domestic, municipal, industrial, and agricultural water supplies
—Water quality
—Water transportation
—Hydroelectric power
—Flood control
—Land stabilization
—Drainage
—Watershed protection and management
—Recreation and fish and wildlife enhancement; and
—Any other related project development purpose;

Preservation of water and related land resources, as a manifestation of proper stewardship in the long-term interest of the Nation's natural bounty, for:

—Protection and rehabilitation of resources to insure availability for their best use when needed.
—Open space, green space, and wild areas of rivers, lakes, beaches, and mountains.

—Areas of unique natural beauty, historical and scientific interest.

Well-being of people is stated as the overriding determinant in considering the best use of water and related land resources:

> Hardship and basic needs of particular groups within the general public shall be of concern, but care shall be taken to avoid resource use and development for the benefit of a few or the disadvantage of many. In particular, policy requirements and guides established by the Congress and aimed at assuring that the use of natural resources, including water resources, safeguards the interests of all of our people shall be observed.

Planning for the use and development of water and related land resources, insofar as practicable shall be comprehensive and consider the needs and possibilities for all significant resource uses and purposes:

> All relevant means (including nonstructural as well as structural measures) singly, or in combination, or in alternative combinations reflecting different basic choice patterns for providing such uses and purposes—

shall be considered.

Formulation and evaluation of plans, document states, "shall normally be based on the expectation of an expanding economy." But plans or alternative plans are to be formulated to permit timely application of standards appropriate to conditions of less than "full employment" nationally, and chronic and persistent unemployment or underemployment in designated areas:

> The prices used for project evaluation should reflect the exchange values expected to prevail at the time costs are incurred and benefits accrued. Estimates of initial project costs should be based upon price relationships prevailing at the time of analysis. Estimates of benefits and deferred costs should be made on the basis of projected normal price relationships expected with a stabilized general price level and under relatively full employment conditions for the economy.
>
> All plans shall be formulated with due regard to all pertinent benefits and costs, both tangible (i.e., capable of expression in monetary terms) and intangible (i.e., not capable of expression in monetary terms).
>
> All viewpoints—national, regional, State, and local—shall be fully considered and taken into account in planning resource use and development.

Significant departures from a national point of view, required to accomplish regional, State, or local objectives, are to be set forth in planning reports.

When secondary benefits, as distinct from primary benefits (i.e., the value of goods for services directly resulting from the project, less associated or induced costs), are included in formulation and evaluation of a project proposal, then planning reports shall indicate:

> (*a*) The amount of secondary benefits considered attributable to the project from a national viewpoint. Such benefits, combined with primary benefits, shall be included in the computation of a benefit-cost ratio.
>
> (*b*) Secondary benefits attributable to the project from a regional, State, or local viewpoint. Such benefits shall also be evaluated, when this procedure is considered pertinent, and an additional benefit-cost ratio computed.

At this point, parenthetically, I would just like to say that this provision in Senate Document 97 with regard to secondary benefits is not as widely recognized, both within the Federal Government and among those concerned outside of the Federal Government, as it should be. It is a most significant provision; and is, in my professional judgment, a fully justifiable provision.

Now, turning to standards for formulation of plans in terms of benefits and costs, Senate Document 97 directs that comprehensive multiple-

purpose river basin plans "shall be formulated initially to include all units and purposes which satisfy these criteria in quantitative economic terms:

(*a*) Tangible benefits exceed project economic costs.
(*b*) Each separable unit or purpose provides benefits at least equal to its costs.
(*c*) The scope of development is such as to provide maximum net benefits; and
(*d*) There is no more economical means, evaluated on a comparable basis, of accomplishing the same purpose or purposes which would be precluded from development if the plans were undertaken.

These standards for formulation, in the context of appropriate related criteria (including an appropriate discount rate) constitute what economists generally refer to as the requirements for economic efficiency. They imply, in this regard, an optimizing model as distinct from an analytical model for appraising cost effectiveness in meeting a fixed objective (e.g., a quantity of "firepower" in military analyses). If an analysis using these standards is based solely upon benefits appropriate to a national viewpoint, then the analysis (within the limits of the skill of the analyst and the practicability of analysis) is believed to indicate an optimum contribution to growth in national income.

I said previously that comprehensive plans were to be formulated *initially* to include all units and purposes which satisfy the criteria of economic efficiency in quantitative economic terms. Senate Document 97 states further that this will provide "a baseline from which the effect of considering intangibles" (e.g., threat to lives, health, and general security posed by large floods) can be judged. Reports and plans, the document directs, shall indicate the extent to which departures from the most efficient economic development are proposed "in order to take into account intangibles or other considerations warranting a modification in scale not reflected in the tangible benefits and project economic costs."

With the foregoing as a foundation, I would like to turn now, specifically, to the central focus of this hearing: discount rates.

Discount rates, as has been stated several times in your hearings, are utilized in planning to convert benefits and costs which are projected to occur over a period of time to a common time basis. Costs need to be amortized using a discount rate over the period of years of analysis (e.g., 50 or 100 years) so that they can be compared properly with average annual benefits. In arriving at average annual benefits, benefits of the same nominal value beyond the first year are first discounted each year from time zero by a discount rate to make the benefits comparable and then their sum is amortized out over the period of analysis.

Senate Document 97 provides that:

The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs . . . shall be based upon the average rate of interest payable by the Treasury (i.e., the *coupon rate*) 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.

This formula for annual determination of the discount rate is the same as that which was contained in Budget Bureau Circular A–47, adopted on December 31, 1952, and withdrawn in May 1962, and that contained in the Water Supply Act of 1958. The latter provides for

the interest rate to be used when obtaining reimbursement over time from non-Federal interests on Federal investments in municipal and industrial water supplies.

The subject of interest rates and discount rates has long been the subject of intense concern. It was prior to promulgation of Senate Document 97 in 1962 and it is in this hearing.

The concern in 1962 is reflected in the following statement contained in the document:

> 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.

In the intervening years, although discussed on many occasions by those involved in the field of water and related land resources planning, it was not until April 1967 that the Water Resources Council believed it might be feasible to initiate definite continuing consideration of this subject by its Economics Committee. It then requested the Committee to do so.

I say "might be feasible" only because all Committee members have full-time jobs within their own departments and agencies. The Water Resources Council staff, to date, has only been able to assign one-fourth man-year of concerted professional staff time to all matters involved in Senate Document 97. Despite problems of staff time, the Economics Committee and the Water Resources Council staff have been able to contribute very valuably to the Council's consideration of this important matter.

Proposed New Discount Formula

The budget message that President Johnson sent to the Congress on January 29, 1968, informed the Congress that—

> The Water Resources Council is developing a more appropriate interest rate to be applied in formulating and evaluating water projects. The revised rate will be related to the average estimated current cost to the Treasury of long-term borrowing. It will be higher than the rate now in use for project evaluation. The new rate will be applied to future projects in order to assure the most effective use of Federal funds in the development of the Nation's water resources.

Later in the budget document, it was stated that—

> The interest rate now being used by Federal agencies in formulating and evaluating proposed water resource projects is significantly lower than the cost of borrowing by the Treasury. To improve the evaluation and selection of projects, administrative action is underway to relate this rate more closely to the average estimated current cost to the Treasury of long-term borrowing. The new interest rate, which will be higher than the rate now being used, will be applied in preparing future project evaluation reports.

The reason that the President referred, in this regard, to the Water Resources Council is that section 103 of the Water Resources Planning Act provides that—

> The Council shall establish, after such consultation with other interested entities, both Federal and non-Federal, as the Council may find appropriate, and with the approval of the President, principles, standards, and procedures for Federal participants in the preparation of comprehensive regional or river basin plans and for the formulation and evaluation of Federal water and related land resources projects.

Accordingly, after substantial deliberation in which representatives of the Bureau of the Budget and the Department of the Treasury par-

ticipated, the Water Resources Council has given public notice that it proposes to establish, under the procedure prescribed in section 103, a new formula for the determination each year of the discount rate for use in the formulation and evaluation of Federal plans for use and development of the Nation's water and related land resources.

Attached to this statement is the Council's notice that appeared in the Federal Register on July 26, together with the addition to the Council's rules and regulations which would implement the proposal if adopted finally by the Council and approved by the President. Interested persons are invited in the notice to submit written comments, suggestions, or objections regarding the proposed regulation to me within 60 days from last Friday.

The basic provision contained in the proposal for determining the discount rate is as follows:

> The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs, or otherwise converting benefits and costs to a common time basis, shall be based upon the average yield during the preceding fiscal year on interest-bearing marketable securities of the United States which, at the time the computation is made, have terms of 15 years or more remaining to maturity: Provided, however, that in no event shall the rate be raised or lowered more than one-quarter percent for any year.

Three points should be highlighted in this proposal.

First, the formula is based upon the current "yield rate" on long-term Treasury bonds. Thus it is affected by the current market value of the bonds, whereas the present formula is based upon the "coupon rate"—that is, the value of the annual payment by the Treasury on the bonds regardless of their current value.

Second, the long-term Treasury bonds included in the determination are only those which, at the time of computation, have terms of 15 years or more to maturity. The present formula includes bonds which, "upon original issue," had 15 years or more to maturity.

Finally, the provision should be highlighted "that in no event shall the rate be raised or lowered more than one-quarter of 1 percent per year."

Later in the proposal it is stated that "the discount rate to be used in plan formulation and evaluation during the remainder of fiscal year 1969 shall be 4⅝ percent," except as provided in another section. This section provides that the present rate of 3¼ percent is to prevail, unless the Congress otherwise decides, with respect to projects authorized prior to the close of the second session of the 90th Congress where the appropriate State or local government agencies have given, prior to December 31, 1969, satisfactory assurances to pay the required non-Federal share of project costs.

The current increase in discount rate between the present and the proposed new formula is 1⅜ percentage points. If the proposed new formula were based upon the average of bid prices for June of each year, then for fiscal year 1969 the discount rate would be 5½ percent. This would be an increase in the discount rate of 2¼ percentage points.

The President's statement in the budget message calls for a discount rate "related to the average estimated current cost to the Treasury of long-term borrowing." The Council's reasons for not proposing a formula based upon, say, June bid prices—that is, the prices for the month immediately preceding the beginning of a new "discount year"—appear to me to be three:

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First, the size of the initial change, and the disrupting adjustments to planning programs that it would entail, would be too great.

It was generally felt that a larger increase would be impractical and undesirable. The proposed change, itself, would mean that the benefit-cost ratio of an average long-life capital intensive project of 1.4:1 would be reduced to about 1.0:1.

Second, the degree of yearly fluctuation in the discount rate needs to be dampened, not accentuated.

Following the yield rate precisely, up and down, could mean a very substantial change each year in the discount rate. Planning of water projects from first formulation and evaluation, through congressional authorization, to appropriation of construction funds, usually takes 5 or more years. It is usually required by the Bureau of the Budget or the Congress that benefits and costs be recalculated on the basis of the currently applicable discount rate two or more times during these years. If the very substantial effect that marked changes in the discount rate can have upon the benefit-cost ratio of a project makes many projects fluctuate from year to year out of and into the "ball park" of economic acceptability, then the Federal Government's administrative process will be greatly disrupted and made more costly. Also, congressional and public attitudes will become strongly adverse to such an unstable process.

To overcome excessive fluctuation in the discount rate from year to year, the provision was included that the rate would not change, up or down, by more than one-fourth point each year.

Third, the discount rate to be used in planning water and related land programs, to be consistent with related provisions in Senate Document 97, should not be based upon a "bond yield rate" that is markedly affected by inflationary or deflationary expectations in the bond market.

No allowance is made for expectations of inflation and deflation in calculating benefits and costs in Senate Document 97. Thus, no discount rate having such expectations built into it should be used, unless, of course, all other prices and costs used in the analysis are also to be adjusted for such expectations.

The actions of the Federal bond market for the past 1 or 2 years clearly have reflected rising expectations with regard to inflation. With the passage of the tax bill, recently, yields on long-term Federal bonds have already declined.

To meet the need for a "deflated" discount rate, the Council's proposal would set the beginning new discount rate at 4⅝ percent. This rate is based upon the average of bid prices for fiscal year 1966. Also, the provision of no rise or fall in the discount rate of more than one-fourth point each year gives some assurance that the discount rate would not respond inappropriately to expectations of inflation or deflation in the Federal bond market.

In closing this statement, Mr. Chairman, I would like to state again that the attachment to this statement includes the Water Resources Council's proposed regulation. No final decision by the Council, with the approval of the President, has yet been made. The notice that appeared in the Federal Register last Friday has provided all those interested in this matter an opportunity to provide the Council

with their comments, suggestions and objections within 60 days. Then the Council will take all communications received into consideration in making up its mind upon the proposal that will be sent to the President for his approval.

Thank you, Mr. Chairman, for this opportunity to appear before the Joint Economic Committee. I hope that this hearing will help clarify and define the best public interest solution with respect to this important problem. I trust that it will broaden the range of interest that is taken within our society in these matters.

Thank you.

Representative MOORHEAD. Thank you, Mr. Caulfield. We appreciate your testimony.

(The attachments to Mr. Caulfield's statement follow:)

TITLE 18—CONSERVATION OF POWER AND WATER RESOURCES

Chapter VI—Water Resources Council

DISCOUNT RATE FOR USE IN PLAN FORMULATION AND EVALUATION

NOTICE OF PROPOSED RULE MAKING

Notice is hereby given that the Water Resources Council proposes to establish, under the procedure prescribed in section 103 of the Water Resources Planning Act (79 Stat. 244; U.S.C. 1962) a new formula for the determination of the discount rates for use each year in the formulation and evaluation of plans for use and development of water and related land resources, by issuing the regulation set forth below.

The proposed new formula would modify that established by section V. G. 2 of the interagency agreement dated May 15, 1962, approved by the President on May 15, 1962, entitled "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources", and published on May 29, 1962, as Senate Document No. 97, 87th Congress, 2d Session.

The discount rate for fiscal year 1969, computed as proposed in the regulation set forth below, would be 4⅝ percent. In following years the rate for any year would not be changed more than ¼ percentage point from that used during the previous year. The current discount rate computed on the basis of the present formula is 3¼ percent. Interested persons are invited to submit written comments, suggestions or objections regarding the proposed regulation to the Executive Director, Water Resources Council, 1025 Vermont Avenue, N.W., Washington, D.C. 20005, within 60 days after the date of publication of this notice in the Federal Register.

HENRY P. CAULFIELD, Jr.,
Executive Director.

Dated July 22, 1968.

TITLE 18—CONSERVATION OF POWER AND WATER RESOURCES

Chapter VI—Water Resources Council

[18 CFR Part 704]

PART 704—PLAN FORMULATION STANDARDS AND PROCEDURES

Subparts A to D [Reserved].

Subpart E—Standards for Plan Formulation and Evaluation.

704.1 to 704.38 [Reserved].

704.39 *Discount Rate.*

(a) The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs, or otherwise converting benefits and costs to a common time basis, shall be based upon the average yield during the preceding fiscal year on interest-bearing marketable securities of the United States which, at the time the computation is made, have terms of 15 years or more remaining to maturity: Provided, however, that in no event shall the rate

be raised or lowered more than one-quarter of one percent for any year. The average yield shall be computed as the average during the fiscal year of the daily bid prices. Where the average rate so computed is not a multiple of one-eighth of 1 percent, the rate of interest shall be the multiple of one-eighth of 1 percent nearest to such average rate.

(b) The computation shall be made as of July 1 each year, and the rate thus computed shall be used during the succeeding 12 months. The Executive Director shall annually request the Secretary of the Treasury to inform the Water Resources Council of the rate thus computed.

(c) Subject to the provisions of subsections (d) and (e) of this section, the provision of subsections (a) and (b) of this section shall apply to all Federal and Federally-assisted water and related land resources project evaluation reports submitted to the Congress, or approved administratively, after the close of the second session of the 90th Congress.

(d) Where construction of a project has been authorized prior to the close of the second session of the 90th Congress, and the appropriate State or local governmental agency or agencies have given prior to December 31, 1969, satisfactory assurances to pay the required non-Federal share of project costs, the discount rate to be used in the computation of benefits and costs for such project shall be the rate in effect immediately prior to the effective date of this section, and that rate shall continue to be used for such project until construction has been completed, unless the Congress otherwise decides.

(e) Notwithstanding the provisions of subsections (a) and (b) of this section, the discount rate to be used in plan formulation and evaluation during the remainder of the fiscal year 1969 shall be 4⅝ percent except as provided by subsection (d) of this section.

(f) Section V. G. 2 of the interagency agreement dated May 15, 1962, approved by the President on May 15, 1962, entitled "Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources", and published on May 29, 1962, as Senate Document No. 97, 87th Congress, 2d Session, is superseded by the provisions of this section.

(g) This section shall be effective upon publication in the Federal Register.

Representative MOORHEAD. The subcommittee would like now to hear from Mr. Hoffman, Assistant Director of the Bureau of the Budget.

Mr. Hoffman, would you also identify for the record your associate?

STATEMENT OF FRED HOFFMAN, ASSISTANT DIRECTOR, BUREAU OF THE BUDGET, ACCOMPANIED BY JACK W. CARLSON, DIRECTOR, PROGRAM EVALUATION STAFF, BUREAU OF THE BUDGET

Mr. HOFFMAN. Mr. Chairman, Senator Jordan, I have with me this morning Mr. Jack W. Carlson, the Director of the Program Evaluation Staff of the Bureau of the Budget, who will assist me in answering your questions.

Mr. Chairman and Senator Jordan, I am very happy to appear before this committee. I believe the subcommittee in its hearings so far has provided a number of useful papers and has stimulated a good deal of healthy discussion of subjects that concern me greatly in my work at the Bureau. I am particularly pleased that the question of discounting has been raised in the context of the PPB hearings. I welcome the subcommittee's strong support of the kind of analysis that is being developed by the planning, programing, and budgeting system.

This morning, with your permission, I would like to insert into the record the full statement that I have prepared for the committee and, because of its length, merely propose to summarize it at this point.

Representative MOORHEAD. Without objection, the full statement will appear in the record and you may now proceed to summarize.

Mr. HOFFMAN. The gist of my remarks will be to emphasize the complexity of decisions about public investment. My remarks will be under several headings:

First, I would like to consider complexities in the analysis of public expenditures generally.

Second, I would like to consider alternative rationales for the application of discounting and for the development of discount rates.

Third, I would like to consider the applications of discounting to public investment decisions as they are made in the course of the operation of the Executive. Finally, I would like to present some thoughts on recent developments and desirable procedures for discounting.

With respect to the analysis of Government expenditures generally, the primary source of complexity arises from the multiplicity of Government objectives. There are a number of ways of classifying the reasons for Government activity. The classification that I would like to present categorizes these reasons as follows:

First, the provision of public goods; that is, goods whose consumption by one individual does not reduce the amount available for consumption by others. The prime example is, of course, national security;

Second, the redistribution of income;

Third, dealing with spillovers—situations in which one individual's decisions may affect another and there is no mechanism that forces the actor to take these effects into account. A prime example of this, is the emission of pollutants where, as individuals, we do not have to take account of the amount of pollution we emit.

Fourth, the management of publicly owned resources, such as timberlands or mineral resources. Here, the Government has the obligation of managing the resources it owns in a way that is efficient from the point of view of the social welfare.

Fifth, removal of imperfections in the functioning of the private market system or alleviation of their effects. Examples are the use of public enterprise to provide competitive standards or the provision of better information to consumers and producers.

Evaluation of Government activities is made particularly difficult because each one is likely to have objectives that cut across a number of the categories I have mentioned. As one example, let me refer to manpower training programs. They have as one of their effects the transfer of income to the participants in the program through an increase in the investment in the human capital of those individuals. It is also argued that they have provided the public good of an improvement in the quality of the citizenry, particularly in its capacity as an electorate. I believe it is generally felt that productive, responsible, self-reliant individuals make a better electorate, and one of the objectives of our manpower training programs is to increase the number of people in this category.

The programs also have spillover effects. They reduce the need for social services and, perhaps, reduce the crime rate in the areas where the participants live, and increase productivity in the economy as a whole by overcoming the ignorance of some of the participants about the link between training and income.

In the case of this group of programs then, it is obvious that we have a very complex set of effects and objectives.

The problem is compounded because objectives often conflict in the comparison of programs. As one example, consider on-the-job training and Job Corps programs. Analyses suggest that on-the-job training programs have higher benefit-cost ratios where the benefits are measured in terms of the expected increase in income of the participants. The Job Corps, on the other hand, has a much higher percentage of disadvantaged people participating in the program. Comparison of these two programs, therefore, reveals conflicts between the objective of economic efficiency and those of income transfer, public goods objectives, and spill-over elimination. The conflict must be resolved when we determine what priority to give the various components of our manpower program.

Because of the conflict, an evaluation of manpower training programs may raise the question of how to measure the value of a dollar of income transferred to someone in the group of hard core unemployed as compared with transferring it to someone in the middle classes. Can we in fact assign some quantitative value greater than one to a dollar transferred to a poor person? I think we feel, both individually and collectively, that a dollar so transferred is in fact worth more than the dollar taken away from the upper income class, but I suspect we would be hard put to find a specific quantitative value for such a measure. I might also add that economics offers no conceptual basis for such a determination.

As a consequence, we find that dollar measures are applicable only to certain components of the objectives of our public activities. There are several important consequences of this state of affairs. Where the nonmarket components of our objectives are especially important in program analysis, cost-benefit analysis cannot tell us how far to extend program activities. When we are dealing with a purely market-determined kind of program, as we might be in the management of some of our public resources, one can argue that a cost-benefit ratio greater than unity is essential to going ahead with a project. Where we are dealing with programs that have very important components that cannot be measured by the market, we cannot make such a statement. We cannot guide our manpower training programs, for example, completely by cost-benefit ratios, cutting them off unless we get a figure of unity and arranging our priorities purely in terms of the size of the cost-benefit ratio.

Another consequence is that we have great difficulty in making comparisons of program activities across major areas of government activity. If the market does not provide a measure of the value of national security, we have no conceptual basis for determining how much national security we should have as compared with highways, dams, and education. We cannot fully determine the national priorities in broad program areas by such quantitative analysis.

A third consequence concerns the nature of the analysis we do. Where market-determined elements are important or dominant, we do and should do cost-benefit analysis. Where the nonmarket elements are quite important, we do a different kind of analysis which I will refer to as cost-effectiveness analysis. We specify a job that ought to be done and examine the most efficient way of doing that job.

Now, we can explore the effect of changes in the nature of the job on the cost of doing it, but basically we are dealing with dollar measures on the cost side and some nondollar specification of the nature of the job and its output on the benefit side. I will return to the distinction between those two types of analyses in the consideration of discounting.

Let me now turn from the problem of public expenditures generally to the problem of public investment and discounting. The distinction is based on the explicit consideration of time. Public investments, like other investments, typically have an early net outlay, followed by a later net inflow of resources. In order to determine whether an investment is worthwhile, it is necessary to compare the early net outlay with the later return. This means comparing dollar quantities received at different points in time.

Economics has developed a widely accepted rationale for such comparisons. It is based on the balance between the existence of a preference by consumers for present consumption over future consumption—the chicken in the hand is worth more than the one in the bush. It is also based on the productive possibilities open to us by investment in physical capital assets that increase the efficiency of production.

Given these two factors—time preference and production possibilities—and given the ability of consumers to alter the time stream of their consumption by borrowing and lending, a single rate of interest would occur if there were no uncertainty; consumers and entrepreneurs would both adjust their activities to that rate of interest. In a world where there are no barriers among markets and no risk or uncertainty, the Government, too, should use that single rate of interest as its discount rate in choosing its investment programs. To depart from the rate would reduce the total productivity of the economy, including the Government goods and services.

Chairman PROXMIRE (now presiding). Will you repeat that statement? Go back one sentence before that, please.

Mr. HOFFMAN. Surely.

The reason for the application of the single discount rate in this simple model of the economy, is that if the Government departed from this rate, it would, in effect, be reducing the total value of goods and services available to the economy, including Government goods and services.

The reason is that the application of a discount rate higher than the interest rate would cause the Government to ignore investments that had a larger return than that available from opportunities in the private sector, thus diverting resources into lower payoff areas. The application of a discount rate lower than this interest rate would result in the opposite effect; there would be overinvestment in Government programs because of the diversion of resources from higher return private investment.

Problems arise, however, as a result of departures from this oversimplified model. As a result of barriers to entry, the administrative costs of borrowing and lending, and imperfections in information, markets are not perfect and funds do not flow among them without friction. Even more important is the fact that risk and uncertainty are an inherent aspect of our economic activity. When we take into account these departures from the simplest model, we find that a number of dif-

ferent positions may be adopted with respect to the rationale for the adoption of a discount rate.

The first rationale is one that retains the notion of opportunity cost; it looks on the discount rate applied to Government programs as reflecting the cost of the funds withdrawn from the economy. However, there are two variants of this approach—one says, simply, we ought to look at the opportunity cost in terms of funds withdrawn from investment in real physical capital. It assumes that all resources used would have been invested. A variant of this approach, somewhat more complex, states the problem more broadly. It notes that funds used by Government programs are withdrawn not only from investment in real physical capital, but also from consumption. Its proponents would argue the appropriate rate is a weighted average of the two, with the weights determined by the impact on private spending of Federal taxes and borrowing required to fund Federal program activities.

A radical departure from the first two concepts is one which rejects the judgment of the private market as a basis for determining the discount rate and which holds that the discount rate ought to be a tool of policy and should specifically reflect governmental objectives. One of the objectives referred to most often is concern for future generations, who cannot express their desires in the private market. Another one is concern for growth, not simply for the income consequences of growth in the economy, but concern for the broader social consequences of being in an expanding economy with its greater possibilities for mobility and relatively painless change.

Still another and quite distinct concept for determining the discount rate is the cost to the Federal Government of borrowing. This has been offered as a rationale in the General Accounting Office survey that has been presented to this subcommittee. In this version, the rate is determined by the cost of borrowing plus the income taxes forgone by the Government. In effect, this concept would reflect the revenue and spending impact of Government borrowing. It is a budgetary concept of the discount rate. It would be appropriate, I might add, if one viewed the Government as having the primary objective of maximizing its net worth, as economists argue private firms do.

Let me turn now from the alternative rationales for determining the discount rate to some considerations of the way in which discounting fits into public investment decisions.

First, given the complex circumstances under which Government decisions are made, I think there is a strong argument for looking not only at some overall aggregative measure of the costs and benefits of Government programs, but also for looking at their year-by-year cost and benefit implications. We would not need to do this if the Government were free to borrow or lend, if it were not subject to specific budgetary constraints. But given the actual environment in which public investment decisions are made, there is useful information in a year-by-year look at the costs and benefits. This does not, however, get at the question of how we evaluate costs and benefits nearer in time as opposed to those in the more distant future. To do that we need to develop a present value concept by applying a discount rate.

I might mention at this point that neither in my paper nor in these remarks have I covered the notion of the internal rate of return. I believe that there are problems in the application of that concept, and I would be glad to discuss it if that were felt to be desirable.

On the question of how to determine the discount rate to apply to Government investment decisions, my own view is that the broader of the two opportunity cost methods mentioned is the more appropriate. However, there are, at this time, practical difficulties in determining the value to be assigned under that concept and in getting general agreement on such a value. Therefore, as a pragmatic solution, it seems to me that there is merit in adopting a two-part approach, based partly on the distinction that I made earlier between programs in which it is appropriate to consider cost-benefit analysis and those in which we are forced by the inapplicability of market measurement to rely on cost-effectiveness analysis. In programs where cost-benefit analysis is appropriate, and particularly in that set of such programs where the Government goods and services correspond to those of a particular sector of the private market, we ought to use the rate of return that currently applies in that sector of the private market. Care should be taken to define that sector broadly enough so that the effects of local or specific market imperfections, which themselves may be the targets of Government action, are largely averaged out.

In other cases I believe that the approach should be to apply a rate that reflects a riskless opportunity cost averaged over the entire private sector and then to reflect risk explicitly in the calculations of costs and benefits. I believe that by doing this we create greater possibilities for reaching common understanding about the basis for decisions than we do when we try to estimate risk on the basis of what a "similarly risky" activity in the private sector is currently yielding. If, however, for other reasons it apppears desirable to treat risk in terms of a discount rate of set of discount rates, they ought to be identified explicitly as risk premiums added to the riskless rate that would apply generally to Government programs.

Now, the question is, what rate to use.

I have identified differences among economists on the conceptual basis for discounting, but, by and large, I think those differences may not be as large as the differences that appear when we try to identify a specific rate, a number, to use. Given this situation, it seems to me that we can still say that the rate ought not to be any less than the yield on Government bonds with long terms to maturity. I believe that most economists would set the rate higher than this, but I could not at this point pick a number and say that 90 percent of economists would agree on that number.

One way of handling this uncertainty would be to test the results of analyses for sensitivity to rates above the yield on Government bonds to see whether it makes a difference, and then to try to argue the question out in the context of particular programs.

With that, let me turn to recent developments and sum up what I think a desirable procedure would involve. You have heard earlier this morning from Mr. Holum and Mr. Caulfield on the recent developments with respect to water resource programs in which the Water Resources Council has taken the lead. The Bureau of the Budget has worked with the Water Resources Council quite effectively in this, I believe.

In the course of providing PPB guidelines for several other agencies, we have also adopted a procedure which I think offers the possibility of generalization after review and further consideration. We

have asked that several agencies, in evaluating their programs, discount cost and benefit streams at a 10-percent rate, and then test for sensitivity to 7.5 and 12.5 percent rates. In these cases, our thinking was largely along the lines that we would identify the activity with corresponding sectors of the private economy.

I might also mention a recent study of oil shale development in which the economic attractiveness of oil shale development to private developers was tested at rates of 12 percent and 20 percent as a basis for determining whether this was economically attractive and for analyzing what government actions might be indicated.

Now, to sum up, I believe a desirable procedure would require, first, a display over the expected life of the program of costs and benefits or physical outputs as part of the analysis for decisionmaking. We now require this in the program memoranda and the program and financial plans under the PPB system.

Second, for programs that have both costs and benefits expressable in dollars and which directly displace private investment in a specific sector, the rate of return in that sector is an appropriate discount rate for calculating the present value of costs and benefits.

Third, for most public investment, we should use as the appropriate rate the private returns that must be foregone over the economy as a whole to release funds for public investment. This rate should eliminate allowances for risk, providing that costs and benefits are explicitly adjusted to allow for the risk of the public project.

Fourth, a riskless rate of return in the private sector should not be less than the rate of return on long-term Government bonds, and neither should the discount rate. Studies should be undertaken to develop a more reliable basis for estimating the riskless rate of return in the private sector.

Fifth, in analyzing programs, we should test for sensitivity to variations in the discount rate.

Sixth, where subsidies are regarded as socially desirable, we should express them explicitly in cost-benefit calculations rather than in the discount rate.

I believe that the above points represent the direction in which we have been moving and will continue to move and that this movement will produce significant improvement in the analysis of Government investment programs. In the coming months, the Bureau of the Budget, in cooperation with Federal agencies and departments, will be continuing its work to improve the use of discounting in the evaluation of public investment programs.

I might simply add that my discussion of the problem, which has stressed the complexity of the problem is not, in my mind, an excuse for abandoning the attempt to apply explicit quantitative analysis to decisions about Government programs. Rather, it is a challenge to develop appropriate concepts and the needed data.

Thank you. I appreciate the opportunity to present this to you.

(The prepared statement of Mr. Hoffman follows:)

PREPARED STATEMENT OF HON. FRED S. HOFFMAN, ASSISTANT DIRECTOR OF THE BUREAU OF THE BUDGET

I am happy to appear before this subcommittee to discuss the question of discounting in the evaluation of Government investment programs. This question is, of course, a part of the larger question of the evaluation of public expendi-

tures—a principal concern of the Planning, Programing, and Budgeting (PPB) System. Since the introduction of that system to the nonmilitary side of the Government, the major Executive Departments and agencies, and the Bureau of the Budget in particular, have devoted much effort to improving the process by which Government resources are allocated to accomplish the various objectives of public policy. My remarks will be organized to try to set the problem of discounting in the context of the broader objectives of improving decisions about Government resource allocation. Recent discussions of PPB before this subcommittee and before the Senate Subcommittee on National Security and International Operations of the Government Operations Committee have emphasized that decisions about public expenditures should and do have a broader basis than formal, quantitative analysis. I know of no one concerned with the development of PPB who believes that a time will come when formal, quantitative analysis will or should completely determine decisions about public expenditures. Nevertheless, the need to develop such analysis is, I believe, among the most urgent requirements in order to improve the quality of Government.

Complexities in Evaluating Public Expenditures

The reasons for dwelling on the limitations of quantitative analysis are to be found at the starting point of PPB—the broad objectives of Government expenditure. PPB is intended to assure that every dollar taxed or borrowed and spent by the Government will return at least a dollar's value, but the determination of that value is often a more complex thing for public than for private expenditure. This arises from the complexity of the objectives of most government programs. The objectives of public programs affecting resource allocation can be classified as follows:

—The provision of public goods—that is, goods whose consumption by one individual does not reduce the amount available for consumption by another. Decisions about such goods have to be made collectively. Examples are deterrence of war and the preservation of scenic beauty.

—The redistribution of income to assist specific groups, such as the poor, the aged, the disadvantaged. Redistribution may be effected by the transfer of money income or by the provision of goods and services. An example of the first type is the public assistance program; food distribution programs are an example of the second.

—The elimination of spillover effects—situations where John Doe's actions may benefit or harm Richard Roe in ways that can be ignored by John Doe's decisions, as when he burns leaves upwind or deposits sewage upriver from his neighbor in the absence of appropriate charges or regulations.

—The management of publicly-owned resources, such as mineral lands, forests, waterways and so on, in a way that will insure their efficient use from the point of view of society.

—The removal of imperfections in the operation of the private market, or the alleviation of their effects. Examples are the use of public enterprise to provide a competitive standard where none would otherwise exist, and the provision of better information to consumers or producers where the market would otherwise work badly.

Unfortunately for simplicity in the evaluation of government programs, almost all of them have implications for more than one of the objectives discussed above. Public expenditures on education may produce transfers of income to the beneficiaries; it may also provide society a public good in the form of a better educated electorate, spillover benefits in terms of a reduction in the crime rate associated with increasing educational levels in the area where the beneficiaries live, and an improvement in the operation of the labor market as a result of increasing the information of private individuals about the relation between education and opportunity. Clearly not all these dimensions of the performance of our public education programs can be subjected to measurement in terms of dollars. The dollar yardstick for the measurement of benefits is relevant only where a private market for the goods or services does or could exist. Since no private market can evaluate the political value of a better educated electorate, that element of the output of public education programs must be measured in non-dollar terms or must be considered qualitatively. This, as I shall discuss below, has important implications for the evaluation of public expenditures and for policy on discounting, in particular.

The evaluation of our manpower programs illustrates how multiple criteria can complicate the task of analysis. It would be easier to evaluate those pro-

grams if the criterion for selection of improvement of programs were solely the addition to income, no matter whose income is increased. But it does matter who benefits. For example, an analysis of the Job Corps program estimates that average net earnings gained by participants in the program are 200 percent of the per-trainee costs. In addition, the program is and should be evaluated by the characteristics of the recipients of the assistance. Nearly all of the recipents are poor and under 21 years of age. In comparison, an analysis of our 1967 experience with the Manpower Development Training Act On the Job Training Program indicates that this program apparently increases the average earnings of participants by about five times the cost, but only one-third of the participants were poor and under 21. In order to choose the desired mix of programs—or for possible orientation of each program—a weighting for each criterion is necessary, and we have no objective social basis for assigning a specific value to a dollar transferred to a poor person relative to a dollar transferred to someone with higher income.

When we are dealing with a program that has the provision of a public good or the redistribution of income as an important part of its objectives, evaluation must take the form of cost-effectiveness analysis rather than cost-benefit analysis. A cost-effectiveness analysis, as I am using the term, is an analysis that compares the cost of alternative ways of doing a given job with output measured in physical, social or some other non-market-oriented terms. I contrast it with the typical cost-benefit analysis that compares costs and benefits directly in dollar terms.

The distinction is one with important implications for the analysis of public resource allocation. Unlike cost-benefit analysis, cost-effectiveness analysis does not provide information on how far we should carry public expenditure in a specific program area. To choose an obvious example, the meaninglessness of a dollar value of changes in the strength of our deterrence of nuclear war makes it necessary to determine the level of deterrence by the judgment of the responsible officials; in the water resource area, by contrast, there is general acceptance of the proposition that only projects whose dollar benefits at least equal the costs (approximately computed) should be undertaken.

The inability to compare the value of additional spending on national security and on water resources, or education, or highways means that formal, quantitative analysis cannot determine the broad priorities among areas of government spending. If the principal role of analysis is, as I believe, in choosing efficient ways of achieving public objectives *within* each of the broad areas of public activity, nevertheless, it has an important role in improving the process by which political, social, and economic considerations are combined to determine broad priorities. I believe it can exercise this role by making more explicit and summarzing more effectively the cost and output consequences of alternative resource allocations.

Even when benefits and/or costs can be measured in common resources, there are problems in measurement. Cost estimates are usually based on engineering drawings which generally exhibit predictable degrees of accuracy. Estimates of benefits, however, must often rely on more speculative data, such as unforeseen changes in technology and population shifts which will affect the benefits that accrue from additional irrigation land, protection of urban lands from potential flooding, and new recreational facilities. Under these difficult measurement conditions, estimates of benefits are likely to have, at best, substantial margins of uncertainty.

The Rationale for Discounting in Evaluating Public Investments

Let me turn next from the evaluation of public expenditures in general to the evaluation of public investments. The distinction rests, of course, on the introduction of time into the considerations of costs and benefits. The typical investment program is one in which an early net outlay of resources is balanced by a later net inflow of resources. The evaluation of patterns of net resource flows requires some method of comparing different streams over time. The economist's approach to this problem is derived from the possibility open to an individual of altering the time stream of resources available to him by borrowing or lending, or some combination of both over time. The terms under which present income can be traded for future income are, of course, determined by consumers' time preference for income on the one hand and by the productivity of capital on the other.

THE SIMPLEST MODEL FOR DETERMINING THE DISCOUNT RATE

In the simplest model of our economy there is only one rate of interest facing lenders and borrowers and governing the rate of investment in productive capital. The effect of an increase in the rate is not only to make it undesirable to engage in some investment projects or to reduce the total level of investment but also to change the character of those projects adopted, making them less capital intensive and more labor intensive. In this simplest model, and given the objective of maximizing gross national product, the Government, too, would apply this rate to evaluating future as opposed to present benefits and costs. It is widely accepted among economists that this model is inadequate because it oversimplifies our economy. However, there is less unanimity as to the extent and the way in which this model should be modified to reflect reality for public policy purposes.

An important limitation on the applicability of the model is the existence of market imperfections both with respect to restrictions on entry of capital into given fields of economic activity and with respect to the information available to investors and savers. Another equally important limitation is the existence of risk and uncertainty—the likelihood of realizing the benefits. As a result of these departures from the simplest model, we find consumers borrowing at much higher rates than they receive on their savings and substantial variations in the rate of return on different types of securities and in different industries. Moreover, the possibility of changes in price levels is also reflected in the market rates of return on saving and investment.

THE DISCOUNT RATE AS DETERMINED BY PRIVATE RETURNS FOREGONE

In the face of this more complicated view of private investment decisions, it is possible to distinguish several alternative conceptual bases for the determination of a discount rate to be used by the Government for the evaluation of investments. The simplest position holds that the appropriate rate is the average rate of return in private industry on investments in productive capital assets, before corporate income taxes. This position is justified on the grounds that the opportunity cost of a dollar of public spending is its productivity in private investment. Unless, therefore, each dollar of public investment yields at least the rate of return in private industry, GNP could be increased, it is argued, by reducing taxes or borrowing and spending and letting private investment increase.

A more complex position, but one with the same basic rationale, would reflect not only the rate of return on productive investment in private industry, but would make allowance for the rates received and paid by various classes of consumers. The relative influence of each component on the average is to be determined by the extent to which additional Federal taxation or borrowing displaces private investment or consumption. This approach can be quite detailed to take account of the incidence of the increase in taxation on various classes of consumers and investors who face different rates as a result of market imperfections. This concept, like the preceding one, is basically an opportunity cost concept.

THE DISCOUNT RATE AS A REFLECTION OF SOCIAL OBJECTIVES

A third concept is a more radical departure. In this approach, the judgment of the private market is not accepted as the final arbiter of the appropriate discount rate for Government programs: instead the discount rate is viewed as a tool for expressing and carrying out distinctively public objectives. Therefore, it is argued, the discount rate should be affected by, but need not be identical with the rate reflecting private opportunities foregone. A form of this position commonly advanced is the argument that the market rate or complex of rates does not permit future generations to express their preference in the market place and that the Government should act as the guardian of their interests, presumably by using a lower than market rate and thereby producing a shift of income into the future. It might also be argued that the Government should value growth for its own sake, apart from the additional income generated, because the viability and vitality of a democratic society are increased by creating more opportunities for upward mobility and change. It is always easier to make desirable changes when growth permits reallocations in which everyone benefits—even if unequally—than when reallocation means taking from one person to give to another.

Apart from the fact that specific non-market objectives introduced into the determination of the rate under this third concept can be questioned (how much current income should we sacrifice for increasing the real income of future generations whose average per capita income is likely to be several times our own?), it also raises questions of inconsistency between the private and public sectors and the propriety of expressing the various objectives through the discount rate for Government investment programs as opposed to other policy variables.

As an alternative to applying a special discount rate, specific social objectives in particular sectors can be reflected by adjusting benefits appropriately, or by first selecting the size of budgets to be allocated for each public purpose and then evaluating each project to determine allocation of the limited budget. Social purposes, such as growth and investment for future generations could be incorporated in criteria that cover both the private and public sectors though they need not be as broad as policy directed at the overall level of economic activity. For example, the investment tax credit, by stimulating private investment would promote consistent growth in both public and private sectors.

Adherents of this approach, nonetheless, argue that on pragmatic grounds the Government should go as far as it can in achieving social objectives through broad policies, such as monetary and fiscal policy, but if constraints on its freedom of action prevent it from imposing a suitable investment policy over the entire economy as a whole, or over large sectors of it, it should accept the second best solution of adjusting selective or all public investment so far as possible to achieve proper social objectives.

THE DISCOUNT RATE AS DETERMINED BY REVENUE-EXPENDITURE EFFECTS OF GOVERNMENT BORROWING

A fourth rationale for the determination of the rate of return which is quite distinct from each of the others, is the notion of basing the discount rate on the Government cost of borrowing. One version of this concept, discussed by the helpful recent General Accounting Office survey, is the cost of Government borrowing adjusted for taxes foregone. This concept is neither a private opportunity cost concept nor a social cost concept. Rather it expresses the combined impact on governmental expenditures (in terms of interest outlays) and revenues (in terms of taxes foregone) of Government borrowing. This expenditure-revenue concept implicitly views the Government as though it were an organization attempting to maximize its net worth, as a profit-maximizing private firm does.

THE APPLICATION OF DISCOUNTING TO PUBLIC INVESTMENT DECISIONS

Having reviewed several alternative rationales for the determination of a discount rate, I should next like to look somewhat more closely at the way in which discounting fits into the evaluation of investment programs before discussing the determination of an appropriate rate.

In view of the complexity of the problem, it may be appropriate to start with a fairly direct approach and suggest that decision makers faced with the need to choose among alternative streams of net benefits over time, should begin by looking at the benefits and costs, year-by-year. In a simple world where the decision-maker was faced with unlimited options to borrow or lend at a fixed interest rate, this would be unnecessary, but in the world in which decisions are actually made the ability of the Government to lend or borrow is limited, the rates are variable over time, and agency budgets cannot be freely shifted from one year to the next. Under these circumstances the year-by-year picture of cost and benefit flows may contain highly useful information to a decision maker. Such a benefit was foreseen from the initiation of the multi-year Program and Financial Plan in the PPB System. Year-by-year comparisons, however, are too complex to be used except where the number of alternatives is relatively few. Where comparisons must be made among a large number of alternatives, it is necessary to resort to some form of aggregative measure. Moreover, even where the number of alternatives is small, such comparisons do not of themselves reflect the fact that dollars now have different and greater value than dollars in the future.

The search for relatively simple measures by which to compare alternative benefits and costs over time has, unfortunately, produced a wide variety of such measures, many of which have only simplicity to recommend them. The recent General Accounting Office survey documents this point. Improvements of current practices are both possible and desirable, but because of the complexity

of Government objectives and the nature of Government programs, I do not believe that the proper approach at this time is to attempt to fix a single discount rate to be applied uniformly over the entire Government. Nonetheless, I believe it is possible to identify a conceptual basis for selecting public discount rates.

The public investment discount rate should be based on private returns foregone in consumption and investment and should be adjusted for different methods for treating risk and inflation between private and public sectors. I believe this is preferable to the alternative of adopting the rate of return on private investment foregone alone because Government funds are drawn from both consumption and investment. It is preferable to the social objective approach because the alternative of directly expressing social objectives in cost and benefit estimates will produce greater clarity about such objectives and permit consistency between private and public investment policy. It is generally preferable to the revenue-expenditure concept because the Government's objectives are usually broader than those of a private firm, since the Government must deal with public goods, the redistribution of income, and the broad conditions for efficiency in the economy which are not inherent in corporate decisions. Until however, the rate implied by the preferred conceptual basis can be measured accurately and on a continuing basis, we must be pragmatic and use acceptable substitutes for what the "real" rate must be.

EVALUATING PUBLIC INVESTMENTS COMPARABLE TO PRIVATE ACTIVITIES

It is useful given our uncertainty about the appropriate rate and the measurement of risk to approach the problem by distinguishing two classes of Government programs, those that supply goods or services similar to goods and services being sold in private markets, and those that have objectives that are peculiar to a government. Obviously, such a distinction must deal with gradations and not completely discrete categories. Examples of the first type of program might be those dealing with the administration of Federally-owned mineral or timber resources, or with the sale of uranium enrichment services from the Federally-owned Gaseous Diffusion Plants. The primary example of the second type of program is, of course, to be found in the Defense Department, but our poverty programs are also heavily weighted in this direction.

Where Government programs can be identified with a particular sector of the economy and where the programs will probably displace private investment in that sector, I would argue that the private rate of return on analogous kinds of investments over the given sector is the appropriate rate for the evaluation of public investment inclusive of allowance for risk. The sector should be defined broadly enough to average out the effects on rates of return of specific market imperfections that would be affected by the proposed Government program and that may be a principal reason for it. In this way we can take advantage of the judgment of the private market of a rate inclusive of an appropriate degree of risk.

EVALUATING PUBLIC INVESTMENTS PECULIAR TO THE PUBLIC SECTOR

The second class of Government programs is quite different however, since there is no private analogue nor is there likely to be direct displacement of investment in a single sector of the economy, nor is it generally possible to express the costs and benefits completely in dollar terms. The significance of the last point has been discussed above.

For such programs that constitute, I believe, the preponderance of Government activities, the appropriate rate at which to discount future costs is a rate that reflects the opportunity cost of Government spending over the economy as a whole.

The Treatment of Risk.—However, it is necessary to consider how to handle risk for such programs. The opportunity cost as inferred from either the rate of return on productive investment or the weighted average of returns from deferred consumption and from productive investments foregone, will reflect some allowance for risk. This occurs because most people when offered a 50–50 chance of getting either zero or $1,000 would be willing to pay less than $500 for the opportunity. That is to say they try to avoid risk and require compensation for undertaking it. While I certainly do not wish to argue that Government programs are riskless—on the contrary they are often subject to considerable risk—I believe that better decisions are likely to result from considering the risks explicitly by adjusting the expected costs and benefits than by attempting

to relate the average risk of peculiarly public programs to "similarly risky" investments in the private sector.[1]

Moreover, although there are some reasons for believing that risk increases as the cost and benefit is farther and farther removed in the future there is no obvious reason to expect riskiness to compound in the way that the discount rate does, nor is there any very good basis for expecting similar degrees of risk or uncertainty on both the cost and benefit side. Also, when only the cost stream rather than a stream of net benefits is to be discounted, attempting to reflect differential riskiness among alternative projects may give the wrong signal. If the discount rate is increased to reflect higher risk, the present value of the cost stream will be reduced and the riskier project will tend to be preferred.

For these reasons, I believe it is preferable to use a riskless rate to discount cost streams in cost-effectiveness analyses, and to reflect risk in an increase in the expected year-by-year costs or a reduction in benefits. If, however, risk is to be handled in terms of the discount rate, a risk increment should be explicitly identified and added to the basic, riskless rate.

Treatment of Inflation.—Finally, the observed rates of return in the private sector in all probability include some allowance for inflation. Since most analyses of Government programs are and shoud be, I would argue, carried out in terms of constant dollar cost estimates, the allowance for inflation in the observed rates of return should be eliminated. Without such an adjustment to the discount rate, the calculation of anticipated benefits in constant prices would be penalized more than costs which generally are closer in time, and the resulting benefit-cost calculation would be inappropriately low.

THE CHOICE OF AN APPROPRIATE DISCOUNT RATE

At this point, unfortunately, it is very difficult to make the transition from the rationale for a discount rate to the choice of specific numbers. It would be expected that those economists who hold that the appropriate rate is determined by the rate of return on productive investment would choose a higher rate than those who favor a weighted average of both private productive investments and consumption foregone in the private sector, and that the second group, in turn, would choose a higher rate than those who favor a weighting by social preferences. It would not surprise me greatly, however, to learn that uncertainty in estimation outweighs the conceptual differences. On one point, nevertheless, I believe they would all agree and that is that the estimate of a long-term riskless rate reflecting a private opportunity cost should not be less than the current yield on Treasury bonds with long-terms to maturity. Many of them would, I am sure, choose a significantly higher rate. Because of the conceptual difficulties in identifying and applying a social rate of time preference and the estimating problems in determining a better estimate of the average private riskless rate, I believe that as a practical matter it is appropriate to regard the yield on Treasury bonds as a minimum value for the discount rate and, where it is relevant, to test the sensitivity of results to higher rates.

Improvements in Government Discounting Practice

Recently, of course, the Government has made significant progress in improving its evaluation of investment programs. Under the leadership of the Water Resource Council with the cooperation of the Budget Bureau, we now have a proposal to increase the discount rate used in water resource projects and to key it directly to the yield of Government bonds with long-terms to maturity. In addition, the Budget Bureau has, this year, provided guidelines on discounting for several agencies in other program areas as part of the PPB analytic process. These agencies were requested to apply discount rates of 10 percent in their analytic studies. Where it was believed that small variations in the rate would make a significant difference to the outcome of the analysis, they were also requested to test for sensitivity of the results to rates of 7½ and 12½ percent. The Department of Defense has also engaged in attempts to

[1] It may be argued that risk in private investments is expressed in the discount rate as opposed to reflecting risk explicitly in components of benefits and cost because the market in securities has no other way to treat riskiness. An individual investor's evaluation of risk which may run in terms of detailed predictions about the outcomes of particular investment projects of a company must ultimately be reflected in a price at which he is willing to buy the company's securities, which in turn implies some rate of return.

systematize the evaluation of investment programs by consistent application of discounting procedures. And there are other examples where agencies have applied varying rates for the analysis of projects which impact on particular private sectors. For example, a recent Department of the Interior study of shale oil tested the economic attractiveness of oil shale development at alternative discount rates of 12 percent and 20 percent.

I believe that there is a good deal more that we can and should do to improve the evaluation of investment programs. However, I view this as a part of the overall problem of increasing and improving the analysis of Government expenditures as part of the development of the PPB System. Until analysis has been strengthened and extended considerably, it will be difficult to assign a great impact on resource allocation decisions to improvements in the discounting process alone. Differences in discounting procedures can only have an effect when costs and benefits of alternatives are systematically compared and when uncertainties or arguments over the definition and measurement of costs and benefits do not swamp the difference due to discounting. Because of the conceptual difficulties in comparing outputs of unlike government programs, I do not believe that improvements in discounting procedures, desirable though they are, will directly exert a major effect on allocations among different programs. In the case of the two manpower training programs—Job Corps and MDTA, OJT—variations in discount rate did not eliminate the need to weigh the importance of selected target groups.

To sum up, the evaluation of public investments is complex, and raises serious conceptual and measurement problems not usually confronted when evaluating private investments. Analysis can and does help to identify better ways to allocate public resources through cost-benefit analysis and cost-effectiveness analysis. Discounting is an important element in both types of analyses.

A desirable procedure would:

1. Require display over the expected life of the costs and benefits or physical outputs of alternative programs as part of the analysis for decision making (as is now required in Program Memoranda and Program and Financial Plans).

2. For programs which have both costs and benefits expressible in dollars and which directly displace private investment in a specific sector, the rate of return in that sector is an appropriate rate for calculating present value of costs and benefits.

3. For most public investment, use the private returns foregone over the economy as a whole to release funds for public investments, as the appropriate rate. This rate should eliminate allowances for risk providing that costs and benefits are explicitly adjusted to allow for the risk of the public project.

4. Reflect the fact that a riskless rate of return in the private sector should *not be less than* the rate of return on Government bonds. Studies should be undertaken to develop a more reliable basis for estimating the riskless rate of return in the private sector.

5. Test for sensitivity to variations in the discount rate above the yield of Government bonds where the results of analyses may be affected by small changes in the discount rate of return.

6. Where subsidies are regarded as socially desirable, express them explicitly in cost-benefit calculations rather than in the discount rate.

I believe that the above points represent the direction in which we have been moving and will continue to move and that this movement will produce significant improvement in the analysis of Government investment programs. In the coming months the Bureau of the Budget will be continuing its work in cooperation with the Federal agencies and departments to improve the application of discounting in the evaluation of public investment programs.

Chairman PROXMIRE. Thank you, gentlemen.

Does that complete the statements by you gentlemen?

Mr. HOLUM. Yes, sir.

Chairman PROXMIRE. First, I want to apologize for being tardy. I cannot be in three places at once, and I was supposed to be on the floor, in the Appropriations Committee, and here. The Appropriations Committee was having a markup of a bill in which I am deeply involved.

I am going to ask my two colleagues to proceed, because they have been here through the entire statements and they may have questions first.

Representative MOORHEAD. Thank you, Mr. Chairman.

Mr. Secretary, first, referring to your statement, as I understand the thrust of your testimony, it is that at least in the past, a lower rate of discount was justified, partly because, as you say, "In many instances, the projects provide much more than goods and services," and things like water quality control, esthetics, amenities, recreation, and so forth were often underestimated. Am I correctly analyzing your testimony, sir?

Mr. HOLUM. I think there has been a very definite inclination on the part of the agencies involved in water resource development to underestimate particularly the regional and social benefits and what we call the indirect benefits, that result from water resource development. As part of the effort to improve Senate Document 97—and I guess that is essentially what we are talking about this morning—we also need to sharpen up those techniques and provide for the ultimate decision the best possible analysis of the benefits as well as the costs.

Representative MOORHEAD. Mr. Caulfield, in your testimony, you quoted from Senate Document 97. At one place, you point out that Document 97 directs the inclusion of both the tangible and the intangible benefits, and also the secondary benefits. Would there be any other benefits?

Mr. CAULFIELD. In Senate Document 97, secondary benefits are defined in such a way as to include what some people talk of as indirect benefits. Secondary benefits here are inclusive of all the types of benefits other than primary benefits, in tangible form, quantitative form, that people have discussed in this field.

Representative MOORHEAD. So there can be no improvement over Senate Document 97 in this respect, is that correct?

Mr. CAULFIELD. Oh, I would not say that. I feel that when we can spell out more clearly, procedurally exactly how to use these concepts in context, particularly in areas of underdevelopment and unemployment, I think we can make a real improvement in the statement of the document. As far as I am concerned, conceptually, it is all in the document, but we can make improvements in the way the document is stated; yes, sir.

Representative MOORHEAD. Mr. Hoffman, in your prepared statement I think you summed up what I am driving at here. On point 6, you said that where subsidies are regarded as socially desirable, they should be expressed explicitly in cost-benefit calculations rather than in the discount rate. Would you agree with me, sir, that the present 3⅛ percent is a subsidy in the form of a lower than realistic discount of rate?

Mr. HOFFMAN. Yes, sir. I believe that this rate is a subsidy. The subsidy may or may not be warranted, but I think it makes it hard to understand the nature and reason for the subsidy if it is loaded into the discount rate. That is my reason for preferring a more explicit statement of subsidy.

Representative MOORHEAD. In your opinion, Mr. Hoffman, is there any subsidy remaining in the proposed 4⅝-percent discount rate?

Mr. HOFFMAN. To answer that I would have to evaluate procedures

for considering risk in calculating costs and benefits. Providing the risk were adequately reflected, I would say that at this time, I have no basis for arguing for any specific higher number than 4⅝, or, more generally, higher than the current yield on Treasury bonds.

Representative MOORHEAD. Well, Mr. Hoffman, what is the current yield on Government bonds?

Mr. HOFFMAN. I believe the figure I saw as of July was about 5.1 percent. On that, however, it seems to me that Mr. Caulfield's point has a good deal of merit. I do think that some reasonably stable figure is required. I do not think that it is possible for the evaluation of water resources programs to track the weekly ups and downs in the Treasury bond market.

Representative MOORHEAD. I agree with you, that we have to average this out, but over what period of time?

Mr. HOFFMAN. The solution adopted by the Water Resources Council is not a bad approximation. Given the long gestation period of proposed water resource projects, I think that you need a relatively constant figure. I might add, however—and this is a problem that I would have to think about—where you are dealing with programs that do not have such a long gestation period for investments you might want a somewhat more active estimate of the going yield on Treasury bonds.

One of the reasons why I would accept the water resource solution is the several-year period between initial proposal and funding. The relevant rate is the rate at the time when you actually begin funding, or perhaps at some intermediate time when you become finally committed to the project.

Representative MOORHEAD. But, Mr. Hoffman, Mr. Caulfield's testimoney on page 14 is that they use the average of bid prices for the fiscal year 1966. That would be the calendar year 1965–66 or 2 years ago. Can you not become a little more current?

Mr. HOFFMAN. Yes, sir. I think in part, this is a function of when the proposal was developed, and I think that it is a matter of judgment as to what leadtime to use and how active to make it. I would argue, however that this figure sets a floor to the figure for use more generally throughout Government.

I do think that we need further study of what a generally applicable minimum rate would be.

Representative MOORHEAD. Mr. Caulfield, you have excepted from the new rate those projects that are already authorized. Is this authorized by the appropriate committee of the Congress—I mean, is it authorization legislation?

Mr. CAULFIELD. For the most part, sir, that is true. There are certain types of projects, such as the smaller Soil Conservation Service projects, which can be authorized administratively by the Department of Agriculture. Then the small projects of the Bureau of Reclamation can be authorized administratively after the Congress has been notified for 60 days that they propose to go through.

But, by and large, what we are talking about are projects that have to have the specific authorization of the Congress.

Representative MOORHEAD. Would this not result in the expenditure of Federal funds for projects which would be considered uneconomical based upon the new discount rate?

Mr. CAULFIELD. That may be—there may be such projects, yes. But in any policy change, there has to be a provision for transition. The projects that are involved in the approvals in this Congress have many commitments made by local people, by States, and so forth. You cannot just all of a sudden cut them off, in equity.

There has to be a transition-type of provision.

You will notice that in our transition provision, however, we have made the proviso that if the Congress should otherwise decide, they could require a higher interest rate to be used. However, as far as the Water Council is concerned, we think this is equitable—at this point, we do—and prior to getting prior comment from all interested persons, I should say. At this point, as a proposal, we think this is an equitable way of bringing about the transition from one state of affairs to another.

Representative MOORHEAD. My time has expired, so I am not asking this as a question. I might suggest that in addition, you say, "and funded within x number of years." I concede that a transition period is necessary.

Mr. CAULFIELD. I see. December 1969, is the stated cutoff date, and then only for projects authorized by the present Congress, sir. Where the financial commitments have not been made within 3 years, the authorization dies. So these cutoff points are in here.

Representative MOORHEAD. Thank you.

Thank you, Mr. Chairman.

Chairman PROXMIRE. Senator Jordan?

Senator JORDAN. Thank you, Mr. Chairman.

Mr. Hoffman, I was very much interested in your explanation of how we evaluate various expenditures that Congress is called upon to make. You state, and I agree with you fully, that the inability to compare the value of additional spending on national security and on water resources, on education, on highways, on manpower training—these are very difficult judgments to make.

You have outlined several procedures for setting up a discount rate. You have set up two ways of treating these different types of expenditures. When the marketplace is involved, you use one way; you use a cost-benefit ratio. When that is not possible, then you go to another measure of value, in which you use cost effectiveness.

Now, my question to you is, how can the Congress know whether we should spend money for the national security, for manpower training, or for a highway or for water resource development projects that do lend themselves to some connection, some relation to the market?

Mr. HOFFMAN. Senator Jordan, the approach I favor is to pursue the implications of decisions that have market implications in market terms as far as we can, and to express their market implications as far as we can, but also to identify as explicitly as we can all of the other considerations that ought to bear on the decision. In such cases, individual judgments are important elements of the decisions. The political process comes to bear on these issues, and we have other ways of evaluating some of these problems. But the important thing is to identify clearly and explicitly both kinds of considerations and to present them as parts of the implications of the decision. This is why I have proposed the procedure that I have.

Senator JORDAN. What you are saying, in effect, is that either the

application of a cost-benefit ratio in the one instance of a cost-effectiveness ratio in the other instance, neither is an exact science?

Mr. HOFFMAN. Yes, sir. I would say that they both present useful information, but they do not exhaust the story. There are other factors that need to be considered as well.

Senator JORDAN. Explain to me, please, what you mean by opportunity costs.

Mr. HOFFMAN. The opportunity cost of a particular use of a given resource is the value of that resource in its best alternative use. That is, in the particular case of public investment funds, the opportunity cost of those funds is the value of the investments and the consumption that will not take place in the private sector because those funds have been withdrawn from the private sector and spent in the public sector.

Senator JORDAN. In effect, then, you take into account the foregone income tax receipts that might accrue to the Federal Government and the private development.

Mr. HOFFMAN. On that, sir, it seems to me that one wants to take into account the total decrease in productivity in the private sector. Part of that decrease will be foregone income tax; part of it would have remained in the private sector. But both components together represent the opportunity cost.

Senator JORDAN. You suggest that if an element of risk is present, it might be possible to compute that element of risk and translate it into a cost that would be, a rate that would be, supplemental, added to your basic rate?

Mr. HOFFMAN. Not quite, sir, as I understand you. Risk is used in two senses. Let me talk about a very simple example, the one I used in the paper. Suppose you have a 50–50 chance of getting nothing, or a thousand dollars. Now, that in itself is a risk. If you were thinking of making 10,000 such bets, then I would argue that the proper procedure for you would be to evaluate that bet at $500. If somebody said, you give me $500 and I will toss the die and give you either zero or $1,000, I would argue you ought to accept it, or at least you should not care whether you accepted it or not. If, however, you are going to do it once, and only once, then I think it is widely accepted that most people behave as though that opportunity is worth less than $500, and this represents a specific allowance for risk or risk-aversion in the value of that opportunity.

Now, I would argue that Government projects have a similar character. When you look at the benefits in a given year, you might say they may be as large as $1 million or they may be as large as $5 million in that year, with some spread in between. If the odds were even, one thing you might do is to say the average value, the expected value, is $3 million; now, should I value that bet at $3 million?

On the principle that you are not going to do this project 10,000 times, some people would argue that you ought to evaluate it at, say, $2.5 million. Similarly, for costs, where costs vary, you might want to raise the value from the expected value.

This is a procedure about which it is very difficult to say anything quantitative. We all know that the phenomenon exists, but it is hard to measure. I would argue that it is better to express explicitly in the costs and benefits what we mean by that kind of risk allowance than to

try to submerge it in a rate of return by an allowance in a discount rate.

Senator JORDAN. Do you believe a rate should reflect an incremental factor for inflation?

Mr. HOFFMAN. If we estimate costs and benefits in constant dollars, then it would be inappropriate to include an allowance for inflation.

Senator JORDAN. Thank you, Mr. Hoffman.

Mr. Caulfield, when you outlined a new formula giving an effective rate of 4⅝ percent that is a substantial jump from the existing 3¼ percent. Explain again to me how you would move from the present 3¼ rate to 4⅝ in the transition period.

Are you going to make the 4⅝ applicable to all new projects?

Mr. CAULFIELD. All projects presented to the Congress for authorization after the 90th Congress, sir.

Senator JORDAN. Beginning with the next one?

Mr. CAULFIELD. Yes, sir.

Senator JORDAN. Will you make it retroactive to any existing authorizations?

Mr. CAULFIELD. No, sir; that is, the executive branch would not. Of course, many times the appropriations committees decide that they want to reevaluate a project. Of course, it is the option of the appropriations committees to do so. But as far as the executive branch is concerned, this is proposed for application for projects authorized after the 90th Congress.

Senator JORDAN. I see. I think you used an illustration of a project having a benefit-cost ratio of 1.4 to 1, at the rate of 3¼ percent. This would be reduced to 1 to 1, the benefit-cost ratio under the new rate of 4⅝ percent.

Mr. CAULFIELD. Yes; I carefully limited that, though, to an average long-life capital intensive project. It would be a big fixed structure, with not much operation and maintenance cost, and the benefit would be spread over a long period of time.

Senator JORDAN. I am sorry; my time is up.

Thank you, Mr. Chairman.

Chairman PROXMIRE. Gentlemen, I want to thank you very, very much for a fine presentation and a most enlightening response here this morning. I would like to start off with Mr. Hoffman.

Mr. Hoffman, what is the policy of the Bureau of the Budget with regard to applying a discount rate in various departments at the present time?

Mr. HOFFMAN. The Bureau has not issued any explicit instruction on the application of discounting throughout Government. I think we view the problem of the discount rate as a part of the problem of improving analysis in each of the program areas in each of the agencies, and we have been approaching it by working with each of the agencies in the context of the PPB system to improve their general analytical processes, including the use of discounting.

Chairman PROXMIRE. You have been working on this for a long, long time, though, and I am just wondering; we have this tremendous divergence in the various departments, as you know. We have the Interior Department, which on water projects has applied, up to now, the 3¼-percent discount factor.

We have in the Tennessee Valley Authority 4.5 percent; the De-

partment of Agriculture Housing Loans, 4⅞; Office of Economic Opportunity family planning program, 5 percent; the Atomic Energy Commission for Radiation and Pasteurization, for example, Government costs, 5 percent; industry benefits, 15 percent.

The Department of Defense, on all shipyard projects, 10 percent; on 14 air stations, 10 percent; 18 other stations, 10 percent. I guess the Corps of Engineers is 3¼ percent, something of that kind, for the public works program. The Agency for International Development, foreign aid, from 8 to 12 percent; the Department of the Interior has a very interesting variation. They have, as I say, for the water programs, applied 3⅛ or 3¼ percent; for energy and mineral development programs, for which exploitation to a private function is 12 percent; utility programs, low-risk 8, high-risk, 12.

The Department of Health, Education, and Welfare goes up to 8 percent on some, 10 percent on others, and so forth.

At any rate, they are all over the place, no consistency at all. It seems to me both the President and the Congress would be served if there were either consistency or rationalization, explanation of why you have these enormous divergences.

Cannot the Bureau of the Budget, as the agency which has the responsibility to try to bring some order out of chaos, does it not have the responsibility to proceed in this area?

Mr. HOFFMAN. I would certainly agree, Senator, that there is a good deal of room for improvement here. I would argue, however, that we have been working to get that improvement and that the attempt to impose by some kind of Bureau of the Budget fiat a very specific, very restrictive procedure and discount rate, would be self-defeating when there is not yet a common understanding and agreement on all of the factors involved, either throughout government, or in the economics profession.

Chairman PROXMIRE. There certainly is agreement in the economic profession that you ought to be consistent?

Mr. HOFFMAN. Yes, sir.

Chairman PROXMIRE. Here you have a transparent example of a waste of resources by the Government itself.

Mr. HOFFMAN. The problem is in reaching agreement on how to be consistent. I think we would all agree that it would be desirable to increase consistency. We have been moving to eliminate some of the worst examples. Now, how far we go and how fast we can move is a function of the extent to which we are able to get common agreement and acceptance of the principles involved. I would agree that the Bureau has a leading role and a responsibility in this area.

Chairman PROXMIRE. Can you tell us just what the thinking of the Bureau of the Budget is right now, today, in looking forward to trying to bring some kind of rationalization, some order, some consistency here?

Mr. HOFFMAN. Well, sir, I am afraid I can give you my thinking only.

Chairman PROXMIRE. I wish you would.

Mr. HOFFMAN. I believe that we need to clarify the reasons and the methods involved in discounting in the evaluation of public investments. I believe we also need to develop a good deal more in the way of understanding and agreement on a rationale for determination of

the discount rate, and then I think there is a difficult problem of devising an acceptable, widely understood way of estimating the appropriate rate. I think we need to do each of these things and, as I have indicated, we have been moving to get started on this process.

Chairman PROXMIRE. Is there not a great deal of unanimity, really, in the economic profession in having at the very, very least this 4⅝ percent as opposed to the 3⅛?

Let me read very briefly the testimony of Professor Baumol, of Princeton, who did a wonderful job for us in testifying last year:

> However, I think if one were to poll, for example, the current and past officers of the American Economic Association for the past 10 or 20 years, you would find the unanimity which I described in my statement. I think you would find that, without a single exception, they would agree that something like the figure I have mentioned is a minimum for the pertinent discount rate, and would agree, therefore, that there is nothing shocking about the fact that very few water resource projects would pass a cost-benefit test if carried out on a rational basis.

Mr. HOFFMAN. Sir, with respect to the agreement on the rate, my own impressions from talking with a number of economists are in accord with that opinion. But I would like to point out that there is one school of thought among economists which could result in their arguing for a lower rate. I am referring to those who believe that the discount rate ought specifically to reflect peculiarly governmental objectives—that it is more than an opportunity cost notion.

Chairman PROXMIRE. Perhaps there is this defect in figuring benefits. Perhaps we are not sufficiently comprehensive or accurate in estimating benefits, but it would seem pretty clear that if you are consistent and accurate in computing benefits, you are just defeating yourself when you apply a different discount rate in one area than you do in another, that you are sure to have a waste of resources.

You are going to invest in some areas that you should not invest in, and fail to invest in some that you should.

Mr. HOFFMAN. My feeling would be somewhat like the one you just expressed, but I would point out that you would not carry all economists with that position.

I might add there are perfectly respectable, competent economists who hold the view that the discount rate ought to reflect more than simply the private opportunity costs.

Chairman PROXMIRE. Well, if we wait until we get a unanimity of agreement among economists, we will never do anything, we know that. Economists have agreed and disagreed on the tax increase and on almost every policy or action Congress ever takes. But there is preponderance of opinion among economists who have studied in this area and who speak with authority that we should have at least a 4⅝, and the evidence we got from the people who testified last year was that many would go, and I think a predominance, would go to between 10 and 15 percent.

Mr. HOFFMAN. Yes, sir, but that, too, is a specific point of view. There, I think you would begin to lose a good deal of that preponderance. The profession would truly be divided over whether to go to 10 or 15 percent in the evaluation of public investment programs.

Chairman PROXMIRE. Mr. Holum, Mr. Hoffman in his statement, says that only projects whose benefits at least equal cost should be undertaken with regard to water projects. Would you agree to that?

Mr. HOLUM. Are you looking at Secretary Udall's statement or——

Chairman PROXMIRE. No; no, I am looking at Mr. Hoffman's statement. I shall read you the statement; I have it now. It is the second sentence in the first paragraph:

> To choose an obvious example, the meaninglessness of a dollar value of changes in the strength of our deterence of nuclear war makes it necessary to determine the level of deterence by the judgment of the responsible officials; in the water resource area, by contrast, there is general acceptance of the proposition that only projects whose dollar benefits at least equal the costs (appropriately computed) should be undertaken.

Mr. HOLUM. If my memory is correct, Mr. Chairman, during the 7½ years I have been here, our legislative committees have reported favorably on one or two projects that had benefit-cost ratios of less than unity. As far as I am concerned, if we can adequately improve our methods of evaluating benefits so that we really do evaluate and make available to the Congress, and they are the decisionmakers, all of the facts with the benefits that the project will provide locally, nationally, now and in the future, on the basis of economic evaluation, I would expect the Congress not to authorize projects that did not have a benefit-cost ratio equal to unity.

Chairman PROXMIRE. In other words, you see nothing magic in water that makes it different from other investments?

Mr. HOLUM. Well, Mr. Chairman, perhaps not any magic. I do feel that the matters that we are discussing here this morning, and I think it is appropriate that they be discussed, very properly, do have some uniqueness. I would like to point out, as Secretary Udall did in his statement, that as far as discounting water projects, the procedures have been uniform over a long period of time. The water agencies are acting together through the Water Resources Council and the Water Resources Planning Act to keep them uniform. But we are dealing here, when we deal with discount rates as they apply to the development and use of our natural resources, with questions that are basic and fundamental as far as I am concerned, as to whether we are going to have an exploitative society or a society that cares about its resources and develops them and utilizes them for the good of people who are living now and for the good of people who will be living in the future.

So I think there is some fundamental difference between this and other programs we have been talking about as far as discounting is concerned and the care that the executive agencies and the Congress are giving it.

Chairman PROXMIRE. We might as well be as blunt and comprehensive as we can on this. The problem is, we are not just dealing with a sheer economic theory. We are dealing with some hard, tough political facts.

The people who really determine whether we go ahead with many of these projects are the members of the Senate and the House Interior Committees and the Secretary of the Interior. The President and Members of Congress have many, many other obligations and we tend to delegate to these gentlemen our decisions to a considerable extent in this area.

The Secretary of the Interior is a wonderful man, and was a brilliant Congressman who comes from Arizona, where water is very, very

important, where, in the House, he sought for many, many years for water projects in his State, almost as an element of religion.

Look at the Interior Committee of the Senate and you will see that its members come from the following States: Washington, New Mexico, Nevada, Idaho, Alaska, Utah, North Dakota, Arizona, South Dakota, Wisconsin—I am happy to see there is one member from Wisconsin—Montana, California, Colorado, Idaho again, Arizona again, Wyoming, Oregon.

Practically all Western States. It is hard to find anyone from east of the Mississippi who ever serves on the Interior Committee.

Representative MOORHEAD. I might say to the chairman, the same pattern holds in the other body.

Chairman PROXMIRE. Exactly.

So we have, you see, an atmosphere of bias, understandable bias, an atmosphere of political force here which I think we have to recognize. Under these circumstances, although I would agree with you that we have to show great concern for our water resources and perhaps take a good, hard look at how we figure benefits, nevertheless, I cannot see for the life of me how you can justify a substantially lower discount rate for water projects than you can for the defense of this country, which, as I indicated, is at 10 percent, a 10-percent return instead of a 3⅛-percent return, or for any other investment made by the Federal Government.

Mr. HOLUM. Well, Mr. Chairman, first, with respect to our legislative committee members, I hold them in high regard, and I know you do, too. I think there are members of our legislative committees, and we have more easterners on the House committee than we do have in the Senate——

Chairman PROXMIRE. Mr. Moorhead said there is a similarity and I believe that is true.

Mr. HOLUM. They come from an area that can understand—it is not a bias, but we can understand——

Chairman PROXMIRE. Well, it is a combination of understanding and bias.

Mr. HOLUM. They understand water resource development. Although my Bureau of Reclamation deals only in the West, it is not just a Western problem. The problems we are dealing with are conservation of our resources, including the programs of the Corps of Engineers. The programs we deal with in the Water Resources Council are across the board, across the country. They have to do with wild rivers, the creation of dams, the creation of national parks.

They are all involved. It is a national problem. I think it is of national concern to use these resources wisely and properly, not to exploit them, to keep a healthy economy now, but to provide for a healthy economy, too, in the future, for our heirs.

Chairman PROXMIRE. Why stop at that? Why not put it on exactly the same basis across the board? We all have a strong bias in favor of problems of our States. If I were a western Senator I would also be carrying the banner for water.

But looking at this as objectively as we can from the standpoint of the whole country, why should we not have the basic figures consistent so that we can make our decisions with our eyes open?

In other words, I am asking you not to defend the 3⅛ percent; I am asking you to defend the 4⅝ against a higher percentage which is applied by so many other agencies.

Mr. HOLUM. I think in Secretary Udall's statement—I do not know if you have had an opportunity to read it.

Chairman PROXMIRE. Yes; I read it.

Mr. HOLUM. I think the record is good. In this area, it has been the people, not just over the last 6 or 7 years, but over time, the people involved in water resource development and land conservation who have worked together to form good methods of accounting and to send these recommendations to Congress on a uniform basis.

They are moving together now to reconsider the methods of discounting and the rates to be applied. They have made a suggestion, offered it to the public for comment, and when they get the comments back, they may be——

Chairman PROXMIRE. I do not mean to be critical of you. I keep recalling a member of the House who kept putting into the Congressional Record in the appendix something about growing bananas on Pike's Peak. In other words, if you brought enough water to the most arid area in the Nation, you would obviously turn it into a paradise.

The question is, however, whether or not we ought to invest limited resources and tax the taxpayer on a basis that relies on a discounting differential which is unfair to most of our States and the overwhelming proportion of our taxpayers. We ought to go ahead with our water investments; but we ought to require them to make the kind of showing that we make for our investments in education and other areas.

Mr. HOLUM. Senator, if you are talking specifically about the reclamation program, and I would rather not because I am trying to fill in for Secretary Udall as chairman of the Water Resources Council, but I think the decisionmakers in the Congress do require, and I think it is part of the total project, that the States of the West, with the approval of the Congress, put aside the revenues from their public lands in what we call the reclamation fund. That produces close to $200 million a year.

That is in turn, under the direction of the Congress, reinvested in development of the West. These projects do meet the benefit-cost ratio and are submitted to the Congress on that basis.

Chairman PROXMIRE. I yield to Mr. Moorhead. I shall be right back.

Representative MOORHEAD. Mr. Chairman, I think you have identified the problem. We have probably inadequately analyzed and valued the benefits of the water projects. The Secretary mentioned this in his statement where he talked about the esthetic amenities, and recreaional opportunities. Recreation in the summertime is 80 percent water based. I think that we should take a hard look again at the benefit side of the equation.

Of course, it is hard to quantify these things, but this is where I think the thrust should be—greater accuracy on valuing the benefits plus greater accuracy on the discount rate. If we did properly value these benefits, we probably would end up with a program of the same water projects anyway.

But the question to either Secretary Holum or Mr. Caulfield, again—you testified that the water projects have the same discount rate, but is it not true—at least I have been so informed—that the evaluation of the benefits varies, let us say, from the Bureau of Reclamation to the Corps of Engineers? The Bureau of Reclamation would include secondary benefits, whereas the Corps of Engineers does not. Am I correctly informed there, gentlemen?

Mr. CAULFIELD. Yes, sir. Senate Document 97 authorizes the Corps of Engineers to include secondary benefits in their project analyses if a secondary benefit cost analysis is indicated. In other words, where the Bureau of Reclamation puts its projects before the Congress, it provides a benefit-cost ratio on the basis of cost of primary benefits and another one with reference to the cost of secondary benefits, so the Congress can see the separate implications of regional economic development.

Representative MOORHEAD. But the Corps of Engineers does not?

Mr. CAULFIELD. The Corps of Engineers has not chosen to do so, by and large.

Representative MOORHEAD. Do you know why?

Mr. CAULFIELD. Well, the Corps, I think they ought to speak for themselves on this. I think it is fair to say, though, that they have taken the position in the eastern part of the country that they feel that the Congress wants them to be conservative, and putting the costs on a primary benefit basis is the most conservative way of looking at water resources projects. However, in the Appalachian region of this country, the Congress has specifically told the Corps of Engineers in the development of that program to consider the benefits to unemployed resources and underemployed resources. The Corps of Engineers in the projects it now evaluates in that region is taking this type of indirect benefit which can be attributed as a national benefit, however, into account, as well as the regional impact of benefits that would be specifically beneficial to that region if the development occurred.

Representative MOORHEAD. So that whether you can go ahead with a particular water project might very well depend on whether you include the secondary benefits, and this, as far as the Corps of Engineers is concerned, would only be in the Appalachian region; is that right?

Mr. CAULFIELD. Or any area that has been designated as an underemployment area or unemployment area, like the economic development-designated areas throughout the country under the Public Works and Economic Development Act of 1965. However, it is being specifically applied by the corps these days in the Appalachian area. That is why I make specific reference to that area.

I might say the Public Works Committees, as you realize, are the committees in the House and the Senate, the legislative committees to which the Corps of Engineers makes its presentation, not the Interior Committees. The Public Works Committees of both the House and the Senate have emphasized to the corps in recent reports, I think in the Omnibus Rivers and Harbors Act, that the Corps should pursue secondary benefits in addition to primary benefits in the presentation of reports.

Representative MOORHEAD. It seems to me that the only reason for a lower discount rate is if the benefit side of the equation is understated,

as it may be in the Corps of Engineers budget, or may have been in the past.

Chairman PROXMIRE. Otherwise, you have two minuses trying to make a plus, trying to compensate for one error by another bigger error.

Mr. Hoffman, do you think it would be proper for the committee to undertake a study to measure the appropriate base interest rate to be published on an ongoing basis for guidance to all Federal agencies?

Mr. HOFFMAN. Yes, sir, I do. I think it would be a difficult thing to do. It might be comparable to the problems that were faced in developing price indexes or measures of gross national product. It would involve agreement on a conceptual basis, and then it would involve the working out of a method for estimating the actual numbers.

Chairman PROXMIRE. Should that not be done by your agency?

Mr. HOFFMAN. I would have to think about that, Senator. I think, based on the analogy with the other two measures that I mentioned that the answer might be "No." It might be better done with some other executive department as the operator.

Chairman PROXMIRE. First, it would have to be done by some executive department that has some responsibility for all of them. It would have to be done, secondly, by an executive agency that does not have an ax to grind. You would not have much in the way of investment in the Bureau of the Budget, at least not in the usual sense, so you would be qualified from the standpoint of objectivity.

Mr. HOFFMAN. Yes, sir.

I think if it were done elsewhere within the executive branch, the Bureau would certainly have to exercise some oversight.

Chairman PROXMIRE. I would appreciate it if, in correcting your remarks, if you think of it, you could come up with any alternative that you might consider in this area. This is something we want to pursue as vigorously as we can.

Mr. HOFFMAN. I shall reflect on it.

Chairman PROXMIRE. Now, Mr. Stockfisch, and also some of the other gentlemen who have testified before us disagree with you pretty vigorously—I am not sure I do. You may be right—on this risk aspect. They argue that the opportunity cost in the private sector has already taken into account the risk. Mr. Stockfisch puts it this way:

> And exactly the same thing happens from the point of view of society, because society obtains the returns from many thousands of investments and some will do better than expected, and some will do worse than expected; but on the whole, the risk incurred by any one individual project is no more pertinent to the overall returns expected by society than the risks incurred by one particular policyholder are pertinent to the overall returns of the insurance company.
>
> For that reason, what is relevant, it seems to me, and I think it seems so to a number of other economists that have some reputation, what is relevant is the average rate of return obtained by industry from those resources with no special account taken of the individual risk of the investors in that particular company. The investors in that particular company may end up losing money on that investment.
>
> But on balance, society will lose on some and gain on others, and come out on the average.

Mr. HOFFMAN. That is a position which has been urged by other economists as well as Mr. Stockfisch. However, I think in order to maintain that the rate of return has averaged out risk, it would be necessary to explain differences, for example, in the rate of return on

equity stocks, and those on corporate bonds for the same corporations. It would be very difficult to explain different relationships between earnings or price or rate of return among the different classes of investment without some recourse to the notion that they reflect different evaluations of risk.

Chairman PROXMIRE. I am not sure about that. You take a look at the price-earnings ratio, not just the relationship between price and dividends, which is another factor explaining the difference other than risk. The price-earnings ratio on the New York Stock Exchange now, even though we have had a couple of bad days on the stock exchange, I think you would find that there is not much difference between that and the yield on Government bonds right now.

What has happened is that the stockholder, of course, makes an investment, will get a return substantially below the return on book value. In other words, in the actual amount of money invested in the corporation, which would have a return before taxes of maybe 12 or 13 percent, and after taxes, 6 or 6.5 percent. The stockholder is paying more than that, because by and large, the stocks are valued at above book value.

Mr. HOFFMAN. Yes, sir. At any one time the relationships are influenced by a number of factors.

Chairman PROXMIRE. This has been the situation for several years.

Mr. HOFFMAN. It has not always been the situation, though, and it seems to me that we have moved into an era where we have certain expectations about rate of growth and inflation and so on that might compensate for current price-earnings ratios that are low relative to the yields or less risky debt security. But it seems to me that to explain the divergences which have occurred in the past one would have to have recourse to some notion of differential risk.

Chairman PROXMIRE. Well, it is hard for me to grasp why the argument that Mr. Stockfisch makes, that the average rate of return, allowing for the ones who lose everything, comes out to around 12 percent, why that would not be the appropriate opportunity cost. I can see this other argument you make on displacement of resources. That is something else.

Mr. HOFFMAN. Mr. Stockfisch's argument, I think, is relevant if you consider the investment in an individual corporation from society's point of view as being analogous to investment in one among many items in the portfolio of a mutual fund. The growth of diversified companies has been a movement, of course, toward precisely this kind of phenomenon from the point of view of even individual investors.

But it is by no means universally true that risks are averaged out among industries or regions even from society's point of view. In fact, the coal mining industry as a whole has experienced one outcome of a risky situation. You have different situations in different industries. You might also have one situation for a firm in one area, and another for a firm in another area.

Chairman PROXMIRE. This is very true, but the coal mining industry is a good example. The coal mining industry, as you say, has deteriorated. Many companies have had to go out of business.

The railroad is another example of an industry where the return is very low and some have consolidated or gone out of business.

In the other areas, however—you have electronics, for instance, many areas of research industries that are booming. And television;

I understand, television companies that are on the air have a rate of return before taxes at around 40 percent—tremendous.

The average, though, works out to be around 12 percent. The point is that when you take money out of the economy that is returning 12 percent and invest it in a Government activity that is earning 3 percent, you would seem to have an action that would reduce your rate of growth and reduce it sharply and result in a malinvestment of funds.

I hasten to add right away for those who say, if you argue like that, you are not going to have any education, the areas of Government that have the greatest return, as I see it, are the human resource areas—education, the poverty program have excellent returns.

Mr. HOFFMAN. I would agree that one of the reasons we regard these programs as among our most urgent programs is precisely because they do have such high economic and social returns.

But to return to your point, it seems to me that there are two distinct questions. One is whether it is possible to consider the average rate of return over productive investment as a meaningful figure. I would say it has meaning. To the extent that funds are drawn out of the private investment, it does reflect the opportunity cost of those funds. And I am not arguing for ignoring risk in connection with Government programs; I am simply saying that the return averaged over investment projects as a whole does reflect some evaluation of risk; that there are kinds of risks that are not averaged out, even from an overall social point of view, and that the risk element either has to be included in the rate of return used by Government or handled explicitly in the costs and benefits.

I would argue for the latter course.

Now, there is another point, too. Not all funds withdrawn by Government come from investment in private industrial capital. So there is the question of the relevant rate of return on funds which, in effect are drawn out of consumption.

Chairman PROXMIRE. Certainly when you have a situation such as we have at the present time, where we are trying hard, or at least many people are trying hard, to put the brakes on the economy, to slow down inflation, to keep it from becoming too expansive and we pass a tax increase to do that, certainly at a time like this it would seem unwise for us to invest money in the Government sector which yields so much less than it does in the private sector.

At a time when you have idle resources, when, as you say, you are not displacing your manpower or your other resources, then I can see a strong argument for going ahead on the basis of recognizing still what your opportunity costs are and what your discounting is, but going ahead anyway, because you want to use idle resources.

Mr. HOFFMAN. Yes, sir; I would agree with that entirely. I personally believe that an opportunity cost approach is the right approach to take. I think the question is how to go about estimating the relevant opportunity cost—for example, I think one would have to take into account the fact that funds are drawn from consumption as well as investment in estimating the rate—and then how to handle risk as a component of the rate of return.

Chairman PROXMIRE. I argue with your risk concept, but anyway, how would the Bureau of the Budget proceed in telling you to make explicit allowance for risk and uncertainty? For example, take a water

project. Would you make allowance for the notion that we might make a breakthrough in the saline area so we might be able to get some sea water that might possibly make water projects unnecessary or obsolete?

Mr. HOFFMAN. Yes, sir; I think that would be an entirely relevant observation. When you move to that kind of consideration, you are moving from risk to what economists would call uncertainty. The difference is that in a situation of risk you are able to estimate the odds, in a situation of uncertainty, you are not. We do feel—at least, I feel, and I think it would be generally accepted—that investment in a water resource project would be risky by virtue of the possibility of technological obsolence; that is to say, the benefits that you calculated as flowing from that project might not accrue; because there might turn out to be a cheaper way to do it.

I would think that, at the very least, that where such possibilities can be identified their effects on benefits ought to be calculated. If it is possible to estimate the probability that technological obsolescence will occur, you can estimate an average value. Where you cannot make such an estimate you can simply look at the two streams of benefits and say: This is how it will turn out if we do not get the breakthrough; this is how it will turn out if we do. You must then call upon the judgment of the decisionmaker to evaluate those two streams of benefits, discounted to present values.

Chairman PROXMIRE. How would you arrive at the discount rate, again, for the riskless and those that have a risk? Would you have more than one level of risk?

Mr. HOFFMAN. Well, the notion of a two-part approach is really, as I tried to indicate, a pragmatic notion. It is a way of getting started. In some areas, we can identify Government activities with particular parts of the private sector. In those areas, I would say we ought to rely on the judgment of the private sector as to risk. The private sector does give us measure of risk in those cases. It is in the areas where public activities have no direct analog that I would argue that we want to handle risk explicitly outside the discount rate, and then we should start from an estimate of a riskless rate of return.

Chairman PROXMIRE. If you do that, then you would have to correct the discount rate now being used by the Defense Department for shipyards and many other things of this kind, and you would have a situation where you would either have to spend more money or not fund projects which show a positive benefit-cost ratio.

Mr. HOFFMAN. Now, in those cases, Senator, it seems to me that the relevant question is not whether to go ahead with a project or not, but how best to do it; that is to say, the calculation in the case of Defense would be, what is the best way to provide the right kinds and mixture of ships? Should you do it by buying new ships, should you modify old ships, and so on.

Chairman PROXMIRE. Maybe in part, but is it not possible at all to consider it a kind of cost-agency comparison? In other words, if you find a good rate of return on shipbuilding, go ahead with it, where you do not on a water project that would show a comparable rate of return?

Mr. HOFFMAN. No, sir; I would have a great——

Chairman PROXMIRE. Or are we comparing apples and oranges?

Mr. HOFFMAN. I am afraid you are in the case of Defense and Water Resources.

Chairman PROXMIRE. Well, those are bad examples. I think there are some instances, though, where you have limited funds and you have to decide that you have to go ahead with a good poverty program, for example, or a somewhat less good public works program.

Mr. HOFFMAN. Yes, I think in some areas——

Chairman PROXMIRE. And your rate of return would help you make that judgment. It is not just a matter of intuition or political preference, it is a matter of being guided to some extent, at least, by what the facts show you on the kind of return you will get.

Mr. HOFFMAN. I agree completely, Senator Proxmire. I think that an analysis should be pushed as far as it can legitimately carry us, and we ought to benefit from analysis as far as we possibly can, and I would try to make as many cross-program comparisons as I legitimately could, using cost-benefit analysis. I would argue, however, that very early we run into difficulties that have to be expressed as footnotes to the calculations, at least, and possibly as more.

Chairman PROXMIRE. I have just one other question for you, then I have a couple of questions for Mr. Caulfield.

Mr. Hoffman, you state the need to measure on a continuing basis accurately the rate implied by the correct conceptual basis. What agency should, in your judgment, undertake the study? Would it be a helpful guide if the base rate could be computed on an ongoing basis for the guidance of our agencies?

Mr. HOFFMAN. If I might, I would like to reflect further on that question before I provide an answer.

Chairman PROXMIRE. Very good.

(The following was subsequently received from Mr. Hoffman:)

As I have indicated in response to an earlier question, efforts to improve the application of discounting to public investment decisions must first achieve a common understanding and agreement on the conceptual basis for discounting, and second, reach agreement on a method or methods for calculating the discount rates to be used. Finally, after completing the first two stages, the assignment of responsibility for preparing current estimates of the rates will have to be considered.

The Bureau of the Budget proposes to continue and intensify its review of alternative conceptual bases and methodologies for determining discount rates. I believe the Joint Economic Committee can also continue to play a useful role in this activity. The Bureau of the Budget will be happy to work with the committee on this. The committee's hearing record has clearly demonstrated that there exists a variety of informed views on the conceptual basis for discounting and the methods of calculating appropriate rates. The Bureau of the Budget in its review of alternatives will seek the views of experts from the Federal Government, private industry, labor, and the academic community.

Our objective, of course, is to improve and better coordinate discounting techniques used for evaluating the benefits and costs of public investment in the Federal Government. The task is made more difficult by the fact that any general guidelines will have to take into account the legislative history and special characteristics of the various Federal programs. Until agreement has been reached on concepts and methods, permitting judgment of the nature and magnitude of the task of providing current estimates of the discount rate or rates, I believe it would be premature to attempt to assign responsibility for this task.

Chairman PROXMIRE. Now, Mr. Caulfield, while you state the new basis for calculating the rate of interest, you do not state the economic

concept upon which this rate is premised. Is it the concept of opportunity cost in the private sector? Do you agree with Mr. Hoffman's conclusions on the rate concept?

Mr. CAULFIELD. The Water Resources Council, in developing this proposal, did not adopt any particular theory of the rate of return. Instead, it was reflecting what it believed to be the intent of the President, the intent of the President's words in the budget message, which did not in itself reflect a particular theory, either social time preference or opportunity cost concept, of the proper discount rate.

Chairman PROXMIRE. If you follow the current cost theory, obviously it would have to be higher than 4⅝, would it not?

Mr. CAULFIELD. No, not necessarily, in terms of the testimony that you had from Professor Baumol and in connection with the testimony you had from Mr. Hoffman, the point was made that it would be at least the yield rate.

Chairman PROXMIRE. Professor Baumol indicated that it was not his preference, but you could not find any lower rate than that.

Mr. CAULFIELD. You are right, pardon me. He said he thought no economists would be in favor of using less than the yield rate. This is the yield rate, in my judgment, corrected for inflation.

Chairman PROXMIRE. Corrected for inflation?

Mr. CAULFIELD. Yes. Since 1966, there has been a substantial expectation of inflation.

Chairman PROXMIRE. Would there be inflation in one area and not in others?

Mr. CAULFIELD. We have used benefit-cost analysis in terms of constant prices. Therefore, we need a discount rate that does not excessively reflect expectations of inflation, such as the interest rates that have been occurring in the last year or so. As evidence, for example, sir, is the fact that 4 weeks ago, the yield rate was about 5½ percent and now it is just possibly a shade over 5 percent, since the tax bill became law.

Chairman PROXMIRE. Well, on the assumption that your costs do take into account inflation, I can certainly speak on that. Congress estimated it would cost $65 million to build the new House Office Building and it cost them $160 million. They estimated $20 million for this building and it cost $26 million. They are always underestimating the costs by an enormous margin.

It seems very unusual to assume that they have corrected for inflation in their estimate of costs.

Mr. CAULFIELD. The point is, they have not corrected for inflation. They have used the prices at the time of the estimate. Those estimates proved wrong because there was inflation between the time when they made the estimates and subsequently. There may also have been mistakes in the estimate.

Chairman PROXMIRE. I understood you to say that the reason for this 4⅝ instead of perhaps a higher rate is because inflationary factors were eliminated in its application to water projects. Am I wrong?

Mr. CAULFIELD. Pardon me. I shall go back now. One could have taken the view, for example, in June, as my testimony indicated, one could have said that the discount rate for 1969 should be based on the average of June prices. That would have turned out at 5.5 percent. We found this not to be appropriate, because, in our judgment, 5.5 percent

included a substantial expectation on the part of the public of inflation, and that expectation was reflected in the yields on bonds.

In consequence, we took a figure of 4⅝ percent, which was the average, based on the average of daily bid prices in 1966. This happens to be the period just before the substantial rise in the Federal bond market.

Now, we have not taken any fixed figure of 4⅝, sir. What we have taken is a figure starting with 4⅝ which can change up or down not more than one-fourth point per year. Thus, it will reflect, we trust—this is the proposal and comments can be made upon it—it will reflect the trend, the deflated trend, hopefully the deflated discount rate or the yield rate on Government bonds, staying within that limitation.

Chairman PROXMIRE. For the record, why do you put the yield rate instead of the coupon rate?

Mr. CAULFIELD. For the very reason that has been expressed many times before this committee: the coupon rate is the rate that in terms of the present bond issues of the Treasury reflects the 2 percent yields in 1940, and the control on interest rates during the war, and thus, it has not moved up very rapidly.

Ten years ago or so, there was only a 1-percent spread between the coupon rate and the yield rate. Today there is an over 2 percent spread between the coupon rate and the yield rate. The yield rate more accurately reflects——

Chairman PROXMIRE. The current rate of interest is reflected more accurately in the coupon rate at the present time?

Is that right or wrong?

Mr. CAULFIELD. It is wrong. The current cost of money is reflected in the——

Chairman PROXMIRE. You are talking about the yield on current issues rather than the overall yield of the whole Government——

Mr. CAULFIELD. I am talking about the yield on bonds that were issued maybe 15 years ago as indicating the yield that is published in the papers every morning on Government bonds relating to their price.

Chairman PROXMIRE. Then you are talking about the yield for an investor that goes right out and buys a bond. He would expect——

Mr. CAULFIELD. Yes, it reflects the current market value of those bonds.

Chairman PROXMIRE. Then I have to go back to these other questions. The discount rate to be given in any year to be based on the average yield for the preceding fiscal year. Why is the 4⅝ rate based on 1966 instead of 1967?

Mr. CAULFIELD. Because this is part of our effort to start with a figure that did not reflect, we trust, inflationary expectations on the part of the people in the bond market. Since for the last year or so, there have been, as you know, expectations of inflation in this country, the tax bill is aimed at curbing those expectations of inflation. Right after the tax bill was passed, the yield has gone down almost half a point.

Chairman PROXMIRE. Gentlemen, once again, thank you very much. This has been most entertaining, as well as enlightening for me.

I very much appreciate it. You have done a fine job. I think we are making progress in this area.

I did not mean to be too critical of you gentlemen from the Interior Department. I think that your decision to increase the rate to 4⅝ percent is statesmanlike and sensible, and certainly can be justified on any kind of an economic basis.

I question whether it is enough, but it is an excellent beginning.

I am delighted to see the Bureau of the Budget is so concerned about this and is working as you have demonstrated, Mr. Hoffman, in the direction of a more consistent rate for all the agencies. I think that once we get this, we can begin to establish some priority. Then, when we increase or decrease spending, we can do it on the basis of much more reason than we have in the past.

You are so right, Mr. Hoffman, in the argument that this cannot be the basis for a definitive decision; all it is is a guideline. But it can be an enormously helpful guideline, believe me, in congressional debate and in finally getting a result that enables us to grow as much as our resources will permit.

Thank you, gentlemen, very much. The subcommittee will reconvene at 10 a.m. tomorrow morning in the public hearing room of the Atomic Energy Committee, room S–407.

(Whereupon, at 12:40 p.m., the Subcommittee on Economy in Government recessed, to reconvene at 10 a.m., Wednesday, July 31, 1968.)

ECONOMIC ANALYSIS OF PUBLIC INVESTMENT DECISIONS: INTEREST RATE POLICY AND DISCOUNTING ANALYSIS

WEDNESDAY, JULY 31, 1968

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ECONOMY IN GOVERNMENT
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10 a.m., in room S–407, the Capitol, Hon. William Proxmire (chairman of the subcommittee) presiding.

Present: Chairman Proxmire.

Also present: John R. Stark, executive director, Robert H. Haveman, economist; and Douglas C. Frechtling, minority economist.

Chairman PROXMIRE. The subcommittee will come to order. Gentlemen, other members might possibly be here later, but as you know, this is convention time in Miami for the minority and it is also a time when we in the Congress are trying to get as much done as possible before we recess. Consequently, other members of the committee are very much involved in other necessary activities this morning which may conflict and make it difficult for them to attend.

Today is the second in the current series of hearings on the question of consistent interest rate and discounting procedures in the analysis of public expenditures. As we were again made aware yesterday, this problem is an important one in the context of the new planning-programing-budgeting system which has been instituted in all Federal agencies. Indeed, in this time of congressional budget-cutting, it is only with the guidance of competent economic analysis that Congress can rationally choose among alternatives rather than apply the wasteful meat-ax approach to the budget.

In our session yesterday, the statements by Secretary of the Interior Udall, Chairman of the Water Resources Council, and Henry Caulfield, the Executive Director of the Council, explained the new proposed regulation for improved interest rate policy in the water resources area. In addition, Mr. Fred Hoffman, Assistant Director of the Bureau of the Budget, presented us with a thoughtful analysis of the conceptual basis for consistent interest rate policy. In addition, he proposed a procedure for consistent expenditure evaluation among the various agencies.

Today, we will hear the testimony of two prominent academic economists on the interest rate question. They are Dr. Otto Eckstein of Harvard University, a former member of the Joint Economic Committee staff and the Council of Economic Advisers, and Dr. Arnold

Harberger, of the University of Chicago. Both of these gentlemen are prominent in the area of public expenditure economics and should contribute substantially to our understanding of this matter.

Tomorrow, we will hear the testimony of representatives of three Federal agencies on the status of interest rate and discounting procedures in their agencies.

Dr. Eckstein, we will be happy to have you go ahead.

STATEMENT OF OTTO ECKSTEIN, PROFESSOR OF ECONOMICS, HARVARD UNIVERSITY

Mr. ECKSTEIN. Thank you, Mr. Chairman. It is always a pleasure to me to work with the Joint Economic Committee and to continue my long association.

INTEREST RATE POLICY FOR THE EVALUATION OF FEDERAL PROGRAMS

These hearings of the Subcommittee on Economy in Government of the Joint Economic Committee are a milestone in Federal expenditure policy. Government investment in physical and human capital has increased enormously in the last 30 years, and the crisis in our cities makes a dramatic further growth of public investment very likely. If these investments are to be productive in accomplishing our national purposes they must be well planned, employing sensible economic principles and meaningful tests of performance.

Although it appears to be an abstract and highly technical matter, the choice of interest rate in planning is fundamental and important. The history of many economies, including our own, is replete with capital projects based on faulty interest rates, with disastrous results and enormous waste. Perhaps the most extreme example was the attempt by the Soviet Union to plan an industrialization process without the use of any interest rate—an absurd undertaking saved only by the ingenuity of technicians in introducing interest-like criteria under other names. Under Joseph Stalin the use of zero interest rates helped produce the worst of gigantism. Projects of enormous scale and capital intensity were started in the various regions of the Soviet Union. Because of their size and capital intensity, years went by with little payoff from these slowly progressing monuments. Even after their completion their returns were often modest. After Stalin's death, as the aspirations of the Russian people have begun to make themselves felt, his successors have sought a higher degree of rationality in economic calculations, and among other things have encouraged more systematic testing of capital investments in terms of their rate of return. Even for large investments a rate as high as 10 percent is prescribed today, and for less capital intensive projects the rates are higher.

Another interesting example can be found in the United Kingdom. Its premature investment in atomic energy for electric power reportedly can partly be blamed on the Government's use of a low interest rate in planning at a time in the early 1950's when capital was scarce.

In the United States the larger part of physical investment has been in private hands. While the actual capital market bears no more than a family resemblance to the perfect allocating mechanism of economic theory, it still provides a vital discipline to investment decisions to avoid the very grossest errors.

But in the public sector, interest rate policy perhaps has been just as remote from economic rationality as in the Soviet Union. In many fields of investment there is no use of interest rates at all. In the water resource areas the interest rates have been about 3 percent, leading to the usual results: excessive scale of development, excessive capital intensity, in other words, waste of the Nation's capital.

So long as Federal investment was no more than a few billion dollars a year, the waste that resulted from a 3-percent interest policy was a luxury that we could afford. But the magnitudes of the tasks before us have increased, and we expect more from economic policy than we used to do. As we attempt to bring economic rationality into the public sector generally, interest rate policy must be thoroughly reexamined. My testimony today will attempt to contribute to the discussion which will lead to the foundation of a sound and comprehensive interest rate policy for Federal investment programs.

I. THE ROLE OF THE INTEREST RATE IN A MARKET ECONOMY

Interest rates serve four essential functions in the market economy:

(1) *The price for liquidity.*—The interest rates in the short-term money market are paid for the use of money for a brief period, usually less than a year. The variations of short-term interest rates are mainly determined by the interplay of swings in the financial needs of business and the Federal Government and the policy of the Federal Reserve System. These interest rates are not pertinent to the planning of long-lived public investments.

(2) *The price and cost of long-term capital.*—Long-term interest rates are the price for borrowing long-term capital. As such, they serve to allocate that share of the Nation's savings which becomes available for long-term investment. They funnel savings into those uses in which they promise to yield a return greater than the interest rate. They also serve to keep capital out of uses which do not hold the promise of yielding the market rate of interest.

(3) *Interest rate as a means of valuation of income and consumption at different points in time.*—Households can choose to consume their lifetime income in various time profiles by saving or borrowing. Typically, households borrow in their early years while acquiring a home and raising children, pass through a savings phase preparatory to retirement, and draw down their savings thereafter. The prices confronting households in these choices are the interest rate at which they can borrow, such as the interest rate on home mortgages, on installment credit or personal loans, and the rates at which they can lend, such as the interest rates on savings accounts, Government bonds and the return on common stocks.

(4) *Interest rates as a way of compensating for the return for taking risks.*—Interest rates differ according to the riskiness of the loan or investment. The highly diverse structure of actual interest rates found in the economy is partly due to differences in risk as viewed by investors.

II. IMPERFECTIONS IN CAPITAL MARKETS

In a perfectly competitive, and perfectly functioning market economy, there would be only one interest rate for all risk-free loans of any given maturity. This interest rate would be faced by both the

borrowers and the lenders. In this way, there would be assurance that the return on marginal investments of businesses exactly equals the rewards for marginal savings made by households. The optimal total amount of saving and investment would be determined through free choice in this process, and, leaving errors aside, the optimal combination of investment projects in the economy would be undertaken.

Economists differ in their assessment of the degree of correspondence between this ideal picture and the actual market economy as we know it. My judgment is rather far out on the spectrum of imperfections: as I have stated earlier, I assume "The capital market to be imperfect, to be rife with rationing, ignorance, differential tax treatments, reluctance to finance investment from external funds, slow adjustment processes, et cetera, which destroy the normative significance of actual rates found in the market." These imperfections, once acknowledged, give rise to two further concepts for interest rates which have received much attention in the academic discussions of interest rates for evaluating public investments.

(5) *The social rate of time preference.*—With no single market rate embodying marginal returns and marginal household preferences perfectly, and with the total savings of the economy not necessarily optimal, a new basis must be found for deriving a socially optimal interest rate. This problem is of particular significance in countries where investment is heavily government-determined, but it is of pertinence even in the United States.

Theorists have devoted considerable effort to the derivation of an optimal rate of social time preference, some would say an excessive rate. The rates have been derived from theoretical models of economic growth and postulated functions for the marginal utility of consumption over time. It is usually inferred from this literature that the rate of social time preference is low; that is, that the planner's interest rate should be low, giving full weight to the welfare of future generations and overriding the myopic desires of present individuals.

(6) A second concept which arises from the imperfections of the capital market is *the opportunity cost of public capital:* In the absence of a perfect capital market no one single actual interest rate can be used as a test to assure that the return of a public project will exceed the return of whatever other investment—or consumption—is forgone in its stead. It therefore becomes necessary to identify, on the most realistic analysis possible, what actual other investments—or consumption—are forgone, and what their return would have been.

In examining these forgone opportunities, and then identifying the opportunity costs, one must ask these questions:

(a) Where would the resources have been used in the absence of the particular public investment—in the public sector or in the private sector?

(b) If the resources are drawn from the public sector, that is, if the particular public investment is at the expense of other public expenditures within a fixed budget, what return would have been earned?

(c) If the resources are drawn from the private sector, are they obtained through taxation or through additional Government borrowing? If general fiscal policy considerations require that the additional resources be obtained through taxation, one must postulate a specific set of tax changes in order to identify what private expendi-

tures are forgone, and one must then measure the returns in those alternative uses. If general fiscal policy permits the public investment to be financed by public borrowing, one must trace what private investments are forgone because of this particular Government claim in the capital market.

(d) Does the public investment preempt a private opportunity at the physical site, or in the same product market, or in utilizing a scarce natural resource? If there is preemption of private investment, an additional test must be performed to assure that the public investment is superior to the preempted private opportunity.

Let me add that I would not include the possibility of preemption of private opportunities in deriving the interest rate itself. It is really a side test that must be performed on a project-by-project basis.

Let me examine quickly what I think is a theoretically correct solution in an imperfect economy and then evaluate if practically it is a solution.

III. A THEORETICALLY CORRECT SOLUTION IN AN IMPERFECT MARKET ECONOMY

A theoretically correct solution to the problem of the choice of interest rate for public investment planning in an imperfect market economy is as follows:

(1) Identify the actual opportunities that are forgone and measure the flow of returns that would have been earned in the alternative use;

(2) Apply the social rate of time preference to derive the present value of the returns forgone in the alternative use;

(3) Undertake only those public investments which yield more present value per dollar of expenditure than the forgone alternatives.[1]

This formulation, which I sketched in my book, "Water Resource Development," translates into U.S. Government practice as follows:

(1) Apply the social time preference rate of interest in the valuation of projects; but

(2) Compute the benefit-cost ratio of the forgone opportunities in the private or public sector. If the interest rate is very low, if we assume the social time preference to be very low, the benefit-cost ratio of the forgone opportunities will be very high.

(3) Undertake those public projects which have a benefit-cost ratio greater than the benefit-cost ratio of the forgone opportunities. With an interest rate of 3 percent, they would nowadays come to a benefit-cost ratio on the order of 2.

While this formulation is correct within the particular theoretical model, and I had high hopes for it 10 years ago, there are serious difficulties in applying the method. It is my present judgment that a more workable approach must be developed. The faults are these:

(1) There is no generally agreed upon empirical basis for deriving the rate of social time preference. One can make plausible arguments in favor of high or low rates. When individuals have a chance to express their preferences about present versus future consumption they

[1] This formulation does not deal with the optimal time schedule of public investments, the physical or economic interdependence of projects, adjustments for risk, or the intricate question of the symmetrical treatment of taxation.

value the present highly. The willingness of households to borrow at interest rates in excess of 10 percent is a strong kind of evidence. I doubt that a rate of social time preference is defensible in a democratic society which is dramatically different from the interest rates revealed to be preferred by consumer saving and borrowing actions.

The theoretical argument has been advanced that the people may choose to redistribute income to future generations collectively—reflecting low social time preference—while expressing high time preference in their private actions. In other words that what they choose to do together, knowing that all will do it together through the tax system, they may choose to be more farsighted than they will in their individual family planning. While not refutable by logic, it is a fragile position. There is no evidence that it is true that people have such collective preferences; governments in underdeveloped countries have been known to misjudge the wishes of their people in taking this point of view, planning on a very capital intensive basis with low interest and then finding great local objection to the fact that the projects do not pay off.

(2) Even if one accepts the argument of collective desire to redistribute income to the future—that is, even if one grants the theoretical argument in total, it is still very dubious that public investments are the most desirable method of accomplishing this goal. A higher rate of taxation reducing the Government deficit, lowering interest rates and permitting a higher rate of capital accumulation, whether private or public, is a far more direct and efficient method of making provision for the future than to provide a privileged access to cheap capital for a few kinds of economic activities which have no extraordinary growth potential.

IV. SOME PRAGMATIC CONSIDERATIONS

Before deriving a sound criterion for Federal public investments, that is, before we finally come to the hard issue of what is the right rate, if there is such a thing, let me set down a few postulates that will underlie my conclusions.

1. *The rate of return on capital in the United States is high.* We are able to keep the economy prosperous through fiscal and monetary management of aggregate demand; fluctuations around our natural growth trend are becoming smaller. If you compare the 1950's with the 1960's, the variations are smaller; if you compare prewar with postwar, the fluctuations are smaller. The rate of advance of technology remains very great; the computer—probably the greatest innovation since the introduction of the automobile 50 years ago—assures further rapid technological progress.

The recorded rates of return on capital are high in most major sectors of the economy. The only exception I can think of are railroads. The market rates of interest, which reflect long run forces of supply and demand for capital, are high and will probably remain so. As the Vietnam war draws to a close and is, at last, financed through higher taxes, the interest rates will diminish somewhat. But it is very unlikely that interest rates will fall to the plateau that prevailed in the early 1960's, when unemployment was 5½ percent for 5 years and prices were stable, when the rate of investment was low and the Government deficits small.

2. *That the demands on public budgets will remain great so that the competition for budget money will remain stiff.* This means that the opportunity cost in the public sector will be high. Whatever criterion is used, it must reflect the overall Federal budget position, including the needs for large public investment in human resources, the considerable outlays for military purposes, and the needs for social overhead investments in a rapidly advancing economy.

3. Third, as a fundamental postulate, *the high productivity of capital must be reflected in the interest rate used for planning and evaluating public investments.* The two-step procedure discussed above, that of using high social time preference rates and revaluing opportunity costs at a social time preference rate, does not appear to be workable for our government. The logic that a low interest rate must be coupled with cutoff benefit-cost ratios on the order of 2 is too obscure for Government and general public discussion. The first part of the method, that low interest rates can be justified on social grounds, is attractive. But the pressures on agencies and their desire to promote their programs are such that they will never accept the second part of the method, that investment programs only be accepted if benefits exceed costs by a factor of 2.

If the two-stage procedure is not workable, the interest rate itself must reflect the high opportunity costs of capital in the private and in the public sector.

The operational question then becomes: What should that interest rate be?

V. WHAT INTEREST RATE FOR PUBLIC INVESTMENTS?

Given these postulates, the social time preference approach is ruled out. With it is also ruled out any logic which would produce interest rates as low as 3 percent which are still applied in some Federal programs. There are no observable interest rates anywhere in the economy as low as this: Capital yields substantially more in all sectors, and households make their saving-borrowing choices also at much higher rates. This is not to argue that the social time preference consideration be eliminated completely in the derivation of the final rate, but the weight given to it must be very limited if resources are not to be grossly wasted.

The Government borrowing rate? This concept has some things to recommend it if it is used properly, but it cannot survive full theoretical scrutiny. On the one hand, it is the interest rate at which the Government, as an enterprise, is able to obtain capital by borrowing. It also is a measure of the pure, risk-free, long-term interest rate in the market. On the other hand, the rate is not appropriate because, in actual practice, public investment projects are not financed by borrowing but by taxation. The opportunity costs in the private or public sectors are likely to exceed the long-term Government borrowing rate.

Nonetheless, if the Government borrowing rate were applied correctly, it would yield a better answer than current practice. The trouble has been that the actual Federal interpretation, as spelled out for example in Senate Document 97, has been very different from a "businesslike" enterprise borrowing cost.

Senate Document 97 bases the rate on the average rate payable on outstanding U.S. securities having maturities of 15 years or more. Because of the 4¼ percent interest ceiling, the Treasury has been unable to issue any securities of longer maturity since April 18, 1963, and has issued no 10-year bonds, which is less than the 15 years postulated, since May 15, 1964. It has issued notes of medium term in recent years, most recently a 7-year issue on May 15, 1968, paying 6 percent. This issue is currently yielding 5.54 percent. In response to the improvement in the bond market after the tax rise, long-term Treasuries are yielding 5.1 percent, a yield made possible only by the complete lack of new issues, and the capital gains component in their yield. If the Treasury were to issue new 15-year debt today, assuming that the interest ceiling is eliminated, it would have to pay at least 5½ percent.

The Government bond rate is a measure of pure interest, before allowance for risk. If it is to be the basis for policy, a risk premium must be added, either in the interest rate or elsewhere in the criterion.

The Opportunity Cost of Public Investment

Let me turn now to what I think is the correct method. To estimate opportunity cost of public capital obtained by taxation is an intricate, but feasible piece of analysis. In an earlier book, "Multiple Purpose River Development," with J. V. Krutilla, I presented such a study and obtained estimates of 5½ to 5¾ percent under the conditions prevailing in 1955. I have not attempted to redo that exercise. The interest rate structure has moved up 2½ percent since then—that is, most long rates have moved up by that amount, suggesting that the opportunity cost today is approximately 8 percent. I append the earlier study for the record, if the committee wishes, to indicate the method in detail.

VI. CONCLUSION AND RECOMMENDATION

The borrowing cost for long-term capital for the Federal Government is 5½ percent—if the Government could borrow long term. The opportunity cost for tax-raised capital is about 8 percent. What, then, should be the interest rate for Federal investment planning?

In my judgment, both rates are of some pertinence, but the heavier weight should be placed on the opportunity cost estimate based on tax financing. The Government borrowing rate can be interpreted as the lower limit of the opportunity cost of borrowed capital, which is a part—albeit a small part—of Federal financing. Under contemporary circumstance, and subject to more detailed reestimation of opportunity cost, under today's interest rate conditions, an interest rate of about 7 to 7½ percent is a proper rate for Federal planning to assure economic use of the Nation's capital.

My testimony has not dealt with the estimation of benefits or the selection of goals. I do not believe that all investments should pass a narrow test of economic efficiency. Programs of human investment and of urban reconstruction have important social and redistributive goals which justify some sacrifice of economic efficiency.

But nothing is gained by confusing sensible economic planning through an unrealistic interest rate policy. Let us quantify our social goals and allocate our scarce resources so they will yield a maximum social return.

I thank you, Mr. Chairman.

(See p. 82 for ch. IV of the book by Dr. Eckstein and John V. Krutilla, referred to in preceding statement.)

Chairman PROXMIRE. Thank you, Professor Eckstein.

Professor Harberger, you may proceed.

STATEMENT OF ARNOLD C. HARBERGER, PROFESSOR OF ECONOMICS, UNIVERSITY OF CHICAGO

Mr. HARBERGER. Mr. Chairman, I am honored by the opportunity to participate in these important hearings and I share the concern of this subcommittee with the problem of improving the productivity with which public capital investment decisions are made.

I am also pleased to share this table with Professor Eckstein and I applaud his excellent statement. While we have some divergences of opinion which will undoubtedly come out in the course of the morning, we share the final conclusion that the relevant discount rate for project evaluation should be much higher than it is in order to avoid serious waste of public funds in investments of low yield.

ON THE OPPORTUNITY COST OF PUBLIC BORROWING

I begin these general comments with a discussion of the approach to the discount rate to be used to evaluate public investments suggested by the Comptroller General of the United States in his report to this committee, dated January 29, 1968, and of the methodology outlined in appendix III of that report. The key feature in which that concept and methodology differ from those of Senate Document 97 is that the Comptroller General's report advocates that the cost of Government borrowing should include, in addition to the interest actually paid by the Government, an adjustment factor to take into account the taxes that the Government loses on the income that would have taken place had the Government decided to borrow less—for example, as a consequence of not undertaking a particular investment project.

There can be no doubt that an adjustment of the type suggested by the Comptroller General is required if the total social costs imposed as a result of additional Government borrowing are to be accounted for. Whenever the economy is operating at levels close to capacity, the resources raised by the Government have to be diverted from alternative uses; and the benefits which those resources would produce in those alternative uses are foregone as a consequence. These benefits clearly include the taxes that would be paid on the income from private investments that are displaced by Government borrowing.

However, the Comptroller General's report errs in concentrating on the "cost to the Treasury" of incremental borrowings rather than focusing more broadly on the "costs to the economy" of such borrowing. This leads to the neglect of the State and local taxes that would have been paid on private investments displaced by Federal borrowing—a point which I shall treat at some length below.

The report also is inconsistent in its application of the incorrect principle which it espouses. If one were to attempt to measure the "cost to the Treasury" of incremental Government borrowing, surely account should be taken of the effect of such borrowing in the yields

of Federal indirect as well as direct taxation, but in point of fact indirect-tax effects are totally neglected in the report.

Moreover, a correct measurement of the "cost to the Treasury" of added Government borrowing would include the effect on tax yields of such increases in interest rates and profit rates as might ensue as a consequence of such borrowing. The Comptroller General's report does not take these into account and hence deviates from its stated objective of measuring the "cost to the Treasury." The error in this case was in a sense a happy one, however, for while the effect on tax yields of induced increases in interest and profit rates operates to reduce the "cost to the Treasury" of Government borrowing, it has no such effect on the "cost to the economy." As will be shown below, the tax gains to the Government arising from changes in interest and profit rates induced by incremental borrowing reflect corresponding losses to the private sector. Thus the Comptroller General's report was right in neglecting such gains, from an overall "cost to the economy" point of view, but the report fails to recognize that in so doing it deviates from its stated objective of measuring "cost to the Treasury."

Apart from the above-mentioned errors, which can be corrected with relative ease, the Comptroller General's incorporates two significant insights.

The first is that the Government, in its normal borrowing operations, does not control the distribution by type of the investment that is displaced. What happens as a result of additional Government borrowing is that the capital market is made a little tighter, as a consequence of which corporations, unincorporated enterprises, and households engaged in borrowing all have to scramble a bit harder for funds. Lending terms are likely to be tightened by financial institutions to all classes of borrowers, and are unlikely to fall exclusively on any one class. In particular, it is highly unlikely that the funds obtained by the Government will, in our present financial structure, all be diverted from corporate investment. Government borrowing will instead displace some corporate investment, some noncorporate investment, some residential construction, and perhaps some purchases of consumer durables. This means that we cannot take the rate of return to capital in any single sector of the economy as the opportunity cost of public borrowing, and it therefore rules out the use of, say, the corporate rate of return, which has been suggested by some investigators as a measure of this opportunity cost. If one is to use private-sector rates of return to obtain the opportunity cost of public funds, what is clearly called for, at least under present institutional arrangements in the capital market, is a weighted average of the rates of return applying in all relevant sectors of the private economy, the weights reflecting the degrees to which investment in each sector is estimated to be displaced by public-sector borrowing.

The second important insight reflected in the Comptroller General's report is that when Government borrowing displaces private investment, the cost of such borrowing to the economy is better measured by the rate of interest on Government bonds plus the tax loss on the income foregone because of displaced private investment, rather than by the overall yield or productivity of the displaced investment. The reason is the complexity of our economy and of our capital market in particular. At any one time one may find in the market some bonds yielding 6

percent, others yielding 7 percent and still others yielding 8 or 9 percent. Why do not all investors forego the 6-percent opportunities in favor of those yielding 9 percent? The answer is obviously that some investors do precisely that, but others regard the 9-percent bonds as too risky for their taste. And those who invest in both classes of bonds will at the margin be indifferent between the two investments.

This leads me to introduce the concept of the supply price of capital funds. When businesses seek additional capital, they do not willingly raise it from high-cost sources when lower cost sources are available; they instead try to obtain their funds in the cheapest way possible. Yet some businesses have to pay very handsome interest rates on borrowed funds, and to hold out prospects for high rates of return on any equity capital they raise, while others can issue debt at lower rates and equity at lower expected yields.

In order to pay the supply price of capital, business has to earn more than that, because the yield that investors receive is net of business taxes.

The supply price of debt capital to a firm might be 7 percent, and that of equity capital 8 percent, yet in order to pay these rates, the firm might have to earn 15 percent on its investment. To see this, suppose an investment of $1 million, financed 70 percent by equity and 30 percent by debt. The possible outcome of such an investment in a typical year might be:

Gross-of-tax income accruing to additional capital	$150,000
Less additional property taxes paid on the new assets	17,000
Less corporation taxes paid on additional equity incomes	56,000
Equals income from new investment, net of business taxes	77,000
Which breaks down into:	
Interest on additional debt (0.07×300.000)	21,000
Plus net income from additional equity (0.08×700,000)	56,000

In order to pay an average supply price of capital equal to 7.7 percent, this firm must earn a 15-percent return.

Suppose for the moment that this was—highly unrealistically, but useful as an implifying assumption—the only investment displaced by the Government's borrowing an additional $1 million at a rate of 5 percent. The rate of return on the displaced investment is 15 percent, but the true opportunity cost of the additional funds is not 15 percent but, in this example, 13.2 percent. This result is obtained as follows:

Actual interest cost paid by Government on new debt	$50,000
Taxes forgone on income from displaced investment:	
Property taxes	17,000
Corporation taxes	56,000
Personal income taxes	9,000
Total opportunity cost	132,000

Only the personal income tax component of this opportunity cost calculation remains to be explained. This is due to the fact that the income, net of business taxes but gross of personal taxes on the displaced investment was $77,000, and this is replaced by interest income on Government bonds of $50,000. Assuming a marginal personal tax rate of 33⅓ percent, there is involved in the displacement a loss of personal income tax revenue equal to $9,000—equals one-third of $27,000.

In this example the difference between the 15 percent rate of return to the displaced investment and the 13.2 percent opportunity cost of capital is equal to the difference of 2.7 percentage points—equals 7.7 minus 5—in the supply price of capital facing the displaced investment and that facing the Government, reduced by one-third to account for lower personal income tax revenues.

The methodology underlying the above calculation is, apart from the treatment of property taxes, essentially identical to that presented by the Comptroller General on pages 25–26 of his report. This brings me to an elaboration of my first point of difference with that report. From the point of view of economic logic, when attempting to measure the cost to the society as a whole of Government borrowing, there is no ground to distinguish whether the taxes foregone on the income from displaced investments would have accrued to the Federal Government or to State and local governments. By focusing on Federal taxes alone, the report unduly narrows its focus. Property tax considerations must enter into any comprehensive measure of the overall opportunity cost of Government borrowing, particularly when property taxes play as important a role in the overall fiscal system as they do in the United States.

The report likewise leaves excise and sales taxes out of consideration, an omission which is harder to understand than that of property taxes since, even apart from highway taxes which might be considered as user charges, the excises by themselves produce some $10 billion per year in revenue to the Federal Government. Of course, State and local sales and excise taxes should also be brought into account; these, which yield considerably more than the Federal excises, further emphasize the importance of incorporating sales and excise taxes into the overall calculation of the opportunity cost of Government borrowing.

To see how the adjustment for sales and excise taxes should be made, assume that the product produced by the displaced investment in the preceding example is subject to sales and excise taxes of 10 percent, and that total costs of sales are distributed as follows:

	Percent
Earnings of capital, gross of property, and profit taxes	20
Earnings of labor, gross of fringe benefits, and social security taxes	20
Depreciation of capital	10
Material inputs	50

Sales and excise taxes apply to the total of all these costs, but we need to know what part of such taxes to attribute to the displaced capital investment. On the working hypothesis that materials inputs bear a fixed relationship to total output in the indusry in question, the following formulation holds. Add "Depreciation to earnings of capital," giving a gross of depreciation capital share of 30 percent, in this case. Then allocate the material input share to labor and capital in proportion to their adjusted shares. In this case we thus allocate to capital 20 percent from "Earnings of capital gross of property and profits taxes" plus 10 percent from "Depreciation of capital," plus 30 percent from "Materials." The total is 60 percent, on which sales and excise taxes will have to be paid, say, at a rate of 10 percent. Our figure for the "Earnings of capital gross of property and profits taxes" was $150,000 in the earlier example. This corresponds to 20 percent of total costs. The excise taxes attributable to this additional capital are 10 percent

times 60 percent of total costs or 0.10 times $450,000, which equals $45,000.

The revised calculation of opportunity costs then would read:

Actual interest cost paid by Government on new debt	$50,000
Taxes forgone on income from displaced investment:	
Property taxes	17,000
Corporation taxes	56,000
Personal income taxes	9,000
Sales and excise taxes foregone as a result of displacement	45,000
Total opportunity cost	177,000

In this case, the presence of a mere 10 percent excise or sales tax has changed the social opportunity cost of the funds in question from 13.2 to 17.7 percent.

My next comment concerns the report's division of displaced investment into just two categories—corporate and noncorporate. In principle this breakdown could be extended to many different sectors. And even though a finer breakdown may appear to be an unnecessary refinement at this early stage of the process of developing a better measure of the opportunity cost of public funds, at least one additional investment sector—owner-occupied residential housing—definitely deserves to be included. The reason is that this type of investment is subject to very different tax treatment from other noncorporate investment. Instead of paying personal income taxes on the income accruing to their housing, owner-occupiers receive tax relief on account of such income. Thus, if $1 million of housing investment were displaced by Government investment, the calculation might look like this:

Actual interest cost paid by Government on new debt	$50,000
Taxes forgone on income from displaced investment:	
Property taxes	15,000
Personal income taxes	−16,667
Total opportunity cost	48,333

If the Government bonds carried an interest rate of 5 percent and the relevant marginal personal tax rate was 33⅓ percent, the tax adjustment here would actually lower the opportunity cost of funds obtained through the displacement of residential construction to 4.83 percent, rather than raising it to 13.2 or 17.7 percent as occurred in our previous examples where business investment was displaced. The importance of owner-occupied housing construction in total investment in the United States, and the known sensitivity of such construction to changes in capital market conditions make it quite essential to take explicit account of the peculiar tax status of this kind of investment when estimating the opportunity cost of public borrowings.

I turn now to a comment on the report which is of comparatively minor significance, and is introduced here only for the sake of completeness. The report assumes that all of in increase in Government borrowing is reflected in displaced private investment, and none in increased private savings. Since increased borrowing from any source tends to increase interest rates, a rise in savings will presumably result if they display a positive responsiveness to changes in interest rates. Since the available evidence suggests that the responsiveness of savings to changes in yields is at best small and possibly zero, the assumption made in the report is certainly a defensible one. Nonetheless

I shall here sketch how one would measure the social opportunity cost of $1 million of funds raised through increased saving:

Actual interest cost paid by the Government	$50,000
Less additional taxes on interest from increased savings	16,667
Total opportunity cost	33,333

In this example, the social opportunity cost of funds coming out of newly generated saving is only 3.3 percent.

I now turn to an illustrative calculation of the overall social opportunity cost of capital, after the fashion of that presented on pages 25 and 26 of the Comptroller General's report. For this purpose I shall assume that funds obtained at the expense of corporate investment have an opportunity cost of 15 percent—lying between the 13.2 percent and the 17.7 percent of our two examples—that those obtained at the expense of investment by noncorporate firms have an opportunity cost of 8.5 percent,[1] that those coming at the expense of housing investment—owner-occupied—have an opportunity cost of 4.8 percent, and that those generated by increased savings have an opportunity cost of 3.3 percent. I shall further assume the following pattern of "sources" for the funds obtained.

Source of funds	Percent of incremental borrowings (1)	Relevant opportunity cost (percent) (2)	(1) × (2) (3)
Displaced corporate investment	50	15.0	7.50
Displaced noncorporate investment	25	8.5	2.13
Displaced owner-occupied housing construction	15	4.8	0.72
Newly stimulated savings	10	3.3	0.33
Overall opportunity cost			10.68

Note that in spite of my having introduced two additional sources, with very low opportunity costs, my resulting figure is substantially higher than that emerging from the report. This is in part due to my having used 5 percent rather than 4 percent as the basic interest rate on Government bonds, and in very small part due to a somewhat higher before-tax yield assumed on corporate and noncorporate investment. But in the main the difference is attributable to my taking property, sales, and excise taxes into account in the calculation. These taxes are lumped together in the national income accounts under the classification "Indirect business tax and nontax liability" and they account for the overwhelming bulk of that category. For 1967, the national income accounts show that category as amounting to almost $70 billion, or well over 11 percent of the approximately $600

[1] This can be obtained as follows:
On $1 million of investment displaced from the noncorporate sector we have:

Actual interest cost paid by Government on new debt	$50,000
Taxes forgone in income from displaced investment:	
Property taxes	15,000
Personal income taxes	10,000
Sales and excise taxes forgone as a result of displacement	10,000
Total opportunity cost	85,000

I assume here a rate of return of 8 percent net of property taxes, which results in $80,000 of taxable income displaced, compared with $50,000 of taxable income generated by interest on the Government bonds. Sales and excise taxes are assumed to be at an average rate of 5 percent with annual sales of $200,000 forgone as a consequence of the diversion of investment.

billion of final-goods spending by the private sector. Property taxes alone, at around $40 billion, outstrip the yield of the corporation income tax, and sales and excise taxes, at around $30 billion. amount to about 5 percent of private-sector acquisitions of final goods and services. These are far-too-important components of our tax structure to be left out of account in the exercise of estimating the opportunity cost of public funds.

Let me emphasize that the exercise just completed is illustrative, and not the result of the long and careful research it would take to come up with a thoroughly defensible estimate of the opportunity cost it seeks to evaluate. However, I am convinced that the order of magnitude is probably correct, and that it is doubtful that further research along the same lines would modify the 10.7-percent figure by more than, say, 2 percentage points—that is, the result of such research would probably be an estimate somewhere in the range between 8.7 and 12.7 percent.

At this point let me express a general caveat concerning the distinction between the "overall cost to the economy" of Government borrowing, and the "cost to the Treasury" concept, elaborating upon my introductory comments in this regard. It is all too easy to identify what I have called "Taxes forgone in income from displaced investment" plus "Sales and excise taxes forgone as a result of displacement" with the "net change in tax revenues resulting from added Government borrowing." This would be a convenient identification if it were only true, but unfortunately it is not, which complicates the analysis a bit. The designation "Taxes forgone on income from displaced investment," and its counterpart for sales and excise taxes are the correct ones, but the net change in tax revenues resulting from added Government borrowing is likely to be a different figure. The difference stems from the fact that the displacement of some private-sector investments is likely to raise the yield of capital that is already in place, and of those current investments that are not displaced by the added Government borrowing. As a consequence, tax revenues stemming from these sources are likely to be higher than they would be in the absence of the added borrowing.

If, as a consequence of added borrowing, the yield rises on capital which would in any event be present, the result is in effect a transfer from the consuming public in general to the owners of capital. Given our tax structure, a part of this transfer will be retransferred to the Government. But it would be totally incorrect to count extra revenues of this type as part of the benefit of added Government borrowing, without taking into account the loss to consumers that they reflect. When the changes in the positions of consumers, owners of capital, and the Government are evaluated together for transfers of the type under discussion, the end result nets to zero. What consumers lose through such transfers is gained by owners of capital or by Government; the transfers therefore produce no increment in overall welfare.[1]

Finally, I turn to an issue posed by the work of Professor Eckstein in "The Social Cost of Federal Financing." [2] Professor Eckstein there

[1] I follow a longstanding convention of cost-benefit analysis in placing the same social valuation on an extra dollar received or given up by any group.

[2] Ch. 4 in John V. Krutilla and Otto Eckstein, "Multiple Purpose River Development" (Baltimore: The Johns Hopkins Press, 1958). (See p. 82, this volume.)

developed a methodology similar to those used in this paper and in the Comptroller General's report, but applied it to the raising of funds by taxation rather than by borrowing. This raises questions like (*a*) Are there reasons why the opportunity cost of public funds obtained via borrowing should be regarded as superior to the opportunity cost of funds raised by taxation as the relevant discount rate for public project evaluation? (*b*) Since funds come from both sources, should not the relevant rate be an appropriately weighted average of the two opportunity costs? (*c*) Should not different rates of discount be used depending on how the funds in question are raised?

I cannot here go into all the ramifications of these questions, but will instead briefly sketch the main issues and propose the outlines of some answers. With respect to question (*c*), the first problem is that we do not know, except for the case of earmarked taxes, what is the source of the funds used in any particular project. Second, there should be—apart from a risk adjustment which would undoubtedly vary from project to project—a single rate of discount used for all Federal projects, since to do otherwise would mean that projects are undertaken in some areas which are inferior to projects rejected in other areas.

With respect to question (*b*), one faces first the issue of what weights to apply to the opportunity costs of funds raised by each of the innumerable possible ways of increasing tax revenues. There simply is no standard pattern in administration recommendation or congressional decisions about changes in tax rates, tax bases, and the like. On the other hand, there is presumably a definable pattern in which Government borrowing displaces private investment, which is determined by the relative sensitivity of different types of investment—and possibly of saving—to changes in the degree of tightness of the capital market. On this ground alone we have a basis for preferring the opportunity cost of borrowed funds to an unknown and unstable mix of opportunity costs of tax funds—or to a weighted average containing such a mix—as the relevant discount rate.

This brings us to question (*a*), since if the opportunity cost of borrowed funds can be defended as being superior to that of tax funds we should, given our answer to (*b*), be willing to opt for the former as the discount rate. I perceive two related grounds on which the superiority of the opportunity cost of borrowed funds can be claimed. The first is that, in any given situation, more taxation means less borrowing associated with given Government expenditures. This means that when an extra dollar is raised via taxation, it can release to the private sector capital funds that will have a social yield equal to the social opportunity cost of Government borrowing.

To calculate the social yield of taxation, therefore, we simply go through the above Government borrowing exercise in reverse, and obtain the saving in interest costs on account of having less debt plus the incremental tax revenues derived from the extra private investment that a lower level of Government borrowing generates.

The second ground for preferring the opportunity cost of borrowing is that it can appropriately serve as a guide to tax decisionmaking. We are accustomed to seeing and discussing benefit-cost analyses of public expenditures; perhaps the idea of benefit-cost analyses of public revenue raised in particular ways is less familiar, but it is equally sound.

There is only one rate of discount which can bring rational calculations to both sides of the tax-expenditure picture in this way, and that is what I have called the social opportunity cost of public borrowing.

The market price of a product should affect a farmer's production and consumption decisions in the sense that any excess of production over consumption can be sold in the market, and any excess of production over consumption must be bought in the market. Even though for some products the amount bought or sold might be small relative to the farm's production of the product and the family's consumption of it, it is perfectly valid for the farmer to base his production decisions on the market price and for his wife to base the family's consumption plans on the market price.

In just the same way the social opportunity cost of government borrowing can operate to guide taxation and expenditure decisions. It matters not that total borrowing is small relative to taxes and expenditures; what is important is that any extra taxes tend to reduce borrowing and any extra expenditures tend to increase it. The one price that can serve as a guide to both sets of decisions is therefore the opportunity cost of government borrowing.

Let it be noted, too, that the use of the social opportunity cost of government borrowing as a guide to tax and expenditure decisions does not mean that the discount rate is beyond the influence of public policy. Actually, there are two ways in which public policy can influence this rate. First, changes in the rates of tax applicable to the different sectors can change the social opportunity cost of capital obtained at their expense. Thus, a reduction in corporation tax rates would at one and the same time serve to channel more funds into the corporate sector of the economy and also to reduce the opportunity cost of any government funds subsequently obtained at the expense of that sector.

Secondly, to the extent that the social cost of additional tax revenue is judged to be lower/higher than its social yield, increases/decreases in the level of taxation over time can make more/less capital available to the private sector, thus leading to decreases/increases in the market level of interest rates and of private-sector capital yields generally. Thus, though at any point in time the opportunity cost of public borrowing is basically determined by the nature of the then-existing tax and capital-market structures, public policy can be used to influence the way in which this discount rate moves through time, via public decisions concerning both the nature of the tax structure and the overall volume of revenue to be raised through taxation.

Thank you, Mr. Chairman.

Chairman PROXMIRE. Mr. Harberger, do you arrive at any general conclusion on the discount rate level? What ought it to be?

Mr. HARBERGER. Well, the calculation that I made, which admittedly is quite rough——

Chairman PROXMIRE. 10.8 percent?

Mr. HARBERGER. 10.7 percent. I would say that something between 8.5 or 11.5 or 12 would probably represent the plausible range for such an estimate.

Chairman PROXMIRE. As I recall, the Comptroller General, in his analysis, in his concept as you indicated, is somewhat close to yours;

that is, it is the cost of long-term borrowing plus forgone taxes or either 7 or 8 percent.

Mr. HARBERGER. That is right.

Chairman PROXMIRE. I take it, Mr. Eckstein, you arrive in that general area, too.

Mr. ECKSTEIN. Yes, Mr. Chairman.

Mr. HARBERGER. My calculation differs from that of the Comptroller General in the particular sense that it takes into account the effects of Government borrowing on sales and excise taxes, and on property taxes. It seems to me that we should not take a narrowly, purely Federal focus in calculating these tax changes. The tax changes really represent what we call in economics external effects of Government borrowing, and if, at the same time as tax revenues are changing for the Federal Government, they are also changing for State and local governments, they should be counted.

Chairman PROXMIRE. Will you spell out what is your rationale for including the tax-forgone item in your calculations?

Mr. HARBERGER. Let me start at another end of the spectrum. If we get government funds, let us say, at the expense of corporate investment with a yield of 15 percent, we might simply take 15 percent as the opportunity cost of those funds, even though the Government is only paying 5 percent on its borrowings. The reason why taxes come into the picture is because the full differences between the 15 percent earned on corporate investment and the 5 percent paid on Government bonds does not represent a true cost to investors. A part of the difference is simply a compensation for the extra risk borne by investors in corporate securities. If the 15-percent yield of corporate investment can be broken down into 5 percentage points of interest—equivalent to that on Government bonds—plus 2 percentage points of risk premium; plus 8 percentage points of taxes, the opportunity cost of Government borrowing at the expense of such investment would be 13—equals 5 plus 8—not 15 percent.

Chairman PROXMIRE. Is this a risk element?

Mr. HARBERGER. It is a risk or taste element on the part of the general public, but it is a genuine cost that is important, I think, or it is relevant to take into account.

Chairman PROXMIRE. That element is wholly gone, absent, from the Government investment?

Mr. HARBERGER. Yes. At least, the risk element is measured by comparing the yields on private securities with those on Government bonds. One need not ask the question, Does the public have some sense of risk concerning Government bonds? The differential we observed in the market is the additional sense of risk that the public has when it compares corporate securities with Government bonds.

Chairman PROXMIRE. You arrive at how big a difference, now?

Mr. HARBERGER. How big a difference in——

Chairman PROXMIRE. Between the Government and corporate bonds.

Mr. HARBERGER. It varies all over the map, Senator.

Chairman PROXMIRE. I know, but overall, in arriving at your calculation of 13 and——

Mr. HARBERGER. What happens is if you were to say in the example I gave that 15 percent is the productivity that capital would have in the corporation, of which 8 is taxes and 7 is the cost of capital to corporations, that compares with, let us say, a 5-percent yield on Govern-

ment bonds. Let us divide up the 15 into 8 which are taxes, 2 which are risk premium, if you like, and 5 which represents the cost of Government bonds.

Chairman PROXMIRE. When you say 8 are taxes, you are talking about the fact that you have a corporation income tax of 50 percent, roughly, and then, in addition to that, you have property taxes and other taxes?

Mr. HARBERGER. Right.

What I am saying is that in measuring the social opportunity cost of capital, if we start with the 15 and divide it up into those three segments—8 of taxes, 2 of risk premium, and 5 of the cost of Government bonds—the 2 of risk premium should not be counted as part of the opportunity cost of Government funds any more than the excess wages that are paid in an outlying mining district should be considered as a part of the true profit of that enterprise. The risk premium is a part of the after-tax supply price of capital, at which investors would voluntarily make their funds available for corporate investment.

Chairman PROXMIRE. I would like to ask you, Dr. Eckstein, to comment on this, the notion of the need for inclusion of foregone taxes.

Mr. ECKSTEIN. There are two ways of getting to the same point. If you start out with basic interest costs and then you want to get to the total return on capital, you have to build in all the individual components, risk, taxes, and so forth, that account for the difference. So you do have to track down all the miscellaneous taxes.

Another approach is to start out with a gross return on capital itself rather than the borrowing costs, which get you to the same place in one step. If you take the tax approach, which is the approach that I have used in the past, you do not go through all these questions about which taxes are forgone and where; this is a somewhat treacherous game, because it can also be played on the benefit side. You get to the return on capital in one step. But if you take the borrowing approach, you certainly have to include taxes.

Chairman PROXMIRE. Now, it seems there is this merit in taking the conceptual approach that Dr. Harberger takes here, from the political standpoint. That is that we now base the discount rate on the cost of borrowing. That is the justification used in Senate Document 97 and all the other documents that have been argued. It would seem perhaps easier to persuade Members of the Congress to recognize the forgone taxes than to move into a new area, which I find a little more congenial, frankly, but nevertheless, I am not sure other Members of the Congress would—but this new area of return on capital: How do you feel about that?

What is the difference?

You say you arrived—I can see that you seem to arrive at a fairly similar position. But why is your approach conceptually superior, other than, as you say, you do not have to worry about this variety of taxes?

Mr. ECKSTEIN. Let me deal with several of these questions systematically.

I think the tax approach is conceptually superior because, in fact, the bulk of Federal financing is tax financing, not borrowing. Even our $25.4 billion deficit is only $25.4 billion out of $180 billion. That is point 1.

Professor Harberger is right, that the tax approach requires you to postulate a specific set of tax changes. I suppose if the Government did an official calculation, it would not be able to reassess each year what the next tax change would be, it would have to take some average of the tax system, where the revenues actually come from on the average and assume some change based on average revenues.

Chairman PROXMIRE. Is it not true that you have the same kind of problem on rate of return? Does that not vary all over the place?

Mr. ECKSTEIN. Yes; but if you take the average of a tax system as the cost, if you assume that the money is raised in proportion with the tax system, you have identified the sources of the money; you then have to estimate only once what the return on capital is in those sources. So it is a computation that is not easy, but I did such a study in 2 months in the summer of 1956 when I was asked the question, What is the opportunity cost of Federal capital? The Government could do that study very well, and I think with reasonable precision.

Let me stress one other point. The results are fairly insensitive to small changes in assumption. At the time I did it, I postulated two kinds of tax models, one which would have emphasized consumption and the other which would have emphasized investment. I thought at the time, one is a Republican tax change and the other is a Democratic.

Chairman PROXMIRE. Which one is the Democratic, the consumption?

Mr. ECKSTEIN. It emphasized consumption. That was back in the mid-1950's. We have all come a long way since then.

Chairman PROXMIRE. We have not reversed our roles, though, have we?

Mr. ECKSTEIN. Not totally.

The results were within a quarter of a point of each other. All of these models are weighted averages of the actual returns. The difference between Harberger's estimate and mine is not really due to his use of a borrowing rather than a tax model, it is the assumption about the fraction of resources that comes out of the corporate sector.

The average rate of return in the corporate sector is on the order of 15 percent; in manufacturing, it is even higher.

Chairman PROXMIRE. Is it that high before taxes?

Mr. ECKSTEIN. Yes.

Chairman PROXMIRE. Then it includes utilities and railroads, the whole thing?

And this would be over a period of substantial time?

Mr. ECKSTEIN. The average, even including railroads, must be close to 15 percent. In manufacturing we average more than 20 percent.

Chairman PROXMIRE. You say this is true of the period between 1948 and 1968?

Mr. ECKSTEIN. Yes; it has its ups and downs because of recessions, but it is on that magnitude. My model extracts a smaller share of resources from manufacturing than Harberger's model. It is a scientific judgment. I would like to see it settled by doing as good a study as you can of it. I believe that somehow, the corporate sector gets its capital and exploits its good investment opportunities, and if you take resources from them one way, they get their capital through borrowing or by cutting down dividends disbursements. If you trim the 50-

percent source of the Harberger calculation to a 10- or 25-percent source, you bring the Harberger estimate down to the other studies.

I do not think, apart from that, it matters for the outcome whether you use a straight borrowing approach corrected with taxes or whether you take a tax approach going directly to rates of return. All of these things are weighted averages of the actual rates prevailing, and they all get up to 7 or 8 percent. I have no particular brief for my method of 10 years ago. It can be done reasonably by a borrowing approach, corrected by taxes.

Chairman PROXMIRE. Can you gentlemen agree that there is any consensus on these approaches in the economic profession among those who specialize in this area, the Government investment area?

Or is it one that is fairly evenly divided, or is it partly so?

Mr. HARBERGER. I am afraid, Senator, that the profession has been rather lax in working its way into this theory. You have sitting before you two out of a handful of people, or maybe a couple of handfuls of people, who have paid serious attention to this problem. I do not think that we can talk about professional consensus at this stage of the game. The particular formulation that I was working on in preparing my comments is going to come out probably later this year or early next year in a paper, and to my knowledge, it has never before been explicitly thoroughly developed in the economic literature.

Mr. ECKSTEIN. We should report that there is a group of scholars mainly concerned with the problems of less developed countries that still develop theoretically the social time preference approach. Now, to my knowledge, except for one attempt of mine, they have never attempted to convert this into numbers. It is a very intricate and amusing theoretical game to devise these social time preference rates from models. If you ask them, would you recommend that the Congress build a project which promises to yield 3 percent, they would say, no, on the grounds that there are better uses for the money.

Chairman PROXMIRE. Yesterday, we had testimony on the views of the economic profession. You usually get more of that when you do not have the economic profession in front of you, although the men were all competent, fine men. But is there, in your view, a feeling, an overall feeling in the economic profession, would you say, that the present system, A, is inadequate; B, is much too low; C, whether you take the Eckstein or Harberger approach or some other approach, that it would be in the area of 7 or 8 to 12 or 15 percent—at any rate, substantially higher? Is that a fair conclusion?

Mr. ECKSTEIN. The present approach is indefensible, even on its own logic.

Chairman PROXMIRE. That is not only your conclusion but the conclusion of other people in this area?

Mr. ECKSTEIN. I cannot imagine any economic scholar who would endorse the present approach.

Chairman PROXMIRE. By that you mean the 4⅝?

Mr. ECKSTEIN. No; I was thinking of the 3.1.

Chairman PROXMIRE. How about that 4⅝ percent?

Mr. HARBERGER. I believe the overwhelming bulk of the economics profession would say that the rate on Government bonds is itself far too low to be used as a discount rate for public investment decisions.

Chairman PROXMIRE. Would you agree, Dr. Eckstein?

Mr. ECKSTEIN. I think so. I would share that judgment. You would, of course, find people generally emphasizing that you ought to consider social goals, you ought to consider benefit measurements. There are many other dimensions of the problem. Economists do not believe all Government actions are strictly to promote Government efficiency, or that the Government is in the business of maximizing profits on these projects. What they would say, I believe, is that it is on the benefit measurement side, on setting social goals in a quantitative way and pursuing them rationally; that is the area where you ought to think of the broader perspective, not in the choice of interest rate.

Chairman PROXMIRE. The interesting thing said by Mr. Fred Hoffman of the Bureau of the Budget was that the 4⅝ percent, which was championed by the other two, Mr. Caulfield and Mr. Holum, who was speaking for Secretary Udall—he said this rate was not inconsistent with an estimate of the risk-free social opportunity cost capital over the whole economy, but it is an absolute minimum estimate to this rate.

Mr. ECKSTEIN. There is no way of raising 4⅝ capital in this economy. If you go to the capital market and offer 4⅝ percent, they will not let you in the door.

Chairman PROXMIRE. That brings me to another question I was going to ask a little later. Let me ask it now. This relates to the notion that you have an inflationary element involved here. The Water Resources Council defended reliance on the current yield of Government securities observed 2 years ago, with a 4⅝ determination. This is defended on the grounds that more recent observed rates are too high because of inflation expectations. Does this approach seem theoretically correct or reasonable to you?

Mr. HARBERGER. Let me speak to that point, Mr. Chairman, because I have spent a fair part of the last 10 years in Latin America, where rates of inflation of 20 percent and up have not been uncommon. It is indeed true that in a market economy, inflationary anticipations can be incorporated into the interest rate and you find in places like Chile and Argentina interest rates of 20 and 25 percent, which are that high simply as a reflection of inflationary anticipations. Under those circumstances, it would be necessary to come to an estimate of the so-called real interest rates; that is to say, an interest rate adjusted downward for inflationary anticipations.

However, I believe that the extent of inflationary anticipations in our present structure is very minor in comparison with the differences between the Government bond rate and the yield of capital in the private economy, and, to put it another way, very minor in comparison with the weight of the tax adjustments that the Comptroller General's report and my own statement consider to be the major component of the difference.

Chairman PROXMIRE. Very minor, but is it sufficient, conceivably, to justify 4⅝ percent as an absolute minimum estimate of the rate for so-called risk-free social opportunity costs?

Mr. HARBERGER. I would say that 4⅝ percent is lower than what I would call the absolute minimum; therefore, even more of an absolute minimum.

Mr. ECKSTEIN. Whatever the reasons may be, Senator, the interest rate structure is higher. The interest rate is a price by which the economy operates. So private investment decisions are made on the

basis of higher interest rates. As a result, the returns required for the productive investments in the private sector must substantially exceed the actual interest rate, not a price-corrected interest rate.

It may well be, for example, if you evaluate a human investment project, that you would have to include a realistic wage projection into those future earnings and not just a productivity projection.

Chairman PROXMIRE. This is a matter of accurately computing your benefits, really?

Mr. ECKSTEIN. So there is a question of symmetry. You cannot assume one thing on the cost side and another thing on the benefit side. You only really confuse the planning process by creating a synthetic situation on the cost side. The fact of the matter is that the interest rates in this country are an important element in resource allocation, and the interest rates, whatever their reason, are far more than 4⅝.

Chairman PROXMIRE. But the argument by Mr. Caulfield is that we are in a period which, as you defined in your paper, is much more inflationary now than it was in the period 1960–65. The idea was to avoid rapid ups and downs and, therefore, we should look to a more stable period which presumably we could return to, rather than this temporary period now that we are in, when you are making investments over a period of many, many years.

Mr. ECKSTEIN. That is a long-term judgmental question about the outlook on interest rates. I have looked into that question some and this is my judgment on it: The interest rate structure moved up about 2.1 percent from the plateau of the early sixties to the peak of a few months ago. The question is: How far will these interest rates recede toward that plateau when Vietnam is over, now that the Federal Government financing is straightened out? It is my judgment, which may be quite wrong, but it is my judgment that the interest rates will recede by perhaps as much as 75 basis points, or three-quarters of a percent. The Government bonds have already receded 50 basis points because of the dramatic change in the Federal financing needs.

So I would think it would be a mistake to give a very heavy weight to the average of the early 1960's, when unemployment was 5.5 percent. After all, we are not going to settle for that over the next 10 years as an average. It also did assume that industrial prices were absolutely stable, which does not seem to be in the cards right away, either.

So I do not recommend that we base the interest rate computation on the very peak wartime rates of December 1967 and briefly in May of 1968. That would not be reasonable.

But I do not think one can justify a large further decline in the assumption about the interest rate from the present levels. You could argue for a fall of another quarter of a percent or half a percent as wartime circumstances and the current inflation. But that seems to me what the most prudent man would project.

Chairman PROXMIRE. Now, on the assumption, then, that we arrive at a different kind, or at least a different figure for the so-called risk-free social opportunity cost of capital, not 4⅝, but some other figure, assuming you build on that, it would still seem to me to be necessary to use some kind of explicit adjustment of benefit and cost streams to allow for the risk and uncertainty that is in these projects, because,

of course, we know that none of the Government investments are absolutely risk free, and many of them are quite risky.

Could you gentlemen describe the procedures by which Government analysts could make these explicit allowances for risk and uncertainty in benefit-cost streams?

I take it you have to do that—at least Mr. Harberger does—because Mr. Harberger made the assertion, as I recall, that we should have a single discount rate for all projects. If you do that, obviously, you are assuming that they all have the same risk or that you are building that into your benefit and cost systems in arriving at the figure.

Mr. HARBERGER. Yes.

Chairman PROXMIRE. How do you do it?

Mr. HARBERGER. I think it is possible, and probably the most feasible way to deal with the problem is to try to identify the considerations governing the risk premia that prevail in the private sector of the economy. We have some excellent studies which show that the risk premia on corporate bonds in the private sector can be fairly closely predicted on the basis of such items as the debt-equity ratio of the corporation and the variability of the earnings of the corporation and the general financial stability of the corporation. What we need to do is try to get counterparts of these, to say for a particular Government investment, whether it is like a public utility investment in terms of its underlying riskiness, or whether it is like a uranium prospecting investment. Then we can make an appropriate risk adjustment for each particular project.

An alternative would be to make a sort of standard risk premium for all Government investments on the ground that the Government has a widely diversified portfolio, and to sort of incorporate, let us say, the average risk premium on all private investments on top of Government risk-free rate in order to arrive at the rate of discount to be used to evaluate Government projects.

Chairman PROXMIRE. You see, so much of this Government activity is different than our experience in the private sector. For example, how do you determine the risk element in providing Federal scholarships for higher education, for instance? Here is something where we think a rate of return is high, but we can provide so many that maybe we get to a point where we decide that it is not wise to invest more in that field but in some other field on the one hand.

Headstart is another example where it seems to me it would be very hard to compute the risk factor. Even the water resources programs, where you have tremendous technological developments in saline research on the one hand and atomic research on the other.

What do you do about this kind of thing? Can you really arrive at a figure, or do you have to take some kind of overall judgment and just apply it?

Mr. HARBERGER. I suspect that at the moment the latter would be the course of prudence. Practically speaking, I would say if the Government were to move from present practice to simply incorporating a risk-free rate in all its decisions and not making any allowance for risk, there would be a tremendous improvement in the picture. It would be still better to use an appropriately calculated risk-free opportunity cost plus a general blanket across-the-board allowance for risk in the

discount rate itself, without making a separate risk allowance for each project or program. A third and still better, approach would be to try to identify especially risky Government investments, investments of medium risk, and investments of demonstrably low risk and to make separate risk adjustments for each of these three categories. If we could simply identify investments in those three classes and have a higher than average discount rate for those that bear the earmarks of being highly speculative and a lower than average discount rate for those of types with assured histories of proven payoffs, we would be doing a decent job, although obviously not the best conceivable job.

Chairman PROXMIRE. Dr. Eckstein, how would you handle this?

Mr. ECKSTEIN. I do not think you can put it all into the interest rate. If you think of investments in technologies, which after all, are a good deal of Government expenditure these days, there you ought to be very conservative, so you ought to assume a short economic life or be conservative in other aspects of the computation. I do not think you can put all of that—you ought to insist on a high interest rate as any reasonable enterprise would.

If you look at human investments, evaluating Headstart if you could do it by this method, that kind of program, which have, on the other hand, a lifetime payoff, again I do not see how you can weigh risk properly by putting in the interest rate.

We know these are high risk investments. We know there are great social rewards, savings in social cost later on. I do not see how you can—I do not think it makes any sense even in these areas to put in an arbitrarily low interest rate which is just an arbitrary way of muddling the computation. You ought to use a rate of the sort we have been talking about even in those areas, but I would not——

Chairman PROXMIRE. If you do not do it with the interest rate, how do you arrive at risk? Usually we do adjust the risk through interest rate. This is——

Mr. ECKSTEIN. Let us take Job Corps, which is not the most difficult of these to evaluate. The benefit of Job Corps is the expected increase in lifetime income of the trainees compared to the income they would have gotten if they had not gone to Job Corps.

There is a probabilistic matter and the analysis as conducted is probabilistic. Some percentage of these youngsters will get better jobs. Some percentage will not. Some percentage will drop out in the first few months with no visible benefit.

I would put the risk adjustment conservatively into a realistic assessment of these probabilities and a realistic assessment of the increases of income—things of that sort.

In the water area, and the general hardware area, roads, things of that sort, I think you can use a risk premium approach. If you start out with a pure interest rate, something like the Government bond rate, then you ought to add a percent or two because that is what you would be earning in the private sector for that kind of investment. That is the risk premium that prevails in the telephone company, the electric power companies. That is the kind of investment it is.

Chairman PROXMIRE. You say in your statement, Dr. Eckstein, the Soviet Republic, U.S.S.R., now uses a 10-percent discount by and large.

Mr. ECKSTEIN. Yes.

Chairman PROXMIRE. And, you deplore the fact they used a zero rate when Stalin was in charge and there was a terrific misallocation of resources and waste. You apparently feel this is much better.

Do you feel that that 10 percent can teach us a lesson that we ought to be around 10 percent, too? Is this 10 percent arrived at through pretty careful and thoughtful and effective calculation or is it wrong?

Mr. ECKSTEIN. Well, I have no way of assessing the Russian situation in detail. We can see in the Russian case what happens if an economy embraces this principle broadly of having no interest rate at all. The 10 percent rate is used now. Of course, they do not call it interest rate even now, but the computation really amounts to that. That is what they are doing and it is a drastic change of policy.

Chairman PROXMIRE. That is an excellent case study that had not occurred to me. I have heard nobody else use it and it is a good example of how wasteful it is if you have either a zero or excessively low discount factor. As you say, we can do some things like grow bananas on Pikes Peak. You can justify any kind of water investment if you ram your discount rate low enough.

Mr. ECKSTEIN. Because you simply are not charging yourself for the cost of capital. Nowadays the Soviet Union has come so far as to use "cost of capital." Interest is forbidden by Karl Marx but they do now use something they call the cost of capital. Now, whether—I should also add that for lighter investment they use figures as high as 20 and 30 percent.

Chairman PROXMIRE. I take it, from your earlier remarks that all of your testimony this morning, particularly with regard to the arriving at something like a 7- to 10-percent discount factor, is on the assumption that we have, if not full employment, high-level employment and unemployment around 4 percent. In other words, if we had a recession, depression, if we had much idle resources, you would have a much lower discount factor because you would have some adjustment, you would not be taking resources from the private sector by and large. You would be putting to work resources that would otherwise be idle; is that correct?

Mr. ECKSTEIN. Yes, although even under those conditions you might have a backlog of good projects with high returns that you might not have to dip that low into low return projects even in a recession. Still on strict economic calculation, the opportunity cost of capital falls sharply as recession deepens into depression.

Chairman PROXMIRE. You would apply, however, this figure that you have suggested, and so would Dr. Harberger, I take it, as long as the unemployment rates are, say, between 3 and 5 percent.

Mr. HARBERGER. I think, Mr. Chairman, that when we get into a situation of unemployment, there are really two things that happen.

Chairman PROXMIRE. Well, unemployment is a very broad index of the whole economy.

Mr. HARBERGER. Right.

Chairman PROXMIRE. Obviously, if we have that we have plants operating at 80 percent of capacity, if we have, say, 5 percent of unemployment, but assuming there is a correspondence and you have identical capacity.

Mr. HARBERGER. When we start out with a situation in which these are unemployed resources of various types, we can incorporate into

the benefits of particular projects the benefit that they have in absorbing unemployment and still use a high discount rate. The inclusion of the extra benefit arising from the employment of unemployed resources would improve the prospects of a project being approved.

Now, the second thing that happens is, as Professor Eckstein pointed out, in times of recession and depression, the general level of market rates goes down. But, that fall in market rates is not a fall which carries over the entire life of a project, 20-, 30-, 50-year project, and the appropriate way of taking into account that fall is to lower the discount rate for the immediate years but not to lower it for all of the later years.

Quite a complex analysis is involved in this sort of thing, but in general when you are dealing with a short-range phenomenon of unemployment, you allow it to create extra benefits if your project is employing unemployed resources. Similarly, if your short-range phenomenon is a drop in general market level of interest rates, you allow that to influence your use of capital in the immediate future. But if the capital that you put into a project is going to be tied up for 20 or 50 years, you do not want to allow the short-term phenomenon of a low-interest rate to influence your discounting over the entire life of the project. Just the discounting corresponding to the years during which this low-interest rate is expected to prevail.

Chairman PROXMIRE. Do you want to comment?

Mr. ECKSTEIN. Well, I should add one footnote to that, though. Even if it is a long-lived project, if it is built during the recession, it is being built when the capital has little opportunity cost. The answer to your question, is, "Yes"; we are thinking in the 3- to 5-percent range.

Chairman PROXMIRE. Most of these projects, these water projects and others, take a number of years to build. They are not built in a year or 6 months. You cannot say that we have either a situation of, say, shortage of labor resources available or shortage of capital resources available on the one hand, or say that we have excessive unemployment because under the Employment Act, under our experiences that we have had under it, the progress we have made, I would agree with you that we are not going to have five and a half percent unemployment, that no party could stand it, and we recognize we cannot stand it.

One of the members of this committee has written to me protesting very strongly about changing the discount approach to water projects. One of the arguments that this man makes is that in the present calculations of benefits, we overlook the increased profits of the businessmen who are operating in the area and that this is an oversight and this is one of the reasons why he says you can justify a lower discount rate.

No. 1, is this a fact, that we do overlook profits consistently?

No. 2, should we include them? Is this justification for a lower discount rate?

Mr. ECKSTEIN. Well, historically we did count stemming benefits which are the profits of processors and we counted induced benefits which are the profits of the people selling to the farm. I had not been aware that the progress on reforming benefit-cost standards had reached the point where we no longer counted these kinds of benefits but I could——

Chairman PROXMIRE. Do you count this as progress?

Mr. ECKSTEIN. In a sense—this is another set of issues. You cannot answer that, all the capital that goes into processing industries would have been idle. It would have earned some other return.

Chairman PROXMIRE. Are you also saying perhaps the business that would go to the people in a particular State, say in Wisconsin, because we have a new water project, might come from business in another State, so that increased profits for the people in Wisconsin might be decreased profits for the people in Minnesota or Illinois or something like that?

Mr. ECKSTEIN. Yes. It is very difficult to show that locating this activity near this project is all additional activity, or additional employment, or additional profits.

Chairman PROXMIRE. Suppose you can show that it is. Suppose you can show it is something new. To the extent that it is would you then say the profit should be recognized as part of the benefits?

Mr. ECKSTEIN. Yes. Then, you could compute the benefits of that original——

Chairman PROXMIRE. It is your understanding they are.

Mr. ECKSTEIN. I have not attempted to follow it in the last year or two, but it was my understanding that there was still some counting of it.

Chairman PROXMIRE. Mr. Harberger?

Mr. HARBERGER. Mr. Chairman, I think there is a sort of a standard approach to this in the theoretical literature which runs essentially as follows: Suppose that a power dam is built, and that as a consequence of that dam there arises in the neighborhood an industrial complex, which means a lot of investment, a lot of employment, and a lot of income generated. Let us suppose that investment in general in the economy has a yield of 10 percent. If investment in a particular plant near this power dam has a yield of 15 rather than 10, the extra 5 can be attributed to the powerplant but not the whole 15. And by the same token, if labor resources locate themselves near the dam, and in those industries they earn $4 an hour, where in alternative opportunities in the economy they would earn $3, you can attribute the benefits of the extra dollar an hour to the project, but you cannot attribute the whole $4 an hour.

Chairman PROXMIRE. I would like to ask you gentleman now about something that has troubled me very, very much and see if there is any rationale at all in the economic profession or on economic theory grounds for the discrepancy we now have in our Federal agencies in applying discount factors.

The Comptroller General's report, with which I am sure you are familiar, showed the variation which grows from 3 percent, in fact, zero in some cases, a few, not many, but 3 is not uncommon and three and an eighth as we know is common, three and a quarter, three and an eighth, for the big public works investment, all the way up to—well, it is 10 percent for much of the Defense Department which represents a very large part of our total investment, and it goes up to 15 percent in some cases. In the Interior Department itself it varies from 3.1 to 12 percent.

Is there any justification for this variety? Would it be proper for the Congress to insist on a uniform discount rate for all agencies with-

out exception but with the instructions, of course, to provide for appropriate cost and benefits to adjust to the fact that you have this?

Mr. ECKSTEIN. It would be proper for the Congress to instruct the executive branch in that way. Perhaps it should be a minimum, because in the technology areas you probably should use higher rates. You should make some——

Chairman PROXMIRE. Oh, I see. Then, you say there should be a floor.

Mr. ECKSTEIN. Yes.

Chairman PROXMIRE. And that floor would be 7 to 8 percent, in your view——

Mr. ECKSTEIN. Yes. Then the technology areas——

Chairman PROXMIRE (continuing). Ten percent in Mr. Harberger's view, and then you have some of these programs which represent a high degree of technology. Let us see. One of the programs here is radiation pasteurization, for example, Atomic Energy Commission. Industry benefits, 15 percent. I do not know whether—that is what they apply now which is above what you recommend. I take it, you would not say they should come down.

Mr. Harberger?

Mr. HARBERGER. I think, Senator, the idea of a uniform discount rate for all Federal agencies has a great appeal and it is an idea that can be sold. I think that talking about, let us say, the whole problem of adjusting for risk is an extremely difficult one, and that the only basis on which one could argue for differential interest rates would be on grounds of risk. When you get to the question of risk, it is obviously not an agency-to-agency phenomenon so much as a project-to-project phenomenon, so even taking risk into consideration does not give you much of a basis for saying one agency should have a different discount rate than another agency.

My own preference would be to set upon a single risk-free discount rate, and then to say that agencies and the Bureau of the Budget should make appropriate allowance for risk in all of their projects and activities. The allowance that they make for risk may consist of raising the discount rate in certain cases above the risk-free one, but it may also consist in shading the benefits or possibility making special upward adjustment of costs.

Chairman PROXMIRE. That is our difficulty. There is so much political incentive involved here and political power involved that the more exceptions you make, in some cases you say you can raise the discount rates and in other cases you can shade the benefits, unless you have pretty firm and explicit guidelines, unless you are going to arrive at a fairly consistent discount rate it is going to be very hard to break this bad habit. You know how hard it is to change a situation in Government as it is when you have vested power involved as you have in this case. Men of great influence in the Senate are going to fight to the death on this. There could be a filibuster if we ever succeed in bringing a bill to the floor. It is going to be very, very hard to achieve this kind of reform in any event.

Mr. HARBERGER. I think if you operate with a risk-free discount rate of 8 percent, the options there are only one way. You either penalize a risky project by using a 9- or 10-percent rate, or you penalize

it by being extra conservative in the estimation of benefits and somewhat inflating your costs as a contingency factor.

All of these operate against the project. The only options anybody has is to be more conservative or more demanding, if you like, than an 8-percent risk-free rate would dictate.

Chairman PROXMIRE. I would like to ask you, Mr. Eckstein—as a former insider in the Government—I would like to ask your opinion on how you would proceed in achieving consistent interest rate policies in Federal agencies.

For example, should some Federal office undertake a study to develop a methodology for estimating the social opportunity cost of capital? Should some agency calculate this rate on an ongoing basis to be used by all agencies as a basic risk-free rate? If so, who should do it?

Mr. ECKSTEIN. I think it could be done, and should be done, by an agency which has an economic, scientific-economic research capability. It should be an agency which has no immediate stake in the outcome, which suggests a number of candidates. One possibility, of course, is the Council of Economic Advisers, although they are rather heavily occupied as it is. It could be the Office of Business Economics in the Department of Commerce. It could conceivably be the Federal Reserve System, although that might get into a question of the proper role of the Federal Reserve within the Government. It could be the Bureau of Labor Statistics. They have capable economists who could do it.

Chairman PROXMIRE. How about the Bureau of the Budget?

Mr. ECKSTEIN. The Bureau of the Budget could do it and I suppose it could be part of the standards that they set down.

Chairman PROXMIRE. They have the power.

Mr. ECKSTEIN. They could also make it stick. I would think that any effort of this type would have to be under Bureau of the Budget sponsorship. It is then really a personality question as much as anything else, whether the rate will command a greater respect in the Government if it is done inside the Bureau or by somebody, some economists' shop somewhat removed from the Bureau.

There is also a question whether such a study should have some panel of outsiders to get it as far removed from bureaucratic struggles as possible.

Chairman PROXMIRE. Well, I think if we are going to make progress in this area, and I hope and pray we are, I think the testimony we have had from you gentlemen and from the Comptroller General and others has been most helpful, but if we are going to do it we are going to have to have a far greater concern by the economic profession, that they recognize the wisdom of this kind of thing and maybe one way of getting at it should be a realization of what we do when we act as we have acted to cut expenditures this time. Many economists opposed that action. I happened to vote for it and supported it as did, of course, the majority of the Members of the House and Senate. We did it in a blind, overall way. The President may exert greater wisdom in exercising his discrimination, but we do not have a basis for determining priorities and it seems to me, here we begin to get them through this and development of PPB. We at least have some kind of a framework on which, when we have to reduce expenditures, and we hope in the future we are going to be in a position with an expand-

ing economy where we have this happier problem than the reverse, that we can make the decision rationally.

Do you not feel that this is going to take much greater concern by the economic profession and then hopefully, by the public? There is a tremendous political force, of course, for keeping Government expenditures under control. We know it has happened in the last couple of years, how enormously they have increased. We know that Dr. Schultze, when I asked him, said the end of the Vietnam war is not going to mean much of a cutback in defense expenditures. Nitze, when he testified before the Senate Appropriations Committee, said he thought we would have a budget of $75 million for defense after the Vietnam war is over. We have $82 million now, so not much of a saving is anticipated.

Under these circumstances and with the terrific problem of the cities and all the other demands that we are going to have that are now built in, we must continue and must expand. Unless we get something of this kind, it seems to me, that we are going to have the same pressure for keeping spending down but it is going to be much less rational. We are going to get a serious dissipation of the investment we should bring to bear in the areas where we should bring it to bear.

Mr. Harberger?

Mr. HARBERGER. Mr. Chairman, let me try to explain the apparent apathy of my colleagues. I think that Professor Eckstein and I are sort of quixotic in the interests and energies that we have put into the improvement of criteria for evaluation of public sector actions. When you actually think about how one could raise money in this country and improve economic efficiency, we first have the agriculture program under which, for the last several years, we have spent about $4 or $5 billion a year to take land out of cultivation, while with the other hand the Government is spending money on irrigation dams to bring land into cultivation. It does not take an economist to see that these two operations are working at cross purposes and one could save money on both sides and have the same amount of effectively cultivated acreage as we have now.

You look at the sugar program which is not only highly costly in terms of money, but is also highly costly in terms of total consumer welfare in the United States. The cost of this program to the economy as a whole has been estimated as high as $500 million a year.

You look at the oil depletion problem and the possibility of saving Federal money or raising further Federal money by a more rational approach to that.

These are things that are counted in the billions of dollars. Some of my colleagues look at the sort of thing I do and accuse me of nit-picking on the corners, trying to solve the last details of appropriate interest-rate policy or to explore the last nuances of the criteria by which we should measure benefits and costs. What about the big issues. If we cannot get people to recognize the wastes that are involved in so many obvious cases in our Federal spending pattern, how can we ever expect to get people down to the point where they are going to recognize the comparatively smaller differences about which this sort of analysis is concerned?

Chairman PROXMIRE. Now, we are talking about the biggest kind of investment. Dr. Eckstein and you, too, Dr. Harberger, have referred

to how this can apply not just to water projects, not just to the big public works projects, but it can apply across the board to a great deal, not all, obviously, but a great deal, of public expenditures, and that it can give us a much more objective criteria, at least, on the basis of which we exercise our value judgments. We are not going to be bound by this, not going to say we will never violate it but at least we will know what we are doing. We would not deceive ourselves by providing a discount rate that provides a benefit-cost ratio that is completely false. Because there is so much money involved and the people do not like to pay taxes and because taxes in the view of many people are already high, it would seem to me that we can summon a great deal of political support for a more rational approach once we can get the idea so that the economic profession espouses it and then the public picks it up.

Wherever I have had a chance to talk with people in my State, I found great support for this. But I am just wondering if the economics profession cannot do more with it.

Mr. ECKSTEIN. Mr. Chairman, the academic community can feel guilty on many scores and many issues where they were late rather than leading, but in this area I do not think we need to plead guilty. I think the basically correct answers have been developed over the last 15 years and have been available for at least 10 and it has just taken this long for the needs to become understood in the Government, and here in the Congress.

To me it is a source of great pleasure that a congressional committee would devote itself to this apparently obscure technical subject which in fact, is a very fundamental subject and guides our public—the interest rate does guide the pattern of public investment. So, I wish you well. [Laughter.] And I think if we can make progress on this at last, I think that is the way I have to put it, if at last we can make progress on this, we will have helped set the stage in a small way toward a more effective public effort in all our social programs.

Chairman PROXMIRE. You see, one of the difficulties is there is a tendency in some administrations, some a little more than others, not to reveal all the facts, not to give all the information and not to keep Congress as well informed as possible. After all, knowledge is power. When you know the score you are in a much better position, much more powerful position, to act than when you do not and I think that if administrations in the future will do their best to take the initiative in informing Congress on what PPB leads to, what it spells out, what these things can do in arriving at more rational decisions, then I think we can begin to make progress.

Let me just ask one more quick question. That was a rollcall, so I cannot detain you very long.

What assumption, if any, do you make, Mr. Harberger, with regard to monetary policy in your calculations about displacement of the private investment by Government investment and borrowing? Do you just assume monetary policy is fixed and established and will not vary? Obviously you could adjust monetary policy, could you not, to permit a greater rate of investment and then not displace, at least in the borrowing area, not displace private capital.

Mr. HARBERGER. I assume that within the context of the tax-fiscal system which is prevailing at a given moment in time, that monetary

policy operates to keep us from getting into a serious recession. In the background of my analysis is an active monetary policy aimed at preventing recession and inflation.

Chairman PROXMIRE. I guess that was the only other question I had, and I want to thank both you gentlemen for a superlative job. This is most helpful, much more so than I think you know. I know how you feel about these 15 years, Dr. Eckstein and Mr. Harberger, in which this has been known. We have moved like molasses in the winter, but I think we are beginning to understand this now and to make more progress on it. Certainly I am going to fight hard to get this committee to make as vigorous a recommendation as possible.

I would appreciate it if you gentleman would expand your remarks in any way you would like, if you wish to do so, when you review your transcripts for the record. We will send a few questions, perhaps, to supplement this at the time that you get your transcript for correction.

The subcommittee will stand in recess until tomorrow morning at 10 o'clock. We will meet in this room.

(Whereupon, at 11:50 a.m., the hearing was recessed, to reconvene at 10 a.m., Thursday, August 1, 1968.)

(The following material accompanied Dr. Eckstein's statement:)

Chapter IV. The Social Cost of Federal Financing from "Multiple Purpose River Development," Studies in Applied Economic Analysis, by John V. Krutilla and Otto Eckstein; published for Resources for the Future, Inc., by The Johns Hopkins Press, Baltimore, Md., 1958.

IV The Social Cost of Federal Financing

We have seen how the interest rate in the competitive model serves as a price in the capital market, bringing the savings preferences of consumers into consistency with the investment plans of business enterprises. Let us now extend the examination to investment undertaken by government.

Most of the activities of government are devoted to satisfying collective wants, wants which cannot be met through goods and services sold in the market place. Whenever the ballot box and the political process replace market choice, investment decisions will not be made by comparing the rate of return of investments with the market rate of interest.[1] Many of the collective goods produced by public investments are valued qualitatively, precluding computations of the rates of return which underlie private investment decisions. The costs are more specific, however; resources employed in a public undertaking have alternative uses in the production of marketable commodities and will, therefore, have a price which measures their opportunity cost.

This cost cannot be measured directly from the borrowing cost, since the funds are raised by taxation, but within the competitive

[1] Some goods, such as electric power, supplied by government are marketable; others, such as flood control, though nonmarketable, can be valued at prices established in related markets. Yet the fact that the investment decision is made in a political context results in the introduction of other considerations and makes it unlikely that the decision will be made in accordance with the economic principle alone.

model the social cost can easily be imputed. An analysis based upon the competitive model would go like this: The cost of capital is measured by the interest rate. Insofar as the necessary taxes reduce marginal investments of firms, they prevent the creation of a stream of returns whose relationship to the foregone investment would have been just equal to the interest rate. Similarly, taxes which fall on consumption reduce the present levels of consumption for which people are willing to pass up the opportunity of collecting the market rate of interest. In other words, the consumer places the same value on the expenditure of the marginal consumption dollar as on a perpetual income stream equal to the interest rate. Thus, if government desires to place an economic value on the cost of raising capital through taxation, it can simply apply the market rate of interest.[2]

Unfortunately, the American economy does not fit the competitive model closely enough to permit use of so simple a procedure. The substantial risk premiums in the terms on which business can borrow, and the rationing of credit to some businesses and to most consumers, preclude the existence of a unique rate of interest and prevent consideration of any single actual rate as a measure of the social cost of capital. Yet, in considering alternative methods of financing water resource development and in evaluating the economic worth of projects, reasonable estimates of the social cost of federal funds are essential. Since the market cannot be consulted for the price of capital, as competitive theory would suggest, it is necessary to derive an estimate by more complicated empirical procedures which take account of some of the complexities of the process by which savings are actually channeled into investment.

That is the task undertaken in this chapter. First, as background for our inquiry, we shall examine the salient facts about saving and borrowing in the United States in a recent year. Then, through the use of models, we shall attempt to derive a figure that can serve as a measure of the social cost of public funds used in development of water resources.

[2] This assumes that the taxes are raised without causing any distortion in decision-making. If there are tax-induced distortions in the economy's allocation of resources, the true social cost of raising capital by taxation will be greater than the market rate of interest.

Saving and Investment in the United States

Before turning to our methods of estimation, let us take a quick look at some rather rough, but revealing, figures about the capital formation of the United States in the year 1955, which will serve as a background for the analysis. Table 3 indicates the total gross investment of the major sectors of the economy, defined somewhat more broadly than in the standard national income accounts—though even the set of categories used here misses large amounts of investment by government. The startlingly large figure for households, $52 billion, is offset to a significant degree by the depreciation of "durables" which last only a relatively few years, and

TABLE 3. *Gross Capital Formation in the United States, 1955*

Sector	($ billion)	
Households:		
Residential construction	17	
Automobiles	17	
Other durables	18	52
Corporate business:		
Plant and equipment expenditures	25	
Inventory investment	4	
Other	1	30
Unincorporated business:		
Plant and equipment expenditures	4	4
Farms:		
Construction and equipment	4	4
Government:		
Federal construction	3	
State and local construction	9	12
Total		102

similarly for some of the other items. Yet it is clear that much investment occurs outside the business sectors; in fact each sector plays a significant part in the process of capital formation.

In the financing of these investments, there are significant depar-

tures from Chapter II's idealized picture, in which we assumed the savings of individuals to be the source of capital, with investors paying the market rate of interest on the requisite loans.[3] Households financed their purchases of automobiles in large part through installment credit, with the total outstanding increasing $4 billion over the year, an amount which is about half the net investment in cars after depreciation. About $15 billion of $17 billion of residential construction was offset by an increase in mortgages,[4] but the $18 billion of other durables was financed out of income for the sector as a whole. The Department of Commerce reports total personal saving to be $17 billion, but this figure does not reflect the borrowing done by households in the form of mortgages. If we subtract money borrowed in this way, we find that net personal saving is at most $2 billion or $3 billion. That is, the household sector—which in our theoretical model was to provide the savings for the business sector—actually saved little more than it invested in its own durables.

Of the $30 billion of real investment carried on by corporations, $15 billion came from depreciation and amortization allowances and another $9 billion from retained earnings. Only the remaining $6 billion was financed by new securities—$2 billion in common stocks and $4 billion in bonds and notes. And of this total, public utilities issued all but $400 million of the stock and $2 billion of the bonds and notes. There was also an increase of bank loans of $4.5 billion, and an increase of other liabilities of $1.5 billion, but this was more than offset by the increase in customer receivables. Thus the business sector as a whole, other than public utilities, borrowed no more than 8 or 10 per cent of the funds for its real investment.

Unincorporated business, which is typically small, and for which our figures are much more sketchy, invested about $4 billion in plant and equipment. Much of the investment of this sector, which consists primarily of retail and other service establishments, consisted of the construction and improvement of stores, which were financed largely by mortgages and bank loans. But the sector as a whole withdrew relatively little from the capital market; repay-

[3] See W. A. Salant, "Saving, Investment, and Stability," *American Economic Review*, May 1956, pp. 42-54.

[4] This figure includes mortgages issued on old houses.

ments of old loans and mortgages roughly offset new ones.

The picture in agriculture is quite similar; $4 billion of construction and agricultural implements was financed principally through bank loans and mortgages, but the repayments of other farmers were at least equal to the borrowing.

Finally, $12 billion of construction was carried on by government. The $9 billion share of state and local government led to the issuance of $5 billion of new securities, but surpluses run by other state and local bodies reduced the net deficit of the sector to $1.5 billion. The federal government invested at least $3 billion in construction, a figure which omits much military work, but this was entirely financed out of taxes, and there was a net cash surplus of $2.7 billion for the year. Foreign investment for the year was negative, with repayments exceeding new investments by $300 million.

It can be seen from these figures that the net borrowing of the various sectors is less than 10 per cent of the total capital formation for the economy as a whole. This is significant. On both the lending and borrowing side of the capital market we need to take a second look at the factors that determine the level of investment and of saving for each group of decision-makers.

The significance of the small amount of net borrowing or lending of the sectors depends, in part, on the degree to which the lenders provide funds for the borrowers within the same sector. To some extent, there is a common capital market for all sectors, in which some personal, business, and government savings are commingled through the activities of financial intermediary institutions. But, at least in the case of the household sector, we find the capital flows primarily within the sector. Of the $15 billion of mortgages, savings and loan associations acquired $5.4 billion; life insurance companies, $3 billion; mutual savings banks, $2.4 billion; individuals, $2.4 billion; and commercial banks, $1.7 billion. All but the last of these sources administer the savings of individuals and, even in the latter category, much of the money available for mortgages springs out of individuals' time deposits. As for the $5 billion of installment and other credit, the household credit corporations which handle the largest part of this paper raise their own funds by sale of their notes to insurance companies and other financial intermediaries who draw the bulk of their funds from individual savings.

For the other sectors, the case is not so clear. Corporate securities draw on a wide variety of sources. Unincorporated business is financed in part by bank loans—which, to a considerable extent represent money created by the banking system—and in part by loans from individuals who are willing either to invest in the business or to lend the owner money because of ties of friendship or family. The securities of state and local governments, because of their tax-exempt feature, are particularly attractive to individuals with very large incomes, and thus can be assumed to draw on individual savings. Capital for agriculture is supplied in the form of mortgages by banks and insurance companies and in the form of loans by commercial banks.

Interest Rates in the American Economy

There is no one interest rate—capital is offered on a very wide range of terms. Bonds, notes, and other debt instruments of governments and corporations find a ready market at rates ranging from 2 to 5 per cent, depending on the terms of the loan and the credit standing of the issuer. Mortgages of good quality are financed at rates between 4½ and 6 per cent, though this rate is kept low by government guarantees of a large part of the total. Other consumer credit is expensive, ranging from 5 to over 25 per cent, with the typical automobile installment loan held by a large credit company costing 9 to 12 per cent. Yet the sales finance companies are able to raise their funds at rates below 4 per cent. The difference between their lending and borrowing rates is explained by the high cost of administration and collection, the pooling of many small, risky loans to reduce risk, and substantial profits. Bank loans to corporations and unincorporated business may cost from 3 to 6 per cent, depending on size, the region of the country, and the credit standing of the borrower, but their availability is strictly rationed to each firm. Loans to agriculture, while only slightly more expensive, are even more severely rationed to each farmer. Most personal saving, in the form of savings accounts, insurance, and pensions, receives a return of 3 per cent or so, with investments in common stocks the only substantial exception. And stock ownership is still restricted to a relatively small

proportion of savers, who receive an income yield of only 4 per cent, but who have been receiving large capital gains.

Measuring the Social Cost of Public Capital: The Method of this Study

The task of discovering the true social cost of the capital devoted to water resource development under actual conditions is much more difficult than if our theoretical model applied in a straightforward way. The model determines one interest rate for each period, a rate which indicates both the opportunity cost of capital in other fields and the rate at which consumers are willing to give up present income for a future income stream. In reality, there are many interest rates for both borrowers and lenders, and we are not free to fasten upon any one of them for our purpose. Yet the sound formulation of public policy requires some clear idea about this social cost. Use of a rate which is much too low may result in the waste of the nation's capital in a project yielding less satisfaction to consumers than if left in its alternative use. Use of an excessively high rate will leave water resources underdeveloped as compared to other resources in the nation's economy. For the typical problem of financing public investment by taxation, we, therefore, need to derive an appropriate estimate for the social cost of capital.

Our method will take account of the actual structure of capital flows in the United States. First, we shall try to determine where the tax money that provides the capital used for federal resource development actually comes from—that is, the incidence of the marginal tax dollars. This requires quantitative study of the revenues produced by different taxes, the persons and organizations who pay these taxes, and the extent to which taxpayers are able to shift their tax liabilities to others. It also requires that we assume in what proportion the various taxes would be increased were the program to be expanded, or which ones would be cut in the event of contraction. Once we know the sources of the money, we can proceed to the second stage and estimate what value attaches to these funds in their alternative uses.

When government imposes taxes in order to finance public investments, it levies a compulsory loan or forced saving on the

community, which releases the resources for the undertaking. The taxes lead to a reduction of consumption by households, to a decline in investment, or both. The social cost of the capital raised from foregone investment is clear: the investments would have yielded a certain rate of return to the community which would have increased the future flow of real national income. The social cost, therefore, is equal to the foregone rate of return on private investments.

To estimate the cost of funds which would have been spent for consumption, we must turn to the saving and borrowing behavior of households. Each individual has certain preferences about the allocation of his expenditures over time, more particularly, the allocation between present and future consumption. If he postpones consumption, he earns interest on the resultant saving; if he pays outstanding debts he reduces his interest payments accordingly. A rational consumer will allocate his expenditures over time in such manner that the rate at which he is willing to give up present consumption for the income stream made possible by the resultant increase of his saving will be equal to the interest rate which he faces in making this choice. Thus, a saver will push his consumption to the point where the satisfaction of a future income stream equal to the interest rate is exactly equal to the satisfaction he derives from the marginal dollar of consumption. Similarly, a borrower will derive satisfaction from his marginal dollar of consumption equal to the stream of interest payments he must make on this marginal expenditure dollar which he has borrowed.[5]

Figure 13 illustrates this optimum condition of consumer behavior. It shows the consumer's indifference map between present consumption expenditures and increases of his future annual consumption streams.

If the consumer's income in the present period is represented by point *a* (Figure 13-a), then he can reach any of the points on the two line segments, *ad* and *ae,* which start at that point. Moving to

[5] This formulation does not detail the intertemporal optimum conditions between all present and future periods and, hence, cannot describe the entire future time profile of an individual's consumption. It is sufficiently detailed for our limited purposes, however, and we seek to keep our assumptions as simple as possible. The same reasoning can be applied to the rate of substitution of consumption expenditures between any two periods, provided the entire structure of future interest rates is also known for the individual.

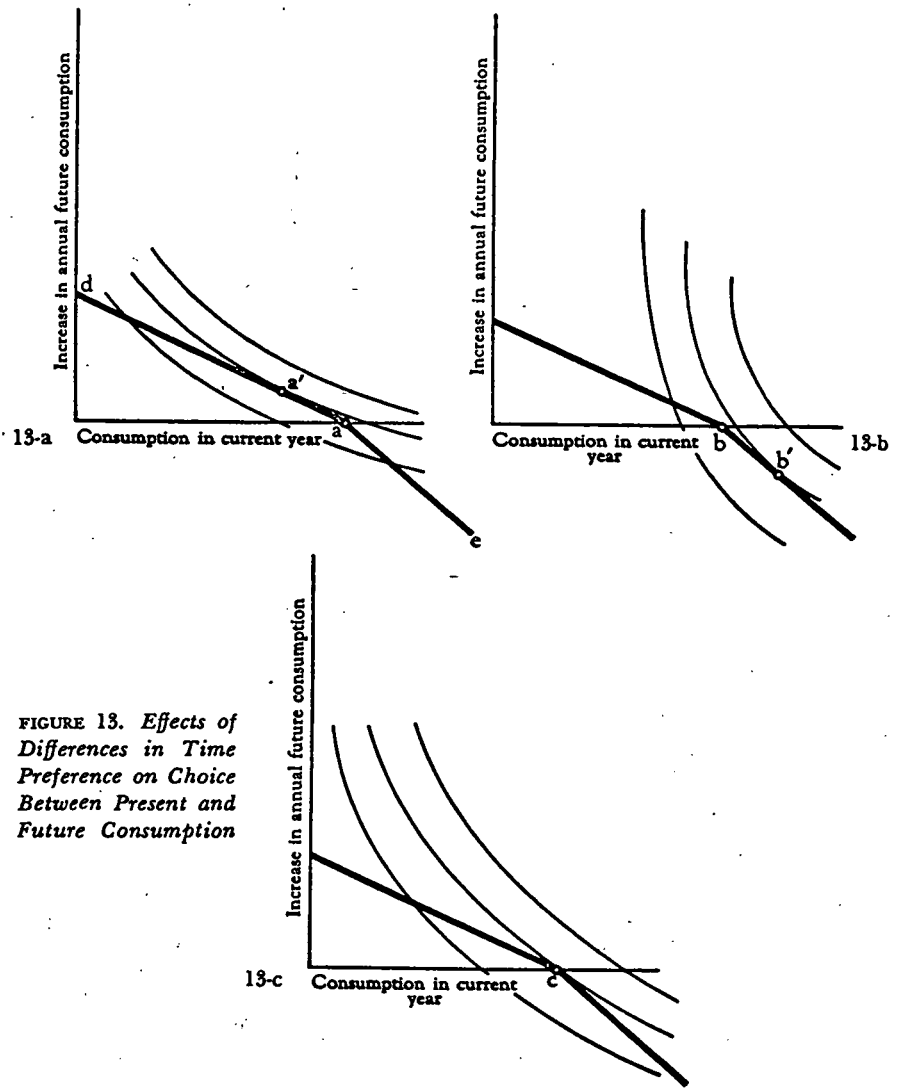

FIGURE 13. *Effects of Differences in Time Preference on Choice Between Present and Future Consumption*

the right along the steeper line means that he is borrowing to increase his present consumption at the expense of future diminished consumption; the slope of this line reflects the relatively high borrowing rate. Moving to the left on the less steep line represents saving out of present income at the relatively low interest rates that can be earned on savings accounts and other assets. It can be seen from the diagram that point *a'*, the point of tangency between the saving line and an indifference curve, is the preferred point that this individual can reach: it is on the highest attainable indifference curve. Point *b* (Figure 13-b) illustrates the case where the individual will borrow and thereby reach the preferred point *b'*, while point *c* (Figure 13-c) represents a situation where the individual does not find it worthwhile to lend at low rates or to borrow at high rates, and so simply spends his current income.

There are several fundamental factors which determine the general shape of a particular consumer's indifference map in any one period. First, there is the phase of the consumer's life cycle of earnings and of expenditure needs. A young married person—with an expectation of a rising income, with dependent children, and with large needs to fully equip his household with standard durables—has a high preference for current consumption expenditures. An older person, expecting a falling income and retirement, saves to increase his consumption later on, and so on. Second, an individual's attitude toward satisfaction enjoyed at different points of time will be reflected in this preference map. People with a very short horizon will have strong preferences for present consumption, while misers will favor the reverse. Third, a person's need and desire for providing for financial contingencies will help to determine these preferences. Many other factors could be cited, but this brief list at least indicates their general nature.

Much of consumer borrowing is for the sake of purchasing durables before sufficient cash can be set aside to pay for them; all mortgages and most installment paper fall in this category. Such borrowing, in a sense, is for investment rather than consumption, for in each instance the asset yields a return to the owner. The return may be monetary; a house, for example, reduces rent payments. It may be a saving of labor, as in the case of washing machines. The rest of the return may be in the form of satisfaction enjoyed directly, sometimes as extra convenience, often as the enjoyment of consumption through use of the durable. But whatever the form of the return, a rational consumer will borrow at a

given interest rate only if his enjoyment of the return is at a rate at least as great as his interest payments. Thus, we can assume that a person who is willing to pay 12 per cent interest on the purchase of a car on credit, or a homeowner paying 5 per cent on the mortgage on his house, presumably is enjoying satisfaction from these assets at rates at least equal to these figures.

In order to determine the social cost of funds raised through taxation of an individual with given preferences about his saving-borrowing behavior (or with given opportunities for investing in durables), we must ascertain the interest rates which he faces. A dollar of taxation is a reduction of his current income. If we can assume that the marginal dollar an individual spends for present consumption, or the dollar he saves, would be worth a future annual income stream equal to his interest rate, then the same interest rate would apply to the dollar required to pay an increase in taxes. Conversely, a tax reduction of a dollar can be converted into a future income stream equal to his interest rate. Interpreting taxation for public investment as a compulsory loan for the sake of future benefits, the social cost of this investment is equal to the interest rate which the government would have to offer to the taxed individuals to induce them to grant the loan voluntarily. Our analysis does not assume that all of the taxed money would have been saved voluntarily; presumably part of it would have been consumed. We assume only that the decision about the fraction to be saved is made rationally and in the light of the opportunities for changes in future income which the interest rate measures. These assumptions are sufficient to derive the value of marginal income in terms of a future stream which can be expressed as an interest rate. We can then apply this reasoning to marginal changes of income which are caused by taxation.

A further requirement for the estimate of the social cost of marginal tax dollars is to discover how these dollars are apportioned among the major categories of decision-making units that face different interest rates. This means allocation of the taxes between businesses and households, between borrowers and lenders, between borrowers at high rates and borrowers at moderate rates, and so on. For households, we use three categories—lenders, borrowers at mortgage rates, and borrowers at short-term credit rates—combined with a breakdown by income class. In the case of business, we estimate the effect on investment and its potential return, in accordance with the size of assets of the taxpaying firms.

Our analysis necessarily is confined to small changes in expenditures and taxation relative to the over-all levels of the federal budget. Large tax changes, such as a 30 per cent reduction in income taxes, would lead to such substantial shifts in consumers' decisions and in the rate-of-return schedules of business that assumptions of the present relationships between incomes, prices, interest rates, and rates of return would no longer be valid. There might be effects on consumers' incomes which would convert borrowers into savers, effects on the total amount of saving and of investment which might alter and shift the interest rate structure, and changes in the relative prices of consumer goods and capital goods which would result in a shift from investment to consumption in the private sector. Since all of water resource development absorbs little more than 1 per cent of the federal budget, any tax changes made possible by changes in this program would be so small as to be truly marginal; no limitation to the applicability of our analysis to this field is imposed by these considerations.

As with other criteria of economic efficiency, our measure abstracts from changes in the distribution of income. We view the public investment as a loan by society to itself in order to build certain physical investments. That is, we assume that it does not matter to whom benefits and costs accrue. In fact, much of the cost is usually borne by individuals who do not benefit from the investment, so that the distribution of income is changed. If we attached a different value to a dollar of cost or benefit for different groups, our efficiency measure would need to be modified. In the present context, the value of the addition of a dollar to the future income stream is assumed to be the same for all taxpayers and beneficiaries. And if we go beyond the measurement of cost and compare it with benefit, we make the additional assumption that who receives the benefits and costs is a matter of indifference. These are ethical judgments which each person is free to accept or reject. Insofar as our interest is focused on the increase in total national income and on the efficiency of particular programs in promoting this objective, this assumption serves as a means of isolating this facet of the problem from redistributive issues.[6]

[6] For further discussions of this question, see the last sections of Chapters II and III. In the water resource field, this value judgment has been made explicit by the Congress in the Flood Control Act of 1936, where it is specified that benefits must exceed costs for a project "to whomsoever they may accrue," in order for a project to have economic feasibility and to be eligible for authorization.

Our quantitative analysis could be presented, with no substantive difference, either as an expansion of investment and a tax increase or as a contraction of investment and a tax cut. It is the change in taxes which is significant; it does not matter whether the public investments would increase existing taxes or prevent a possible reduction. Since the actual tax policy issues have appeared in terms of tax reductions in recent years, we consider the problem from this point of view.

In order to measure the cost of capital for a wide range of taxes, we present two models using different sets of assumptions about the potential tax cuts which are forestalled by the public investments. In Model A, we assume that the personal income tax is reduced in a manner most advantageous to low-income families and that sales taxes are lowered. These tax cuts would primarily boost consumption. Model B consists of a reduction of the personal income tax with emphasis on upper-income brackets, combined with a reduction of the corporation income tax. This model would increase investment.

Throughout the analysis it is assumed that the government runs a successful stabilization policy. This is not to say that full employment and stable price levels prevail constantly, but only that neither major unemployment nor severe inflation is allowed to develop. This assumption accords both with the avowed objectives of the government and with the general setting assumed for federal resource development programs, and it corresponds with the record of recent years. Most of the data for our quantitative analysis are based on the year 1955, a year in which employment was high and prices stable, and the money supply was moderately tight.

In this context, a reduction in a specific government expenditure must be considered an autonomous change that must be offset by some weapon in the arsenal of the stabilizers. It is this reasoning which forces us to derive our estimates of social cost on the basis of specific counteracting fiscal or monetary policies.[7]

[7] Thus our procedure measures what Musgrave calls the "differential incidence" of expenditures (See R. A. Musgrave, "General Equilibrium Aspects of Incidence Theory," *American Economic Review*, May 1953, pp. 504-17). A reduction of expenditures by $1.00 may require an offsetting tax cut of less than $1.00, because the multiplier effects of the former may exceed the effects of tax reduction (see H. C. Wallich, "Income-Generating Effects of a Balanced Budget," *Quarterly Journal of Economics*, 1944, pp. 78-91). In our quantitative

This may seem to be a cumbersome procedure for deriving one number—the opportunity cost applicable to resource development funds. But there is no short cut. With capital coming from many sources, which face widely differing borrowing and lending rates of interest and whose saving and investment decisions are conditioned by altogether different factors, the actual impact of federally financed projects on the economic activities of the other sectors of the economy varies widely. It has been argued, for example, that the true opportunity cost of capital is the rate of return earned on the marginal investments of the most successful private firms, such as DuPont or General Motors, rates which before taxes are in excess of 20 per cent. But this is not the true opportunity cost; reduction of the federal program by $100 million would not result in expansion of investment by such firms of an equal amount. It has also been argued that the interest rate on long-term government bonds measures the social cost of public capital.[8] This rate is also inappropriate, because it presupposes that the entire cost of projects is financed out of voluntary bond purchases and that the risks attached to projects are borne by the buyers—two conditions that do not hold. A number of other easily derived rates can be supported by plausible arguments, but in the end the arguments break down. A sector-by-sector approach, assuming a specific incidence of marginal taxation, is far more trustworthy because it corresponds to the actual conditions under which public capital is raised.

Before embarking on our detailed quantitative study, a few precautionary comments should be made about our basic assumptions. We take it as axiomatic that a measure of the social cost of capital which is consistent with an economic efficiency approach must accept the sovereignty of consumers' choice, even in matters of

study, we assume that the fiscal authorities reduce taxes by the appropriate amount, i.e., an amount sufficient to result in the utilization of a bundle of resources equal to the quantity released by the reduction of expenditures. Thus, we assume constancy of effective demand. We also assume that our result is not affected by any redistributions of income attributable to the multiplier effects of the two offsetting changes in the budget.

[8] The practice of most agencies and the recommendations of Budget Bureau Circular A-47 and of the Sub-Committee on Benefits and Costs of the Federal Interagency River Basin Committee imply this position. See Otto Eckstein, *Water Resource Development: The Economics of Project Evaluation* (Cambridge: Harvard University Press, in press), Chapter IV, for a survey of actual practice.

allocation of expenditures over time, and particularly with regard to their decisions on how much to consume and how much to invest. It has been widely contended that consumers' sovereignty should be rejected for intertemporal choices because of the myopia of individuals,[9] which leads to inadequate amounts of saving and investment for society as a whole from a long-run point of view. It has also been contended that it is not the function of government slavishly to follow individual desires, but to act for unborn generations, to take the lead in providing for the future.

We do not reject these considerations and shall return to them later in this chapter. In some instances, they will be reflected in the higher social criteria which may supersede the efficiency criteria as we have defined them. But, throughout this study, we take the view that economic efficiency is one of the significant criteria and that it requires measurement of gains and costs in terms of the subjective valuations of the individuals who constitute our society. In the case of the cost of capital, we also look to individual preferences, and it is on this basis that we proceed.

Model A: A Tax Cut Stimulating Consumption

Our first tax model estimating the social cost of capital consists of reductions which are particularly favorable to low-income families. In Model A, 80 per cent of the tax cut is in the form of an increase in the personal exemption of the federal income tax. The other 20 per cent is assumed to go into a reduction of those federal excises which would, in fact, be most likely to take place. When our computations for each of these tax cuts are completed and the results combined, we arrive at the following applicable interest rates:

[9] M. Dobb, *On Economic Theory and Socialism* (New York: International Publishers, 1955), pp. 38-41, 73-77, 244-45, and 258-60; A. C. Pigou, *The Economics of Welfare* (4th ed.; London: Macmillan Company, 1932), pp. 22-30; W. J. Baumol, *Welfare Economics and the Theory of the State* (Cambridge: Harvard University Press, 1952), pp. 91-92; and R. H. Strotz, "Myopia and Inconsistency in Dynamic Utility Maximization," *Review of Economic Studies*, 1955-6, pp. 165-180.

	Per cent
Increased personal exemption	5.87
Reduced excises	5.49
Weighted average for Model A	5.79

INCREASING THE EXEMPTION OF THE PERSONAL INCOME TAX

A tax cut in the form of a higher exemption frequently has been proposed in Congress. Assuming that the income tax liabilities are not shifted, it is easy to compute the incidence of the tax cut by income classes. Let us suppose the exemption is raised by $1.00. The tax saving on the typical return in each income class depends upon the marginal tax rate paid; the saving for the income class also depends upon the number of exemptions claimed. It can be seen from Table 4 that most of the tax saving accrues to those with low and middle incomes—those with incomes of $5,000 or less.

TABLE 4. *Incidence by Income Classes of an Increase in the Personal Exemption*

Income class ($ thousand)	Number of exemptions[a] (000)	Tax saving per dollar[b] (cents)	Total tax saving ($ thousand)	Per cent distribution of tax saving
0 to 3	24,472	21	5,139	19.5
3 to 5	44,557	24	10,694	40.6
5 to 7.5	23,066	27	6,228	23.6
7.5 to 10	4,906	33	1,619	6.1
10 to 15	2,705	41	1,109	4.2
15 to 20	984	50	492	1.9
20 to 30	839	59	495	1.9
30 to 50	507	67	340	1.3
50 to 100	223	79	176	.7
Over 100	63	90	57	.2

[a] U. S. Treasury Department, Internal Revenue Service, *Statistics of Income for 1951*, 1955, based on returns with taxable income.

[b] Marginal tax rates at average income tax liability reported in each class.

Discovery of the rates at which each income class saves or borrows requires examination of its asset and credit position. The

Survey of Consumer Finances provides relevant data on this question; they are summarized in Table 5. It shows, for each income class, what percentage of spending units have a significant amount of short-term consumer debt and mortgages.

TABLE 5. *Asset-Debt Position of Consumer*

	Income class		
	$0 to $3,000 (per cent)	$3,000 to $5,000 (per cent)	Over $5,000 (per cent)
Owed more than $100 of consumer debt	33	52	52
Owed mortgages only	5	8	11
Owed neither kind of debt	62	40	37

Source: 1956 Survey of Consumer Finances, "Consumer Indebtedness," *Federal Reserve Bulletin,* July 1956, p. 702.

To derive the interest rates on which consumers make their marginal borrowing-saving decisions, we must estimate the rate of return earned on their assets and the rates paid on their debts. Let us assume that the interest paid on the assets held by debt-free households is 3 per cent, a rate typical of the savings accounts and U. S. government bonds into which most households in the lower-income brackets put their savings. To take account of the higher returns earned on common stock by 15 per cent of the class with incomes above $5,000,[10] we increase this rate to 3.75 per cent for the class with no debts.

A rate of 5 per cent is applied to mortgage loans. This rate is somewhat above that charged on loans guaranteed by the Federal Housing Administration or the Veterans Administration, but corresponds to rates on conventional first mortgages and allows for the considerably higher rates which prevail on second mortgages.[11]

As for interest on short-term consumer credit, rates vary widely, from less than 6 per cent on some personal bank loans (and 0 per

[10] 1955 Survey of Consumer Finances, "The Financial Position of Consumers," *Federal Reserve Bulletin,* June 1955, p. 621.

[11] This rate corresponds to the findings of Morton for 1947. See J. E. Morton, *Urban Mortgage Lending Experience,* National Bureau of Economic Research (Princeton: Princeton University Press, 1956), pp. 80-81.

cent on loans within families) to over 30 per cent on some small loans of finance companies. This range can be narrowed by studying the composition of personal debt. Of the $36 billion outstanding at the end of 1955, $14 billion was automobile paper.[12] The rates of most automobile paper were between 8 and 12 per cent, with that held by banks near the lower figure and by finance companies near the higher one. Another $6 billion was for other consumer goods paper, which has comparable rates. Personal loans constituted $8 billion. Of these the small loans which bore very high rates were offset to some degree by low rates on bank loans available to the best of the credit risks. Of the remaining, about half were charge accounts and the rest were service credit and repair and modernization loans. The rates on these categories tended to be relatively low, ranging from 6 per cent on regular charge accounts to 9 per cent on modernization loans. The average rate for personal debt suggested by these figures is about 10 per cent. A breakdown by type of holder is consistent with this estimate, since banks hold 33 per cent, credit unions 5 per cent, stores 25 per cent, sales finance companies 28 per cent, and others 9 per cent. It would be incorrect, however, to assume that all income classes pay the same rates. Generally, poorer people obtain small loans at very high rates and borrow from sales finance companies for their durable goods purchases; those with higher incomes are able to obtain bank loans and have charge accounts. To allow for this factor, we assume a rate of 12 per cent for consumer credit for those with the lowest income and a rate of 9 per cent for the rest.

Interest payments are deductible from federal income taxation. This implies that the actual rate which governs the choice of consumers is not the rate paid, but the rate adjusted for the saving in taxes. But the applicability of this reasoning is limited by the wide use of the standard deduction in income tax returns. Itemized deductions were made on only 8 per cent of the returns for $3,000 or less; 24 per cent for $3,000 to $5,000; and 40 per cent for $5,000 and over. Because the tax saving from this source is usually more significant in the case of mortgages, we use the borrowing rate after taxes only in the case of households with mortgages.

[12] U. S. Department of Commerce, *Survey of Current Business*, March 1956, p. S-16.

Interest receipts, on the other hand, are taxable income, which again argues for the use of interest rates after taxes. But the amounts of interest received are relatively small for most households and frequently are not reported to the tax collectors. Only 7 per cent of returns with incomes below $5,000, and 20 per cent with higher incomes, reported interest receipts.[13] Therefore, we use the before-tax interest rates except for half of the interest recipients with top incomes.

Our set of categories for assigning interest rates to households does not properly describe one group in the debt-free households. The fact that the largest percentage of debt-free households is found among the lowest incomes does not mean that low-income families have less need for credit. Rather, many of these families are not sufficiently good credit risks to get any loans except small loans at very unattractive terms. It would be incorrect to assume that these families make their borrowing-saving decisions on a rate of 3 per cent. For a sizeable group of low-income families, the lack of the use of credit can be explained on other grounds. Unskilled workers are heavily represented; because their income reaches a peak relatively early in life, they have relatively little inducement to borrow. Still other low-income families consist of older people who are living on their capital; they also have no incentive to borrow. To take account of the group who wants credit but is too poor to obtain it, we assume that 20 per cent of the nonborrowers have a high time-preference and, if they were free to do so, would make use of short-term consumer credit at the usual rate of 12 per cent.

Table 6 gives the rates derived in the manner we have indicated, with adjustments for taxes incorporated in the figures. Table 7 gives the distribution of households by income class, asset-debt position, and by their marginal borrowing or lending rates. Those who owe both consumer debt and mortgages are considered to be paying the higher borrowing rate (that for consumer debt), which is the rate that must be considered marginal. Low-income families unable to borrow at reasonable rates are listed separately.

[13]U. S. Treasury Department, Internal Revenue Service, *Statistics of Income for 1952, Preliminary Report.* These figures include returns reporting miscellaneous income on the federal income tax form 1040a. We apply after-tax interest rates to one-half the interest recipients in the top class because that is the degree of compliance suggested by our asset-debt data.

TABLE 6. *Interest Rates Faced by Households in Their Saving-Spending Decisions*

	Interest rates for income class		
	$0 to $3,000 (per cent)	$3,000 to $5,000 (per cent)	Over $5,000 (per cent)
Owed more than $100 of consumer debt	12.0	8.3	7.3
Owed mortgages only	4.0	3.9	3.5
Owed neither kind of debt and held savings	3.0	3.0	3.2
Unable to borrow at reasonable rates	12.0	..	..

Source: See text.

The table also gives the average rate for each income class and the distribution of tax savings caused by an increase of the personal exemption. The final figure, computed by weighting the average rates applicable to the three income classes by their shares of tax savings, is equal to 5.87 per cent.[14] This is the rate which our quantitative analysis suggests as the proper measure of value to consumers of the tax savings made possible by an increase in the exemption of the personal income tax.[15]

[14] The use of income classes as defined by the Internal Revenue Service in combination with the definitions of the Survey of Consumer Finances introduces a slight upward bias into the estimate. The Survey's "spending unit" includes all related persons living together who pool their incomes, while the Internal Revenue Service gives its figures in terms of tax returns. Since some spending units will file several tax returns, relatively fewer spending units will fall into our lowest-income class. This bias is accentuated by the fact that our tax data pertain to 1951, when incomes were lower than in 1955. Data for the distribution of income from the two sources suggest that as many as one-half of the returns filed in the lowest-income class in 1951 should be assigned to "spending units" in the next income class in 1955. Similarly, the data suggest that one-third of all returns filed in the middle-income class in 1951 belonged to "spending units" in the highest class in 1955. On these assumptions, our estimate for the interest rate would fall to 5.70 per cent. This probably overstates the bias since the Survey's sample appears to underrepresent low-income "spending units."

[15] Our analysis has not endeavored to impute a rate of return to the investments made possible by the increased savings of consumers. Presumably, a return greater than the borrowing cost is earned on these investments, which serves as an inducement for the investor. An estimate of this extra return requires identification of the marginal borrowers to whom these investible funds

TABLE 7. *The Average Interest Rate Applicable to the Distribution of Tax Savings From Increasing Personal Exemption Based on Distribution of Spending Units by Income Class, Asset-Debt Position, and Marginal Borrowing or Lending Rates of Interest*

Item	Income class					
	$0 to $3,000		$3,000 to $5,000		Over $5,000	
	(1) Per cent of units [a]	(2) Interest rate [b] (per cent)	(3) Per cent of units [a]	(4) Interest rate [b] (per cent)	(5) Per cent of units [a]	(6) Interest rate [b] (per cent)
Owed more than $100 of consumer debt ..	33	12.0	52	8.3	52	7.3
Owed mortgages only	5	4.0	8	3.9	11	3.5
Owed neither kind of debt	50	3.0	40	3.0	37	3.2
Unable to borrow at reasonable rates [b]	12	12.0	—	—	—	—
Average rate for each income class		7.0		5.8		5.4
Percentage distribution of tax saving [c]		19.5		40.6		39.9
Average applicable interest rate						5.87

[a] 1956 Survey of Consumer Finances, *op. cit.*
[b] See text.
[c] *Statistics of Income for 1951, op. cit.*

REDUCING SELECTED EXCISE TAXES

In addition to the increase in personal exemption, amounting to 80 per cent of the tax cut, our Model A calls for a cut in excise taxes sufficient to make up 20 per cent of the decline in government revenue. We assume a reduction for only those commodities which seem likely to be affected by an actual move to cut excises. Thus, all road-user taxes are excluded because they have been set aside to finance the expanding federal highway program. Taxes on alcoholic beverages and tobacco are ruled out because they are imposed, in part, for noneconomic reasons and have a long-accepted place in the federal revenue structure. We treat the remaining excises as if they were cut proportionately, and assume that the price elasticity of consumer demand is such that the relative increase in sales will be the same for all commodities in question. These two assumptions imply that the proportionate cut in tax rates leads to a proportionate fall in the revenues from the various excises.

The incidence of excise taxes is usually assumed to fall on the consumer.[16] The incidence by income classes, then, depends on the distribution of the tax cut among commodities and on their income elasticity. Table 8 sheds some light on this question. It lists the major federal excises, shows the revenues derived from them and their percentage distribution, and gives estimates of the income elasticities of the commodities which have been made by the U. S. Department of Commerce. Using the distribution of taxes as weights, an average income elasticity is computed for the entire excise tax cut. Both the prewar and postwar figures produce an

would be made available, a task we shall not assay. Were we to assume that the return above borrowing cost is 3 per cent—a liberal figure in view of the low- and middle-income sources of these savings and the channels into which their savings usually flow—and were we to apply marginal propensities to save by income classes (see footnotes to Table 14) to estimate the share of the tax cut that would be saved, we would increase our estimate by .12 percentage points, resulting in a figure of 5.99 per cent.

[16] Musgrave and Tucker followed this assumption in their studies of tax incidence. (See R. A. Musgrave, J. J. Carroll, L. D. Cook, and L. Frane, "Distribution of Tax Payments by Income Groups: A Case Study for 1948," *National Tax Journal*, March 1951; and R. S. Tucker, "Distribution of Tax Burdens in 1948," *ibid.*, September 1951.) This assumption is only a first approximation and overlooks the effects of product substitution.

TABLE 8. *Excise Taxes and Income Elasticities for Selected Goods and Services*

Commodity	Tax revenue[a] ($ million)	Per cent of tax revenue	Income elasticity[b] 1929-40	Income elasticity[b] 1947-54
Musical instruments and radios	248	12.3	2.5	1.1
Records	8	.4	2.5	1.1
Appliances	107	5.3	1.3	0.3
Cameras	15	.7	1.5	0.6
Jewelry	142	7.1	1.8	0.3
Furs	27	1.3	1.5	1.5
Toiletries	72	3.6	0.8	0.5
Luggage	51	2.5	1.1	1.3
Admissions	189	9.4	0.8	−0.4
Telephone	520	25.9	0.5	1.7
Transportation	632	31.4	1.1	1.1
Average elasticity			1.15	1.00

[a] U. S. Treasury Department, *Treasury Bulletin,* March 1956. Figures are for fiscal 1955.

[b] U. S. Department of Commerce, "Consumer Expenditure Patterns," *Survey of Current Business,* September 1955, pp. 23-32. These estimates are based on time series analysis and are of questionable statistical validity in view of the small number of observations and the strong trends in some of the series. But the similarity of the results for the average of the two periods offers considerable evidence that the actual value is not far removed from 1.0. It may appear puzzling that these luxuries do not have a higher elasticity; but the result can be explained by the wide range of goods and prices offered in each category.

estimate very close to 1.0, which implies an incidence of the taxes among income classes similar to the distribution of income.[17]

Table 9 shows the distribution of family income and the interest rates applicable to the tax saving in each class. Averaging the rates by using the income distribution as weights, gives us the

[17] Rolph has put forth the view that factors of production bear the cost of excise taxes through backward shifting. Our computation is consistent with this assumption if the changes in factor payment are proportional, for this will distribute the tax saving among income classes in accordance with the distribution of income. See E. R. Rolph, "A Proposed Revision of Excise Tax Theory," *Journal of Political Economy,* April 1952, pp. 102-17.

interest rate applicable to this form of tax cut.[18] This rate turns out to be 5.49 per cent.

Averaging the 5.87 per cent rate for the increased personal exemption and the 5.49 per cent for excise cuts, weighted by their relative importance, we get an over-all estimate of the applicable rate under the tax assumptions of Model A, which is equal to 5.79 per cent.

TABLE 9. *Reduction of Selected Excise Taxes: Distribution of Income and Applicable Interest Rates, 1955*

Family income class ($ thousand)	Family personal income [a] ($ billion)	Per cent distribution before tax	Per cent distribution after tax [b]	Applicable interest rate [c] (per cent)
0 to 3	25.0	9	10	7.0
3 to 5	59.1	21	22	5.8
5 to 7.5	81.6	28	28	5.8
7.5 to 10	47.1	16	16	5.4
10 to 15	29.3	10	10	5.0
Over 15	46.0	16	14	4.6
Average applicable interest rate				5.49

[a] S. F. Goldsmith, "Income Distribution in the United States, 1952-55," *Survey of Current Business, op. cit.*, June 1956, pp. 9-16. Our income classes have to be defined as income before tax because the *Survey* data on which our interest rates are based are given that way.

[b] Since the income elasticities were derived from regressions on disposable, or after-tax, income, it is the distribution of income after taxes which supplies the proper weights for our average interest rate. The distribution after taxes was computed by applying the average tax rate for each income class (given in the Goldsmith article cited above) to the before-tax income.

[c] The rates for the lower brackets are carried over from the preceding section. The breakdown in the upper brackets is derived in detail in the discussion of Model B.

[18] A reduction of excise taxes is less likely than a reduction of income taxes to result in accrual of additional returns to marginal investors to whom additional private savings are made available. This is because the tax cut leads to price reductions of consumer goods and hence induces some substitution of consumption for saving. While we cannot be sure that the substitution effect will exactly cancel the income effect on consumption, it is unlikely that the net result will be significant. The distribution of the tax cut among income classes, and particularly to high-consumption families, strengthens this conclusion.

Model B: A Tax Cut Stimulating Investment

In Model B, we make quite different assumptions about the tax cuts made possible by a reduction in expenditures, though we again try to cast our assumptions in a plausible form from a political point of view. We assume that 50 per cent of the reduction will be taken by reducing the rate structure of the personal income tax. Rather than assume a new rate schedule, we assume that it is the objective of the rate changes to reduce the tax bill of each taxpayer in the same proportion. Income tax payments represent a larger percentage of the income in higher brackets; therefore, such a tax cut would produce a more than proportionate increase in after-tax incomes in the higher-income classes and would, therefore, reduce the degree of progression of the personal tax structure. The remaining 50 per cent of the reduction is assumed to take the form of a cut in corporate income taxes, distributed among corporations in proportion to their tax liability. Combining the interest rates applicable to each of these tax cuts, we derive our over-all estimate for Model B as follows:

	Per cent
Proportionate reduction of personal income taxes	5.29
Proportionate cut in corporation taxes	5.59
Weighted Average for Model B	5.44

REDUCING PERSONAL INCOME TAX LIABILITIES PROPORTIONATELY

Much of the method applied in Model A can be used for the personal income tax cut favoring upper-income families. Let us first look at the distribution of tax savings among income classes, given in Table 10. Comparing the incidence of this tax cut with the incidence of an increase in the exemption, we find that much more of it accrues to high-income classes, 59 per cent of it to incomes over $7,500. Where Model A emphasized the asset-debt position of families with low and middle incomes, for whom the Survey of

Consumer Finances provides good coverage, Model B must give much more detailed estimates for the upper-income classes. Insofar as the tax cut does accrue to families with incomes below $5,000,

TABLE 10. *Incidence by Income Classes of a Proportionate Reduction of Income Tax Payments, 1954*

Family personal income ($ thousand)	Per cent distribution of income tax liability[a]
0 to 3	3.6
3 to 5	13.2
5 to 7.5	24.0
7.5 to 10	14.4
10 to 15	10.3
15 to 20	5.0
20 to 30	6.5
30 to 50	7.8
50 to 100	7.7
Over 100	7.5

[a] Goldsmith, *op cit.*, p. 15. The breakdown of the 34.5 per cent paid on incomes above $15,000 is in proportion to the tax liabilities of these classes in 1952, as given in the *Statistics of Income for 1952, Preliminary Report*, U. S. Treasury Department, Internal Revenue Service.

we can simply use the interest rates derived earlier. But a somewhat different approach is required for the upper-income groups. In the lower brackets, the diversity of interest rates is explained primarily by the presence or absence of debt and by the kind of debt owed. In the upper brackets, the form of the assets from which income is derived and the rates at which such income is taxed are the most important variables.

First, we determine what proportion of families in each class has debts in such amounts that borrowing rates would dominate choices between spending and saving, and then estimate the relevant borrowing rates. For the remaining families, which include a rapidly increasing share as we go up the income scale, we try to determine the kind of earning assets from which they derive their nonwage income and at what rates of return this income is received. Again, combining the distribution of incidence of the tax cut with the interest rates applicable to different income classes, we derive an average rate which measures the value of the money released by the postulated tax cut.

Table 11 presents the asset-debt position of households with incomes greater than $5,000. It shows a wide prevalence of debt, which results from lumping all incomes above $10,000 into one bracket. Since debt for consumption purposes falls rapidly in the higher brackets, in our subsequent analysis the figures for the bracket over $10,000 are applied only in the range $10,000 to $15,000. Also, in the higher brackets, the relevance of the borrowing rate ceases, because the rate of return on assets increases while the borrowing cost falls, until at some point on the income scale, the borrowing rate is no longer marginal—the return on assets playing the role instead. When that point is reached, consumer credit is likely to be in the form of charge accounts owed as a matter of convenience, and mortgages owed—in part—in order to raise funds for investment purposes.

Table 11 also shows the interest rates applicable to debtors in these income classes. As in Model A, rates of 9 per cent on short-term debt and 5 per cent on mortgages are used in deriving these rates, but in the case of the upper-income classes, it is assumed that interest payments are deducted from the tax liability and the rates are adjusted accordingly.

To derive the rates of return which upper-income families earn on their assets, we estimate asset holdings by income class and the rates applicable to each asset category. Table 12 shows in what form upper-income classes receive property income as reported in income tax returns.

TABLE 11. *Debt Position of Families with Incomes Over $5,000*

Income class ($ thousand)	Per cent owed more than $100 of short-term debt [a]	Per cent owed mortgages only [a]	Per cent owed neither kind of debt	Interest rate applicable to debtors (per cent)
5 to 7.5	56	11	33	6.2
7.5 to 10	52	22	26	5.6
Over 10	41	22	37	4.9

[a] 1956 Survey of Consumer Finances, *op. cit.*, pp. 701-03.

In the case of business and professional income, part is actually managerial wages or income earned for supplying professional services. While we have no direct data on this breakdown, the Department of Commerce has estimated that, in 1949, 11.3 per cent

of all incomes of $5,000 and over was professional income; 37.8 per cent, from farms; and the remaining 50.9 per cent from unincorporated business.[19] We consider all of the professional income to be a form of wages.[20] As for the income from farms and unincorporated business, we allow 50 per cent of the income as managerial

TABLE 12. *Percentage Breakdown of Nonwage Income in Upper-Income Classes*[a]

Income class ($ thousand)	Business and professional	Dividends plus retained earning	Rent	Interest	Income from trusts
5 to 7.5	69.9	14.2	8.9	5.0	2.1
7.5 to 10	67.0	17.0	6.9	6.2	2.7
10 to 15	67.0	18.4	6.7	4.5	3.4
15 to 20	66.3	19.6	6.1	4.2	4.0
20 to 30	62.7	21.8	5.9	4.2	5.3
30 to 50	58.6	26.1	5.5	4.0	5.8
50 to 100	46.3	36.4	5.5	3.9	8.2
Over 100	22.2	56.8	4.3	2.9	13.9

[a] *Statistics of Income for 1952, Preliminary Report, op. cit.* Direct data on the holdings of assets of investors, not derived from tax information, are generally consistent with the figures given here. See J. K. Butters, L. E. Thompson, and L. L. Bollinger, *Effects of Taxation on Investment by Individuals* (Boston: Graduate School of Business Administration, Harvard University, 1953), p: 468.

TABLE 13. *Percentage Breakdown of Income from Assets in Upper-Income Classes*

Income class ($ thousand)	Business	Dividends plus retained earnings	Rent	Interest	Income from trusts
5 to 7.5	56.4	20.6	12.9	7.2	3.0
7.5 to 10	47.5	27.2	11.1	9.9	4.3
10 to 15	47.4	29.4	10.7	7.2	5.4
15 to 20	46.5	31.0	9.6	6.6	6.3
20 to 30	42.7	33.5	9.1	6.5	8.2
30 to 50	38.2	39.0	8.2	6.0	8.6
50 to 100	27.5	49.0	7.4	5.2	10.9
Over 100	10.9	64.2	5.1	3.3	15.8

[19] U. S. Department of Commerce, *National Income, 1954 Edition, A Supplement to the Survey of Current Business*, p. 76.

[20] While many professions require considerable investment in equipment, a reduction in income would not be likely to affect this kind of investment.

wages and the remainder as income earned on assets. Table 13 gives the distribution of income from assets which is implied by these assumptions.

Turning to the rates of return, Figure 14 throws considerable light on prevailing rates in unincorporated business. Each dot on the frequency distribution indicates the median rate of return of a sample of firms in an industry. Most of the firms have assets in excess of $50,000—the proper size to yield incomes which fall into the brackets with which we are concerned. Both the means and the medians of the industry medians fall very close to 6 per cent [21]

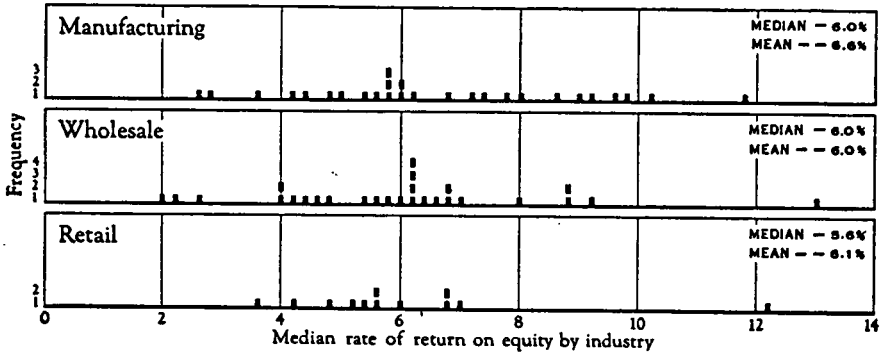

FIGURE 14. *Rates of Return in Small and Medium-Sized Firms*
Source: Dun's Review, October, November, and December 1955. Data compiled by Roy A. Foulke.

for all three categories of data; we use this figure as our estimate. In the case of farming, the average rate of return on investment, after allowing for the value of operator and family labor, has been estimated at 4.9 per cent for the year 1949, although the return in 38 per cent of the regions of the United States is in excess of 6 per cent.[22] The subsequent deterioration of farm prices has lowered the average return. But we are concerned with farms yielding an income in excess of $7,500, earned only on the farms which are the

[21] Use of the median assures that the presence of a few large firms or of a few extreme values will not bias the estimates.

[22] E. G. Strand, E. O. Heady, and J. A. Seagraves, *Productivity of Resources Used on Commercial Farms,* U. S. Department of Agriculture, Technical Bulletin No. 1128, November 1955, p. 50.

largest and most successful, and located in the better regions, and so we assume a rate of return of 6 per cent to apply.

Treatment of the returns on stock poses severe problems. The *ex post* rate of return has been extremely high in recent years because of the doubling of common stock prices. If we considered all capital gains to be income, the annual rate of return of recent years would exceed 15 per cent. But in making decisions, individuals did not fully anticipate these capital gains, nor would it be realistic to suppose that this rate will continue indefinitely. Yet, it also would be unrealistic to exclude all capital gains, since the high rate of income retention of corporations makes likely the continued growth of the value of stocks. To take account of this factor, we assume that the yield on stocks is equal to dividends plus retained earnings. In 1955, the average dividend yield on all common stock was 3.93 per cent; since only 50 per cent of earnings was paid out, we assume a total rate of return of 8 per cent.

Income from rent, interest, and trusts represents relatively small shares of total property income. For the rate of return on real estate, we use two sources. The first is profits of corporations whose main business is the holding of real estate. This has been at the rate of 12 per cent before taxes,[23] a figure which primarily represents commercial property and apartment houses. Second, for residential property as a whole, some unpublished investigations of R. Muth suggest an average rate of 5.5 per cent.[24] Since commercial property and residential property of above average profitability are likely to be held by individuals in the upper-income brackets, we assume that rental income is earned at a rate of return of 8 per cent. For interest, a rate of 3 per cent is assumed. This is slightly higher than the rates of 2.8 to 2.9 per cent which prevailed on government bonds in 1955, but lower than the average yield of 3.25 per cent on corporate bonds.[25] Finally, we assign an interest rate to income from trusts. Since the trusts represent various combinations of other assets, we simply assume that their rate of

[23] U. S. Treasury Department, Internal Revenue Service, *Statistics of Income for 1951* (Washington, D. C.: Government Printing Office, 1955), and *Statistics of Income for 1952, op. cit.*

[24] For an abstract, see R. F. Muth, "The Demand for Non-Farm Housing," *Econometrica*, April 1957, p. 365.

[25] Board of Governors, Federal Reserve System, *Federal Reserve Bulletin*, May 1956, p. 477.

return is equal to the average rate of return earned by the income class.

These rates have been stated before taxes. In the case of funds actually used for investment, this rate measures the social opportunity cost since the assets which the money makes possible yield this return. But in determining a rate of interest which measures the value of the funds used for consumption, we must use the rates of return that could be earned after taxes, since these are the rates which households actually face in making decisions. Table

TABLE 14. *Rates of Return Earned by Households, Adjusted for Taxes by Upper-Income Classes and Form of Property*

Income class ($ thousand)	Rates of return for form of property income (per cent)				
	Business income	Dividends plus retained earnings	Rent	Interest	Average rate of return [a] (per cent)
Rate of return before tax [b]	6.0	8.0	8.0	3.0	—
Rate of return after taxes by households [c] for:					
5 to 7.5	4.5	6.5	6.0	2.2	5.0
7.5 to 10	4.2	6.2	5.7	2.1	4.7
10 to 15	3.8	5.8	5.1	1.9	4.4
15 to 20	3.2	5.1	4.2	1.6	3.8
20 to 30	2.5	4.6	3.2	1.2	3.2
30 to 50	2.1	4.4	2.8	1.0	3.1
50 to 100	1.4	4.0	1.9	1.2	2.9
Over 100	0.7	3.4	0.9	0.9	2.8
Applicable rate of return [d] for:					
5 to 7.5	4.5	6.5	6.0	2.2	5.0
7.5 to 10	4.4	6.4	6.0	2.2	4.9
10 to 15	4.4	6.4	5.9	2.2	5.0
15 to 20	3.9	5.9	5.2	2.0	4.6
20 to 30	3.9	6.0	5.1	1.9	4.6
30 to 50	3.7	5.8	4.9	1.8	4.6
50 to 100	3.2	5.6	4.3	2.3	4.6
Over 100	2.8	5.2	3.7	1.9	4.6

[a] The average is weighted by the distribution of property income within the income class.

See text.

[c] The following marginal tax rates are applied to the respective income classes: .25, .29, .36, .47, .59, .65, .76, and .89. These rates represent the marginal rate in each income class as indicated by the average tax liability reported for the class. In applying the rates, half of the income from stock is considered long-term capital gain. Also 25 per cent of the interest income in the top two brackets is considered to be from tax-exempt bonds yielding an average of 2.6 per cent; this assumption is based on the findings of Butters, Thompson, and Bollinger, *op. cit.*, p. 468.

[d] These rates are derived as follows: We assume the following marginal propensities to save: 0, 12, 26, and 26 per cent respectively on the first four brackets, and 40 per cent on all brackets over $20,000. (Source: Survey of the Bureau of Labor Statistics to revise the Consumer Price Index, 1950, as reported in *Business Week,* June 16, 1956, p. 104; the figure for the top bracket is based on the 1936 survey of the National Resources Committee, reported in M. Bronfenbrenner, *et al.,* "A Study in Redistribution and Consumption," *Review of Economics and Statistics,* May 1955, p. 153, adjusted downward in accordance with the shift of the known portions of the consumption function.) We apply the rates after tax to the portion of the tax cut that would be consumed and the rates before tax to the share that would be invested, and then compute a weighted average.

These rates can be given an alternative interpretation to that of the text. Where the government is considered a "partner" in the ownership of the assets, the return in excess of the after-tax rate can be considered to be the return earned by the government on the assets. The rate at which taxes are paid on the part of the tax cut which is invested measures the government's share of the returns.

14 first gives the rates of return after taxes, and then shows the adjusted rates of return allowing for the higher rates that must be applied to the portion of the tax cut which is actually invested. Taking these adjusted rates in combination with the distribution of various kinds of property income of Table 13, we derive the average rates of return applicable to the property holders in each income class (final column of Table 14). Combining the resulting rates with the rates given for debtors in Table 11, we derive the average interest rate for the entire income class (column 3, Table 15). Finally, bringing in the rates for low-income classes from Model A, and the distribution of the tax cut from Table 10, we compute the over-all interest rate for this form of tax cut. These computations, summarized in Table 15, show an over-all rate of 5.29 per cent.[26]

[26] If we assume that an additional return of 3 per cent above borrowing cost accrues to the investors to whom the additional savings are made available, our

TABLE 15. *Summary of Derivation of Interest Rate Applicable to Proportionate Reduction of Personal Income Tax Payments*

Income class ($ thousand)	(1) Interest rate applicable to debtors (per cent)	(2) Interest rate applicable to investors (per cent)	(3) Average rate for class (per cent)	(4) Per cent distribution of tax cut
0 to 3	—	—	7.0	3.6
3 to 5	—	—	5.8	13.2
5 to 7.5	6.2	5.00	5.8	24.0
7.5 to 10	5.6	4.93	5.4	14.4
10 to 15	4.9	5.03	5.0	10.3
15 to 20	—	4.56	4.6	5.0
20 to 30	—	4.64	4.6	6.5
30 to 50	—	4.58	4.6	7.8
50 to 100	—	4.56	4.6	7.7
Over 100	—	4.63	4.6	7.5
Average applicable interest rate				5.29

Source: See text.

REDUCING THE CORPORATION INCOME TAX PROPORTIONATELY

In order to discover the interest rate applicable to a cut in the corporation income tax, we must first analyze its incidence. To what extent is it passed on to consumers through lower prices and to workers through higher wages? There is little evidence on these questions. Colm argues [27] that the benefit of the reductions after World War II accrued primarily to profits and, to some extent, to wages, but that under less inflationary conditions more of the tax cut would be passed on to consumers. Musgrave,[28] in his study of the incidence of taxation, assumes that 33 per cent of the tax is passed on to consumers and 12 per cent to wage and salary earners, leaving 55 per cent as the increase in corporate earnings. We adopt his assumption for our tax cut.

estimate is increased by .61 percentage points to 5.9 per cent. This probably overstates the effect, since the return to the investor is identical with the return to the saver on a large part of the property incomes.

[27] Gerhard Colm, "The Corporation and the Corporation Income Tax in the American Economy," *American Economic Review*, May 1954, p. 493.

[28] Musgrave, Carroll, Cook, and Frane, *op. cit.*, p. 16.

The interest rate applicable to the share of the tax cut benefiting wage and salary earners can be derived from the distribution of this form of income by income classes and our earlier estimates of interest rates. Similarly, the part of the tax cut passed on to consumers can be allocated to income classes in accordance with the distribution of consumption, and then be combined with our interest rates. The rates derived from these computations, summarized in Table 16, are 5.81 per cent for wage and salary earners and 5.68 per cent for consumers.

TABLE 16. *Derivation of Interest Rates Applicable to the Shares for Wages and Salaries and Consumption of a Reduction in the Corporation Income Tax*

Income class ($ thousand)	Per cent distribution of wages and salaries [a]	Per cent distribution of consumption [b]	Applicable interest rates [c] (per cent)
0 to 3	15	12	7.0
3 to 5	33	24	5.8
5 to 7.5	29	29	5.8
7.5 to 10	11	15	5.4
10 to 15	5	9	5.0
Over 15	7	11	4.6
Average applicable interest rate (per cent)	5.81	5.68	

[a] *Statistics of Income for 1952, op. cit.*, adjusted for 1955 conditions by applying the pattern of change of the distribution of personal income as reported in Goldsmith, *op. cit.*

[b] Assumes average propensities to consume in the respective income brackets as follows: 1.1, .96, .90, .82, .75, and .60. These propensities are taken from M. Bronfenbrenner, *et al., op. cit.;* values for the four lower income classes are based on Federal Reserve Board data for 1950; values of the two upper income classes are from National Resources Committee data for 1935-6, adjusted upward in accordance with the drift of the known portions of the consumption function.

[c] See Tables 7 and 15.

Part of the unshifted portion of the tax cut is passed on to dividend recipients. We use the relationships between dividends and earnings established by Lintner to discover the share going to dividends. He found that an increase in earnings will lead to a gradual increase in dividends until the traditional payout ratio of

the firm has been restored.[29] In the first year, dividends will rise 13.5 per cent of the increase in earnings; in subsequent years, the same percentage of the gap between the dividend paid in the previous period and the dividend called for by the firm's traditional payout ratio will be closed. For the country as a whole, the average payout ratio was about .50[30] in 1955, so a reduction of the tax by $1.00 will increase dividends 13.5¢ in the first year, 23.4¢ in the second year, and so on until the increase would equal 50¢. An average of these payments over a period of 100 years—a period corresponding to the economic life of water resource projects —would be 47¢. So, of the 54 per cent of the tax cut which accrues to increased profits, 47 per cent is passed on to dividend recipients. The distribution of dividends by income classes is given in Table 17. Applying the interest rates derived earlier, we find that a rate of 4.96 per cent is applicable to this portion of the tax cut.

These allocations leave 29.2 per cent of the tax cut as the increase of retained earnings. How much will the investment of the taxed firms increase as a result? To answer this question, we consider firms with assets greater than $10 million separately from smaller firms. This division into "large" and "small" corporations is necessary because the influence of the availability of additional funds on investment varies sharply with the size of the enterprise. We assume that 75 per cent of the tax is paid by large firms, 25 per cent by the rest.[31]

In regard to large corporations, Lintner cites a number of reasons

[29] J. Lintner, "Determinants of Corporate Savings," Chapter 14 in *Savings in the Modern Economy*, W. Heller, ed. (Minneapolis: University of Minnesota Press, 1953); and Lintner, "Distribution of Incomes of Corporations among Dividends, Retained Earnings and Taxes," *American Economic Review*, May 1956, pp. 97-113.

[30] *Statistics of Income for 1952, op. cit.* The payout ratio of small corporations is lower, and we assume a ratio of .35. This figure is an average of the payout ratios by asset size, weighted by the distribution of tax payments, and allowing for a gradual approach to the average ratio.

[31] In 1951, corporations with assets over $10 million paid 70.4 per cent of the tax (*Statistics of Income for 1951, op. cit.*). Figures for all corporations for 1951 are not yet available, but we can make a good estimate from the data on manufacturing. In this sector, which pays two-thirds of the entire tax, the percentage paid by large corporations rose from 76 to 82 per cent from 1951 to 1955. Our estimate assumes a somewhat smaller increase of taxes paid by large corporations outside manufacturing.

TABLE 17. *Derivation of Interest Rate Applicable to the Share of Corporation Income Tax Cut Benefiting Dividend Recipients*

Income class ($ thousand)	Per cent distribution of dividends [a]	Interest rate [b] (per cent)
0 to 3	4	7.0
3 to 5	6	5.8
5 to 7.5	8	5.8
7.5 to 10	7	5.4
10 to 15	11	5.0
15 to 20	7	4.6
20 to 30	11	4.6
30 to 50	13	4.6
50 to 100	14	4.6
Over 100	19	4.6
Average applicable interest rate ..		4.96

[a] *Statistics of Income for 1952, op. cit.*
[b] See Table 15.

for believing that the effect on real investment will be small.[82] Most corporations are forced to maintain a certain level of investment. Failure to expand capacity or to maintain a steady rate of reduction of costs, by jeopardizing the firm's competitive position in the industry, would pose a serious threat to its long-run future. Investment for diversification, which is usually motivated by a desire to reduce the variability of production levels and earnings, would also be relatively immune to changes in tax rates. If internally generated funds are inadequate for these purposes, the firm borrows. The effect on investment incentives caused by a tax rate which takes away part of a firm's profits on successful ventures, is, to a large extent, offset by the government's bearing part of the losses through reduced tax liability in the event of failure. Finally,

[82] J. Lintner, "Effects of Corporate Taxation on Real Investment," *American Economic Review*, May 1954, pp. 520-34. For an analysis of the effect of taxation on the conditions of supply of capital see J. K. Butters, "Federal Income Taxation and External vs. Internal Financing," *Journal of Finance*, September 1949, pp. 197-205. In times of very tight money, the effect on internal investment will be larger, of course. For a somewhat stronger emphasis on liquidity as an investment-determining variable, particularly in recessions, see J. Meyer and E. Kuh, "Acceleration and Related Theories of Investment: An Empirical Inquiry," *Review of Economics and Statistics*, August 1955, pp. 217-30.

in many instances, the limit to a firm's rate of expansion is not set by the diminishing attractiveness of profit opportunities in relation to borrowing costs, but rather by its supply of managerial personnel. The firm undertakes as much investment as its staff can handle successfully. Lintner believes this analysis to be particularly applicable in periods of high employment. In depressions, firms hesitate to borrow for fear of inability to repay, and the relationship between the levels of taxation and of investment becomes much stronger. Since our analysis supposes that a successful stabilization policy precludes depression, we assume that an increase of retained earnings of $1.00 would lead to only 10¢ of added investment in the firm. A rate of return of 21 per cent, the average rate of return of large corporations in 1955 before taxes,[33] is assumed for the share of the tax cut that would be invested by the firm.

The liquidity of the large firm would be increased by the remaining 90¢ of increased retained earnings. Firms with a significant amount of debt would be able to lower it; firms which raise funds by financing their accounts receivable could reduce this practice; those which are creditors would be able to increase their financial assets—consisting in the case of large corporations primarily of government securities.[34] Thus, the major share of the increase of retained earnings would add primarily to that large pool of low-interest, low-risk, relatively liquid capital into which excess corporation funds are channeled, and from which the loans of large corporations, governments, and financial institutions are drawn. An increase in the supply of loanable funds in this market would have several effects. To some extent, interest rates on low-risk securities would fall and the severity of rationing would diminish, leading to some increase of mortgages and perhaps even a small

[33] This figure is derived as follows: 78 per cent of the tax cut goes to manufacturing, 17 per cent to utilities, and 5 per cent to trade. The average rate of return of large corporations in manufacturing was 23.8 per cent (reported in *Quarterly Financial Report for Manufacturing Corporations, Fourth Quarter 1955,* Federal Trade Commission and Securities and Exchange Commission, Washington, April 1956). The rate for utilities was estimated directly from prevalent standards of rate regulation to be equal to 10 per cent. The rate for trade, which is equal to 20 per cent, assumes that it stood in the same ratio to the rate in manufacturing as in 1952. (Figures for 1952 from SEC data.) A weighted average yields our estimate. The concept of rate of return used by the SEC may overstate the actual rate by 1 to 2 per cent.

[34] C. E. Silberman, "The Big Corporate Lenders," *Fortune,* August 1956, p. 112.

increase of business borrowing. The effect of the drop in low-risk interest rates would be gradually diffused through the credit structure, as banks and other financial institutions adapted their portfolios to the changed pattern of interest yields. Because the primary impact of an increased supply of funds is on the low-interest, low-risk sector of the capital market, and only the spill-over occasioned by secondary repercussions makes funds available to risky investments producing higher yields, we assume an average rate of 5 per cent to apply to this part of our tax cut.

The investment behavior of small corporations is considerably more sensitive than that of large corporations to changes in tax rates.[35] Companies with high growth potential are affected most adversely by corporate taxes, which prevent internal accumulation of the capital they need. External sources of long-term capital are available to small companies only at high cost in terms of both money and loss of control.[36] The corporation income tax also diminishes the attraction of risky investments, since a small firm is less likely to be able to take advantage of the loss-offset provisions to reduce the tax liability on profitable operations. But the significance of these arguments should not be overstated. Not all small business would grow rapidly in the absence of taxes; the need for new capital of many companies is small and can be satisfied. A recent survey of the Department of Commerce [37] found that of all the firms in their sample, 56 per cent had no desire for outside financing, 24 per cent obtained all the funds they desired, 13 per cent obtained some, and only 7 per cent failed to obtain any. New firms were somewhat less successful in raising capital and, most significantly, it was the demand for long-term and, particularly, for equity funds which failed to be met. On the basis of this evidence, we assume that 50 per cent of the increase in retained earnings is invested within the small firm; to this we assign a rate of 18 per

[35] Lintner, "Effects of Corporate Taxation on Real Investment," *op. cit.*, p. 533.

[36] For an analysis of the case of the growing firm, see J. K. Butters and J. Lintner, *Effect of Federal Taxes on Growing Enterprises* (Boston: Graduate School of Business Administration, Harvard University, 1945).

[37] Loughlin F. McHugh and Jack N. Ciacco, "External Financing of Small and Medium-Size Business," *Survey of Current Business, op. cit.*, October 1955, pp. 15-22.

cent.[88] The remaining 50 per cent, we assume, is used to reduce bank loans or to purchase liquid assets, at a rate of 5 per cent. The computation for this form of tax cut is summarized in Table 18. The interest rate applicable to a reduction of the corporation income tax is 5.59 per cent.[89]

TABLE 18. *Summary of Derivation of Interest Rates Applicable to Proportionate Reduction of Corporation Income Tax Payments*

Incidence	Per cent of tax cut	Applicable interest rate (per cent)
Shares of tax cut:		
Shifted to consumers	33.3	5.68
Shifted to wage and salary earners	12.5	5.81
Left as increased corporate earnings	54.2	
Large corporations—Distribution of 75 per cent of total increased corporate earnings:		
47 per cent passed on in dividends	19.1	4.96
53 per cent retained as earnings of which		
10 per cent invested in firm	2.2	21.00
90 per cent reduces debt or loaned in market	19.4	5.00
Small corporations—Distribution of 25 per cent of total increased corporate earnings:		
35 per cent passed on in dividends	4.7	4.96
65 per cent retained as earnings, of which		
50 per cent is invested in firm	4.4	18.00
50 per cent reduces debt or loaned in market	4.4	5.00
Average applicable interest rate		5.59

Source: See text.

[88] This rate is obtained as follows: In manufacturing, to which 54 per cent of the tax cut accrues, the average rate of return of small corporations was 18 per cent in 1955 (*Quarterly Financial Report, op. cit.,*); for utilities, which pay 9 per cent of the tax, the rate is about 10 per cent; and in trade, which pays 18 per cent of the tax, the rate is 20 per cent (footnote 33). The remaining 19 per cent of the tax cut goes to finance, services, and construction; we assume that the average rate for small corporations applies here. A weighted average of these rates yields our estimate.

[89] Again making an allowance of 3 per cent for the return accruing to the investors of the additional personal savings, our estimate is raised by .24 percentage points to 5.83 per cent. Were we to assume an extra return of 3 per cent on the funds made available to the capital market by corporations as well,

Combining this estimate with the interest rate of 5.29 per cent for the proportionate reduction of personal income taxes, we derive an over-all estimate for Model B of 5.44 per cent.

Interpretation of Our Results

The estimates of opportunity costs derived from our two models were quite similar, although the assumed changes in taxation were very different. This suggests that a value of the order of magnitude of our derived results could serve as a measure of the social cost of capital for federal investment. But before accepting this conclusion, it is necessary to examine possible errors in the assumptions and in the data of our quantitative analysis.

ACCURACY AND LIMITATIONS

A possible source of error is our analysis of the incidence and effects of taxation. Insofar as possible, we have tried to follow the views generally held by experts in this field. Changes in most of our assumptions would have only a moderate effect on the results. Experiments with somewhat different assumptions of incidence produced estimates similar to those obtained. Two exceptions, however, would upset our results. First, if it is assumed that a reduction in the corporation income tax will lead to an upsurge of investment by large corporations, then more of the tax cut would earn the high rates of profit which are prevalent. We have tried to show, however, that this effect is unlikely under the assumed economic condition of high employment. Second, it can be argued that the high levels of federal taxation lead to a large waste of economic resources caused both by the managerial efforts devoted to the tax problem and the distortions in economic decisions of firms and households resulting from a desire to avoid taxes. These considerations are not likely to have much relevance to the problem under study here because the magnitudes of the possible tax reduction are so small compared to the taxes which are needed to finance

the total estimate would rise to 6.59 per cent. In times of moderate monetary policy, the condition postulated for our analysis, these effects would not be of the magnitude indicated here.

defense and other programs. Our result is meant to apply only to small tax cuts.[40]

The rates of return which we assumed are another possible source of error. Through parts of the analysis, average rates were used to approximate marginal rates of return. Households were assumed to add to their assets in such proportion that the average rate of return of their property incomes would remain constant. For any one firm or household that is not likely to be a good approximation; but for large aggregates the error will be smaller. The typical household will not hold assets in the proportions of the group average; some households will make investments in their own business, others in common stocks, others in real estate—depending upon the experience of the head of the household and the opportunities to which he has access. Additional funds are likely to be put into the household's major form of asset. With the tax cut spread over all households in the income class, the money is likely to be invested proportionately to total holdings.

Similarly, business was assumed to make its additional investments at a rate equal to its average rate of return. In the case of industry, the tax cut is diffused over successful and marginal firms in many fields. This does not rule out a systematic bias between marginal and average rates, but the direction of bias is not clear. On the one hand, extra funds must go into investment opportunities

[40] We have made no allowance for effects originating in rounds of re-spending subsequent to the economic units on whom the initial impact falls. The increase in disposable income due to a tax reduction will have multiplier effects on the incomes of others, of course, but we have assumed that a correctly managed fiscal and monetary policy offsets these multiplier effects. Nevertheless, the multiplier effects and their policy offsets will lead to some redistribution of income, and it is logically possible that there are systematic differences between the time preferences of the gainers and the losers of this redistribution. This would affect our estimate. But since both the initial repercussions and their offsets are diffused more or less randomly through the economy, it is most unlikely that there will be systematic differences between the two groups in this regard. Further, the similarity of our estimates for different taxes argues that if there are systematic differences in the two groups with regard to important economic characteristics, the effect on the social cost of capital will still be small. For a full discussion of these effects, see A. H. Conrad, "The Multiplier Effects of Redistributive Public Budgets," *Review of Economics and Statistics*, May 1955, pp. 160-73; also see M. Bronfenbrenner, Taro Yamane, and C. H. Lee, "A Study in Redistribution and Consumption." *ibid.*, pp. 149-59.

which are considered marginal in comparison to the opportunities that are undertaken without the tax cut. On the other, new investment opportunities may yield generally higher returns than the reported average for old and new capital. Also, business will not undertake any investment unless the expected rate of return meets minimum standards that are sufficiently high actually to yield an adequate return for the particular kind of investment. Finally it should be stressed that most of Model A and a large part of Model B do not use this approximation.

Our results are not meant to apply in periods of serious inflation or depression. In an inflationary period, monetary policy is likely to be pursued with such vigor that the supply of investible funds to firms will be severely restricted, while the attractiveness of high returns on investments will exercise strong pressure to invest any funds that become available. Under these conditions, the increase in retained earnings made possible by a reduction in the corporation income tax would, in large part, lead to investment within the firm. Since large corporations tend to earn high rates of return on internal investments, the interest rate applicable to such a tax cut would be considerably higher than our estimates. Even the reductions in personal taxes are quite likely to have significant investment effects. For in periods of money shortage, when there is sharp competition among borrowers for funds, more personal savings are likely to find their way into business uses in which high rates of return prevail.

In years of depression, when government expenditures are designed to raise the total level of effective demand in order to employ idle resources, the social cost of capital is extremely low. Tax policy, in such periods, would endeavor to tax idle hoards of funds rather than money which would be spent for consumption or investment; and much of public expenditures would be financed by government loans designed to avoid competition with private demands for investible funds. In real terms, many of the resources absorbed by public investment would have been idle and, hence, would have an opportunity cost close to zero. Expressed as an interest rate, it is not at all inconceivable that the social cost of public capital would be negative in such circumstances.

The year 1955, for which our estimate was derived, can be considered typical of long-term conditions, however. Employment was high, though not to a point where inflation had set in. Fiscal and

monetary policies were moderate, endeavoring to keep the economy within a narrow range of balance, without drastic inflationary or deflationary measures. Consumer indebtedness reached an all-time high, but the strong upward trend in the use of credit suggests that the debt position of 1955 will be typical for future years.

How wide then is the range of error of our estimates? We believe that the actual level lies within a range of 1 per cent of our estimates for the general economic conditions postulated for our analysis. This statement is based both on judgment and upon experiments in which those assumptions most open to question were varied. Combining all reasonable assumptions that would raise the rate yields an estimate of 7 per cent; conversely, all plausible assumptions that would produce a low rate yield an estimate of 5 per cent. It is our conclusion that the probable value for the economic conditions postulated lies between 5 and 6 per cent.

AN ALTERNATIVE: A TIGHTER MONETARY POLICY

So far, our analysis has assumed that the expenditures for water resource projects would be offset by taxation sufficient to preserve balance in the economy. Let us also consider briefly the case where monetary rather than tax policy is used to restore equilibrium. An expansion of the federal program would then have to be offset by a tightening of monetary policy of sufficient degree to release the quantity of resources needed for the program. To estimate the social cost of capital under this assumption, it is necessary to discover which economic activities would be curtailed by the diminished supply of credit.

It is unlikely that a change in monetary policy would be a permanent method of compensating for a change in expenditures, because this would reduce the remaining potential of this stabilizing weapon. But the initial offset might well be in this form, subsequently to be converted into a change of tax rates.

We shall not undertake a full-scale quantitative effort to measure the incidence of monetary policy. The kinds of assumptions required would be considerably more arbitrary than those of our tax study, and the rates of return that would be earned by the marginal borrowers to whom credit would be denied could not be estimated with sufficient accuracy. However, we can get some idea

of the order of magnitude by listing the sectors affected by monetary policy and the rates of return prevailing in them.

Bank loans are the traditional, perhaps most important, form of credit that can be reduced through monetary policy. Loans to business, which totaled $31 billion in 1955, were made at nominal average rates of 4.2 per cent.[41] While we cannot estimate what rates of return would have been earned on curtailed loans, we know that the rate expected by the borrower must be at least 4.2 per cent. And it is probably more, in view of the somewhat higher interest rates charged to marginal borrowers and the return above borrowing cost which must be expected as an incentive to take the risk of the investment. Loans to individuals totaled $17 billion and were made at a wide range of rates—from as low as 4.5 per cent to over 10 per cent, depending upon the purpose, the collateral, and the credit worthiness of the individual. The marginal loans that would be refused because of a tighter monetary policy would have borne rates well above the minimum of the range.

The market for mortgages would also be tightened by monetary policy, both through a toughening of the terms and diminished availability of funds. Total outstanding mortgages were in excess of $130 billion, but the impact of the policy is concentrated on only a portion of the market. The rates on this category of credit largely fall between 4½ and 6 per cent and would apply to the mortgages that are precluded by the change in the monetary policy necessitated by a public investment. Debt issues of state and local governments would be curtailed, bearing very low interest rates, but often used to finance investments yielding higher returns, e.g., schools, hospitals, etc. Other forms of credit—such as brokers' loans on securities, corporate borrowing from sources other than banks, etc.—would also bear part of the impact, but the effect would be less important quantitatively.

These figures suggest that the social cost of federal capital raised in this manner is roughly of the same order of magnitude as the cost of releasing the necessary resources through taxation. Depending upon the exact combination of weapons employed by the

[41] "Business Loans of Member Banks," *Federal Reserve Bulletin, op. cit.*, April 1956, pp. 328-40. This rate makes no allowance for the common practice of requiring minimum account balances, which raises the effective rate of the loan by as much as 1 per cent.

monetary authorities and the circumstances at the time, the rate might be somewhat higher or lower; but the difference in cost under the two types of policies is moderate. The extent to which the resources will be drawn out of investment rather than consumption will differ more broadly, however.

AN ALTERNATIVE: SEPARATING RISK-BEARING FROM PURE INTEREST

So far, we have treated risk as a source of market imperfection, and have considered differences in interest rates caused by varying risk premiums to lead to a misallocation of resources. In the model we employ, a correct allocation of resources would require that the rate of return on marginal investments of all kinds be the same. If it were not, the total return could be increased by switching investments from fields with low marginal returns to fields with higher returns. In the real world, where there are differences in risk, a higher return is expected to prevail on the riskier investments, with part of this higher return a risk premium. This is a reward for taking risks, and may be needed to attract capital into risky uses. Yet our model would consider such differences inefficient; we assume that the riskiness of the returns on an investment do not detract from their contribution to real national income. That is, the satisfaction derived from the national output is independent of the total amount of risk taken on the nation's investments.

In the context of public investments, there is considerable justification for this assumption. From the point of view of the economy as a whole, the risks on investment are far smaller than the sum of risks of individual investments. Where one undertaking in one locality may fall far short of its expected outcome, other undertakings will succeed beyond expectations, and to some extent the failure of some assures the success of others. There is much cancellation of risks since the insurance principle of pooling reduces greatly the relative dispersion of outcomes for the nation's investment program as a whole. And, from the point of view of the long-run growth of the country, the increase of national income produced by risky investments on which a high return is to be earned, whatever the reason, will be greater than the increase of income to be expected from low-risk, low-return investments.

There are other reasons for adhering to our model's assumption. First, the empirical evidence on the relationship between risk-taking and individual welfare is scanty and unconvincing. While people purchase insurance to reduce risk, they also gamble.[42] Second, and more important, there are two very strong institutional factors in our economy which erode the relationship between high risk and high return. One is the giant corporation which undertakes so many investments that there is much pooling of risks within its own program. The suppliers of the corporation's capital bear only a fraction of the sum of risks of the individual investment projects, and the same is true of the company itself. The other institutional factor is our tax system, which makes risky investments particularly attractive to wealthy individuals, since they usually lead to capital gains rather than ordinary income. With much the largest part of the investable funds made available by personal sources [43] coming from taxpayers in the upper brackets, the differential between tax rates on capital gains and on ordinary income promotes the willingness to take risks to such an extent that the difference between the rates of return of risky and secure investments must be much diminished.

Let us briefly consider the cost of capital if risk premiums are treated as prices paid for the factor service of risk-bearing. Lenders are assumed to be rational in this respect, and the risk premium of a loan must be sufficient to compensate for the risk which is taken. On this assumption, a federal loan which displaces a risky private loan and invests the proceeds in a risk-free project would entail a lower social cost than the alternative since there is a reduction in risk-bearing. If we make the bold assumption that all differences in interest rates for the same period are risk premiums, then it might be argued that the true social cost of a risk-free federal investment is the pure interest rate alone—a rate which is probably best approximated by the yield on federal securities with a term equal to the life of the investment.

[42] Cf. M. Friedman and L. J. Savage, "The Utility Analysis of Choices Involving Risk," *Journal of Political Economy*, August 1948, pp. 279-304; and F. Mosteller and P. Nogee, "An Experimental Measurement of Utility," *ibid.*, October 1951, pp. 371–405.

[43] For a full discussion of this point, see J. K. Butters, L. E. Thompson, and L. L. Bollinger, *Effects of Taxation, Investment by Individuals*, (Boston: Gradu-

Actual resource projects are not free of risks, however. Where outputs are marketable, there is no assurance that the expected revenues will be collected; even in the case of nonmarketable outputs, such as recreation and flood control, there is no guarantee that the expected benefits will actually accrue. In the case of water resource projects, there are always the risks caused by meteorologic and hydrologic uncertainties. Yields on government securities do not reflect these risks, since the federal taxing power stands behind the bonds and any losses on projects will be paid out of taxes.

To discover a risk premium which reflects individual willingness to bear risks, we would need to estimate the cost of raising money for water resource projects that would be incurred by a public corporation unable to employ the taxing power to guarantee its securities. The cost of financing some of the purposes, such as navigation, electric power, and municipal water supply, would be similar to the cost incurred by private utilities, since the service and the risk is almost the same. These companies typically could raise capital at an average cost of 4.5 per cent in 1955,[44] which serves as a first approximation for these purposes. The financing of irrigation would, in part, depend upon the security of the repayment contracts and, in part, on the likelihood that the settlers would realize the projected benefits. Nonreimbursable purposes, such as flood control, for which there are no comparable private industries, are subject to the risk that benefits will not be fully realized. To impute risk premiums for these purposes, we would need to take account of the fact that in some instances, particularly in the case of flood control, the projects also serve to reduce risks—a factor which should lower the interest rate. We shall not venture an estimate. Suffice it to say that, taking the water resource program as a whole, the interest rate derived from these assumptions would be well above the pure rate of interest as measured by the long-term government bond rate, but would be far below the highest rates prevailing in the private economy.

ate School of Business Administration, Harvard University, 1953) especially Chapters 2, 4-7, 9, 10, and 17.

[44] This assumes 50 per cent of the funds to come from bonds paying 3.22 per cent, 15 per cent from preferred stock paying 4.25 per cent, and 35 per cent from common stock with an earnings price ratio of 6.5 per cent. All figures are net of taxes. For a more detailed discussion of these figures see Chapter VII, Table 38.

A FINAL COMMENT

Our statistical analysis has provided an estimate which is designed to reflect the social cost of capital raised by federal taxation. We defined our concept of social cost in terms of the opportunities foregone in the private sector of the economy, either because of curtailed investment or of curtailed consumption. According to our results, if an efficient allocation of resources is the criterion, only those public investments that can produce a rate of return equal to the opportunity cost—or a rate of 5 to 6 per cent—should be undertaken. In operational terms, this would require that an interest rate of that order be used in the evaluation of projects.

Acceptance of this conclusion, however, requires that the exact meaning of the notion of efficiency in this context be made clear. As we pointed out in Chapter II, efficiency is a relative concept dependent on a specific distribution of income. An arrangement which is efficient with one distribution of income may be inefficient with another. The set of demands resulting from one income distribution will not be identical with the demands generated by a different income distribution, and so the prices which lead to efficiency in one case will not be appropriate to the other.

In considering the efficiency of an interest rate, this interdependence takes on particular significance. The interest rate indicates the relative value of output realized at different points in time, including the relative values for different generations. When we accept an interest rate determined by the preferences of the present generation—as we do in our quantitative models—we implicitly accept the time preference of the present generation of decision-makers. Children and unborn generations have no vote in the market place. With the power of the ballot distributed differently from the power of the purse, the community—when acting collectively through the political process—may decide on a distribution of consumption among generations different from the distribution it indicates through its saving behavior. There is no logical reason to give priority to one judgment over the other; our economic analysis must presuppose that the distribution of income and consumption implicit in the efficient allocation of resources is acceptable to society. Should an ethical choice be made through the political process to distribute more of the total consumption to future generations, our opportunity-cost measure of the interest

rate would cease to be a proper indicator of social value. A lower interest rate might lead to a larger number of projects, would favor projects which are particularly long-lived, and would lead to the fuller development of the potential of many project opportunities.

The decision not to abide by the market judgment need not be based entirely on ethical considerations. As we have seen earlier, the capital market is imperfect because of the riskiness of investment and for various institutional reasons. Also, because of imperfect perception of future circumstances and the uncertainties surrounding individual lives, it is less likely that consumers make their saving-borrowing decisions as rationally as their choices among commodities. Consequently, the actual intertemporal choices in our economy, including the determination of the over-all level of saving and investment, are made in a rather haphazard manner.[45]

These arguments provide a point of contact between economic analysis and conservationist philosophy. Most of the policies advocated in the name of conservation are designed to make stronger provision for the future than the market mechanism would call for. Resource development is a particularly potent area for the kind of investment designed to benefit future generations. There are opportunities for development of extremely enduring, in some cases perpetual, additions to the nation's capital stock, which will increase in value as population and the economy grow. It may well be that the desire to redistribute income toward future generations can provide some rationale for continued use of a low interest rate.

But this line of argument has limitations. Insofar as a low interest rate leads to the justification of some projects at the expense of others which can produce a better return, the rate will result in a social loss even within water resource fields. Also, if the fundamental objective is the redistribution of income toward the future, the critical variable is not so much the interest rate as the over-all level of investment.[46] The best policy to meet this objec-

[45] It is not clear whether the actual level of saving is higher or lower than the ideal (defined in terms of the judgment of the present generation). On the one hand, the large gap between borrowing and lending rates indicates that the level is too low; on the other, the saving carried on by corporations may far exceed the level desired by their stockholders.

[46] For a fuller discussion of this point, see Otto Eckstein, "Investment Criteria

tive is to increase the amount invested every year and to put the funds into those lines of activity in which the rate of return is greatest. In this way, the contribution to future output is maximized and, should the time profile of output made possible by the investment place too much of the output in early years, an appropriate share of it can be reinvested. A series of reinvestment cycles, each at a high rate of return, will make a greater contribution to the welfare of future generations than investment in one very durable project which yields a low rate of return. It may be possible that the federal government is limited in the fields in which it can employ the desired extra investment; that resource projects yielding low rates of return must be undertaken because of a lack of better opportunities. But this argument holds only if the additional ethical judgment is made that the extra investment must be carried on under federal aegis.

There are other reasons for using a low interest rate. It may be a means of subsidizing new regions in a manner designed to promote their growth to maturity. In some instances, the low interest rate helps to justify projects needed as stand-by capacity for defense purposes. Or it may be a means of increasing the economy's rate of growth for the sake of preserving a lead over the Russian economy. But in these situations, the low interest rate serves to obscure the true issues. The public will be better informed and will be able to come to a more soundly based judgment if the costs of meeting these purposes are made explicit.

Note to Chapter IV

We present a brief formal derivation of the model employed to measure the social cost of capital drawn from consumption.

Let C_l = consumption expenditure of individual l in the present period,
S_l = net saving of l in the present period,
Y_l = disposable income of l in the present period,
i_l = interest rate faced by l for his marginal saving-borrowing decisions,

for Economic Development and the Theory of Intertemporal Welfare Economics," *Quarterly Journal of Economics*, February 1957.

and A_i = perpetual future consumption stream that i can enjoy.

Two identities are implicit in these definitions:

(1) $Y_i = C_i + S_i$, and

(2) $i_i \Delta S_i = \Delta A_i$.

The identity (2) defines the rate at which saving produces a future consumption stream. We assume a utility function

(3) $U_i = U_i (C_i, A_i)$,

which reflects *i's* present valuation of current consumption and consumption in the future. He maximizes his utility function subject to his income and interest constraints. This is equivalent to maximizing the Lagrangean expression

(4) $\phi = U_i (C_i, A_i) - \lambda (Y_i - C_i - S_i) - \mu (i_i \Delta S_i - \Delta A_i)$,

which has the first-order maximum conditions

(5) $\frac{\partial U_i}{\partial C_i} + \lambda = 0, \quad \lambda - \mu i_i = 0, \quad \text{and} \quad \frac{\partial U_i}{\partial A_i} + \mu = 0.$

Therefore,

(6) $\frac{\partial U_i}{\partial C_i} = -\mu i_i \quad \text{and} \quad \frac{\partial U_i}{\partial A_i} = -\mu, \text{ and so}$

(7) $\frac{\frac{\partial U_i}{\partial C_i}}{\frac{\partial U_i}{\partial A_i}} = i_i, \quad \text{or} \quad \frac{\partial U_i}{\partial C_i} = i_i \frac{\partial U_i}{\partial A_i}.$

A change in taxation is a change in disposable income, part of which will change consumption, part saving. Thus,

(8) $\Delta Y_i = \Delta C_i + \Delta S_i$,

and the change in *i's* utility is

(9) $\Delta U_i = \frac{\partial U_i}{\partial C_i} \Delta C_i + \frac{\partial U_i}{\partial A_i} \Delta A_i$,

neglecting higher order terms on the grounds that they will be of the second order of smalls. (9) is equivalent to

$$(10)\quad \Delta U_i = i_i \frac{\partial U_i}{\partial A_i} \Delta C_i + \frac{\partial U_i}{\partial A_i} i_i \Delta S_i, \text{ or}$$

$$(11)\quad \Delta U_i = i_i \frac{\partial U_i}{\partial A_i} \Delta Y_i.$$

We define a Social Welfare Function for all the individuals l in the economy.

$$(12)\quad W = \Sigma_l U_l.$$

Then

$$(13)\quad \Delta W_c = \Sigma_l \frac{\partial U_l}{\partial A_l} i_l \Delta Y_l, \text{ where } c \text{ refers to costs.}$$

We assume that $\frac{\partial U_l}{\partial A_l}$ is the same for all individuals and equal to the arbitrary constant α. Then

$$(14)\quad \Delta W_c = \alpha \Sigma_l i_l \Delta Y_l.$$

ΔW_c measures the costs in the analysis. The benefits are a flow of future annual income accruing to various individuals, or

$$(15)\quad B = \Sigma_l \Delta B_l.$$

Assuming the value of marginal future income the same for beneficiaries as for taxpayers, we have

$$(16)\quad \Delta W_b = \alpha \Sigma_l \Delta B_l.$$

In order for a project to represent a favorable economic change, the value of benefits must exceed the value of costs, or $\Delta W_b > \Delta W_c$. This requires

$$(17)\quad \alpha \Sigma_l \Delta B_l > \alpha \Sigma_l i_l \Delta Y_l.$$

This inequality is unaffected by the value for α. For convenience, let $\alpha = 1$. Then the criterion becomes

$$(18)\quad \Sigma_l \Delta B_l > \Sigma_l i_l \Delta Y_l \quad \text{or}$$

$$(19)\quad \frac{\Sigma_l \Delta B_l}{\Sigma_l i_l \Delta Y_l} > 1.$$

Use of the interest rate that our analysis seeks to estimate for benefit-cost analysis is equivalent to criterion (19). We have esti-

mated $\Sigma_t i_t \frac{\Delta Y_t}{\Sigma_t \Delta Y_t}$; the benefit-cost criterion then becomes

$$(20) \quad \frac{\Sigma_t \Delta B_t}{\Sigma_t i_t \frac{\Delta Y_t}{\Sigma_t \Delta Y_t} \cdot \Sigma_t \Delta Y_t} > 1,$$

which is identical to (19).

ECONOMIC ANALYSIS OF PUBLIC INVESTMENT DECISIONS: INTEREST RATE POLICY AND DISCOUNTING ANALYSIS

THURSDAY, AUGUST 1, 1968

CONGRESS OF THE UNITED STATES,
SUBCOMMITTEE ON ECONOMY IN GOVERNMENT
OF THE JOINT ECONOMIC COMMITTEE,
Washington, D.C.

The subcommittee met, pursuant to notice, at 10 a.m., in room S–407, the Capitol, Hon. William Proxmire (chairman of the subcommittee) presiding.

Present: Chairman Proxmire.

Also present: John R. Stark, executive director; Robert H. Haveman, economist; and Douglas C. Frechtling, minority economist.

Chairman PROXMIRE. The committee will come to order.

As I said yesterday, this is an unfortunate time of year for hearings because Members of the House and Senate are busy winding things up and others are in Miami, Fla., winding other things up. At any rate, I am delighted with the quality of the hearings so far. We delayed the beginning of the hearings this morning a little bit, waiting for the statements. I had not seen your statement, Mr. Lynn, but I have it here now.

This is the final session in the current series of hearings on the interest rate and discounting procedures in Federal agencies. These have been most helpful hearings for a number of reasons. We have heard the announcement and rationale for a proposed new interest rate procedure for water resource agencies.

We have heard proposals for implementing consistent, across-the-board interest rate and discounting procedure in all Federal agencies.

It has been recommended that a base risk-free interest rate be published on an on-going basis as a guide to all analysts of public investments.

All of these are important steps in the implementation of a sound planning-programing-budgeting system in the Federal Government.

Indeed, it is becoming increasingly clear as the demands on the Federal budget grow that Congress requires the guidance of competent economic analysis of proposed expenditures. It is only with such guidance that we in the legislative branch can rationally choose among alternatives rather than apply the wasteful meat ax to the budget.

This morning we will hear the statements of representatives of three Federal agencies. We welcome Assistant Secretary Mackey of the Department of Transportation, Assistant Secretary Enthoven of Defense, and Dr. Laurence Lynn, who is his deputy, and Dr. Robert Levine, Assistant Director of the Office of Economic Opportunity.

They will discuss with us the use of discounting in their agencies and their suggestions for the improvement of discounting and interest rate policy throughout the Federal Government?

Mr. Enthoven, you may proceed.

STATEMENT OF ALAIN ENTHOVEN, ASSISTANT SECRETARY OF DEFENSE, OFFICE OF SYSTEMS ANALYSIS

Mr. ENTHOVEN. Thank you very much, Mr. Chairman. I very much appreciate the opportunity to take part in these hearings, which I think are performing a very valuable public service.

DISCOUNTING PROCEDURES AND INTEREST RATE POLICY IN FEDERAL DEPARTMENTS AND AGENCIES

In the Department of Defense we now use analyses of military effectiveness in relation to cost ("cost-effectiveness analysis") regularly as one of the factors considered in reaching program decisions. However, we emphasize analysis as an aid to judgment and not as a substitute for it. Thus, discounting calculations, when they are used, are but one of the factors to be judged in the total context of decision.

In our cost-effectiveness analysis we use discounting—or accumulated interest charges as I now prefer to look at it—selectively as an analytical tool. In some cases, the time profiles of expenditures of the alternatives under consideration are not significantly different from each other. In such cases we don't include interest charges; rather, we focus attention on the significant differences that do exist among the alternatives. In other cases, however, the time profiles of expenditures do differ significantly. In such cases, we do introduce cumulative interest charges in comparing costs and in designing "equal cost" alternatives.

I have found that the easiest way to explain the commonsense of discounting is to point out that it is equivalent to adding a cumulative interest charge to the cost of Government programs. When comparing two systems, each of which will provide a desired level of military effectiveness, we believe that the system which involves extra investment today should produce enough savings later on to pay off both principal and interest. Discounting future costs back to present values is frequently misunderstood and is sometimes erroneously used in such a way as to make the cost of particular programs look smaller. By showing how interest charges add up over time, the basic issue is much more easily grasped.

As for the question of what interest rate to use, available evidence suggests that the opportunity cost of resources used by the Government in our economy is in the 5–10 percent range, though I realize that the conceptual and empirical difficulties involved in coming up with such estimates are very great.

In my judgment, 10 percent is a sensible choice for us in the Department of Defense, first because it is close to the best available estimates of the opportunity cost of capital and, second, because our investments in new weapons are both very large and subject to great technical and strategic risks.

The fact that the before tax yields on many private investments are

substantially higher than 10 percent reflects a substantial compensation for their riskiness. I believe it is reasonable for us to make at least a modest allowance for risk in our interest rate calculations.

However, I think that in our analysis we should treat the uncertainties explicitly and not merely fold them into a higher target rate of return. This makes it possible for the uncertainties to be judged explicitly by the official responsible for making the decisions.

I would like to give my full support to the establishment of a consistent discount rate policy for evaluating Federal investment, though I recognize the basic discount rate used throughout the Federal Government may not need to be as high as 10 percent.

The issues involved in choosing an appropriate discount rate concept and a correct discount rate are extremely complex, a fact which is borne out both in the economic literature on the subject and in the recent testimony before this committee. The basic point, however, is quite straightforward: The resources used by the Government in its investment projects can also be used productively by private consumers and investors. Whether the Government raises its funds by taxation or by borrowing, some consumers must forgo consumption opportunities which, since they already pass up risk-free investments offering 5 percent interest, must be worth at least 5 percent to them, and some investors must forgo in investment opportunities which return 10–20 percent before taxes.

Government agencies should take these opportunity costs into account when calculating the costs of their projects and determining their value to society.

I believe that the rate that is used should not be biased either for or against Government investments.

Adopting a sensible interest rate policy should have two desirable results: *First*, it should lead to a more rational allocation of resources between the private economy and the public sector; *second*, it should encourage the proponents of investment projects to design them specifically to achieve high rates of return.

Discounting should be much more than a mechanical procedure for weighing future costs and benefits. Project designers should recognize that features that do not pay their way in significantly increased benefits or reduced costs should be left out. If they do, the Government will have a menu of much more productive investment alternatives to choose from.

Proper discounting is only one aspect of good analysis, however. If the analyses underlying investment proposals are poorly conceived, or if benefit and cost estimates are faulty, discounting is unlikely to lead to better decisions. As a practical matter, the use of discounting will probably place an even greater premium on competent analysis. If programs must be justified against tougher cost-benefit criteria, great care must be taken to insure that benefit and cost concepts and estimates are sound.

I think this committee is performing a valuable service by surfacing the discounting problem and promoting rational debate on the complex issues involved: I appreciate the opportunity to support the committee's objectives.

Thank you, sir.

Chairman PROXMIRE. Thank you, Mr. Enthoven.

Our next witness is Mr. Lynn.

Mr. Lynn, you have a substantial statement, I see. We would be delighted to have you summarize it or present it in any way you see fit.

STATEMENT OF LAURENCE E. LYNN, JR., DEPUTY ASSISTANT SECRETARY OF DEFENSE (ECONOMICS AND RESOURCE ANALYSIS)

Mr. LYNN. Mr. Chairman, I would like to read comments from my statement to support Dr. Enthoven's testimony.

The commonsense of using an interest rate concept in government investment decisions is this: The Government should obtain a rate of return on its investments at least as large as the value of the consumption and investment opportunities private citizens must give up. Therefore, the Government should assess itself an interest charge on the funds it needs that is equal to the opportunity cost of these funds to private consumers and investors.

Returns to Government investments should be large enough to cover both principal and interest. If the Government ignores these opportunity costs and undertakes project with relatively low rates of return, then society as a whole—public and private—is not receiving the maximum attainable value from its resources; the general welfare will be lower than it could be. In fact, Government agencies should deliberately design their investment projects with their rate of return in mind.

Establishing and enforcing appropriate discounting procedures should not only lead to wiser investment decisions but encourage the design and development of better investment projects as well.

An important analytical question is, how should the Government be assumed to finance its new projects, and how do consumers and investors share in providing the resources; that is, how does one define and measure opportunity costs?

I believe that the Government can be assumed to finance its activities out of tax revenues and that in the long run, the alternative to more Government spending is lower taxes, not less borrowing. The amount the Government plans to borrow each year should be assumed to be determined mainly by how much the Government wants to stimulate or restrain aggregate demand by varying the size of its deficit or surplus, not necessarily by the level and composition of Government investments.

It is sometimes argued that the discount rate should be reduced in those periods in which resources are unemployed and their opportunity cost is, therefore, zero. As a practical matter, discount rate procedures should not be manipulated to reflect highly changeable circumstances such as the extent and nature of unemployment. When the Government desires to stimulate private economic activity, it will want to expand investments earning the highest rates of return, not seek low return projects. If there aren't enough of these high payoff projects, an explicit judgment can always be made to finance projects with relatively low returns as calculated by the usual methods.

In 1958, Prof. Otto Eckstein, who appeared before you yesterday, estimated the reduction in private consumption, private investment, housing, and other types of investment when the Government obtains

resources through taxation. At that time, his estimate of the opportunity cost of public capital obtained through taxation was about 6 percent. However, in private correspondence, and I believe here yesterday, he indicated that using current data with his model would yield a cost estimate of about 8 percent.

Other investigators have calculated the cost of capital to the Government by assuming that the Government borrows the necessary funds. They have estimated that the cost of borrowed capital is significantly higher than the interest yield on Government bonds. Because Government borrowing displaces private investment to a significant extent, the Government forgoes the taxes it would collect on the returns to these investments. This cost to the Government must be added to the Government bond yield, less the taxes the Government collects on this yield, to come up with the right opportunity cost.

Working along these lines, the GAO estimated that Government borrowing costs may be as high as 7 to 8 percent, and other investigators have estimated it at closer to 10 percent. There are some problems with interpreting these calculations as opportunity costs, but I think the important thing to recognize is that both the tax models and the borrowing models economists have used have produced similar estimates of the opportunity cost of public capital, answers which are in the 7 to 10 percent range. I believe that further research along these lines will support this result, since both taxing and borrowing affect both consumption and investment to a significant degree.

Up to this point, the discussion has been in terms of undifferentiated Government investments whose costs and benefits can in principle be measured. In fact, there are many different types of Government investments, and for many of them it is difficult or impossible to measure or compare the value of the benefits, even in principle. For example, it is impossible to put a monetary value on the benefits of investment in a new defense weapon system. It is not possible, even in principle, to develop a market test of the volume of assured destruction capability against the Soviet Union or our ability to defeat Warsaw Pact tactical air forces in conventional combat in Europe, still less to put a monetary value on improvements in those capabilities.

In situations where there is no market test of benefits, two types of analyses must be done. First, should we buy the capability, however we measure the benefits? Secondly, which of the alternative ways of providing this capability should we choose?

Since this is the characteristic type of problem encountered in the Defense Department, it is worth discussing how we do it in more detail.

Typically we measure the benefits or effectiveness of our investments against some criterion of military need. For airlift and sealift investments, for example, the need is expressed in terms of the desired schedules for moving forces to where they may be needed. For tactical air investments, one way the need can be expressed is in terms of delivering ordnance to a target system, against expected opposition, in sufficient quantity to destroy a certain percentage of the targets. We set up tests of effectiveness like this in each mission area, using perhaps several different measures of effectiveness. Deciding whether or not additional investments should be undertaken involves complex judgments about the value of the extra effectiveness relative to its cost.

But in choosing among alternative ways of achieving a given level of effectiveness, however, formal analysis has an important role to play, and the proper use of discounting is an important part of the analysis. We are concerned to know which alternative will provide the desired effectiveness for the lowest total cost, over the relative lifetime of the projects.

Alternatively, we may be interested in knowing which of several equal cost alternatives gives us the most for our money.

The question arises here as in cost-benefit analyses as to whether costs in different years should be equally weighted and the answer is no. We should not be indifferent between programs which involve high outlays today and programs the costs of which are spread more evenly in time. Because the differences in cost among the alternatives have an opportunity cost to the private economy, an appropriate interest rate should be charged in estimating total program costs in order for the system which provides a given level of effectiveness for the smallest opportunity cost to the economy to be chosen.

At the end of my statement I have given a number of examples of how we have used discounting in the Defense Department. I might add that these examples were not specially prepared for this testimony. They have been taken directly from our working papers and have actually been used in our considerations of various proposals. I would like to review one of them to show how we do analysis using discounted costs.

A common problem is to decide whether a new weapons system will have payoffs in increased capability or in reduced costs for achieving given effectiveness which justify a large initial investment in research, development, and procurement. For example, the Defense Department is considering new types of transport aircraft for use in the combat theater beginning in the mid-1970's.

These aircraft will be expensive to develop, but they promise improved performance and lower operating costs. In our analyses, we have sought to construct several alternative tactical airlift force structures, each of which will provide the same capability to move troops, equipment, and supplies from selected types of origins to selected types of destinations over the entire period of the next 15 years.

The objective is to see whether a new aircraft will reduce the costs of providing the designated capability enough to repay the investment in development and procurement at a reasonable rate of return.

I have included a table which summarizes the costs of different forces designed to meet one particular set of lift requirements over the next 15 years. For purposes of this comparison, year-by-year procurement and operating costs were computed, and an interest charge of 10 percent compounded annually was added. Separately shown are estimated research, development, test and evaluation costs, also calculated on a year-by-year basis with allowance for interest at 10 percent. The purpose of showing these costs separately is to show how the time profiles of costs for the different forces vary. During the development phase of new aircraft, existing aircraft must be kept in the force. They are replaced only when the new models become available.

The table in the statement shows that all three new aircraft will enable us to reduce the total cost of buying and operating the forces required for the job. Only with aircraft B, however, can we completely

write off the development bill at 10 percent over a 15-year period. Naturally, then, we are quite interested in aircraft B. However, there are great uncertainties about the cost estimates as well as about the technical risks, and we have to take these uncertainties into account. What this analysis is supposed to do is to encourage the proponents of new aircraft types to design them so that they are as profitable as possible an investment for the Defense Department without sacrificing the capability to meet basic mission requirements.

The best time to encourage this type of work is in the very early stages of an analysis when the alternatives are still being designed.

Mr. Chairman, this concludes the remarks I would like to make.

Chairman PROXMIRE. I wish you would go on for just a few moments and give us your analysis on the supersonic transport.

Mr. LYNN. I am pleased you noticed.

Chairman PROXMIRE. I did. I could not resist it.

Mr. LYNN. We have, of course, had some experience in the past with doing economic analyses of the SST program, because Mr. McNamara was quite deeply involved in the Government committee dealing with that subject. We do not attempt to review or judge the merits of the investment. We attempt merely to do economic analysis of the payoffs of this investment in cash terms, given the very great uncertainties and risks associated with the program. The analyses we show here are, I think, a very good illustration of how difficult it is to take into account all of the uncertainties in arriving at a sensible decision. But I think what we have tried to do is to display the revelant information in a meaningful way so a decisionmaker can focus on it.

For example, there are a variety of estimates of how large the SST market will actually be. There is also the question of what discount rates to use. So we show, for different estimates of the size of the SST market, the present value of the SST investment at discount rates of 5, 10, and 15 percent.

In this way one can look at the question of how the uncertainties about the size of the market affect judgments about the SST program and at how opinions about the right discount rate affect these judgments. As to what the judgments finally are, of course, that involves a great many more considerations than we can encompass in this particular kind of analysis.

Chariman PROXMIRE. You are a diplomat as well as an economist. I shall come back to this in the questioning.

(The prepared statement of Mr. Lynn follows:)

PREPARED STATEMENT OF LAURENCE E. LYNN, JR.

The need for appropriate discounting and interest rate policies in government agencies is now widely recognized, thanks in large part to the Joint Economic Committee. The correct and consistent use of discounting, however, is only one aspect of good analysis. Using the "right" discount rate will not necessarily lead to wiser decisions on government investments if the supporting analyses are poorly conceived and carried out. On the other hand, good program analyses will reflect the appropriate use of discounting procedures in both the design and the evaluation of alternatives.

This paper first discusses an appropriate interest rate policy for use in Federal agencies. Second, the Defense Department's current discounting policies and procedures are described, along with several examples of how discounting has been used in practice in DoD.

I. An Interest Rate Policy for Use in Federal Agencies

A. The common sense of discounting

In evaluating investment opportunites open to the government, we attempt to project both their costs and their benefits several years into the future and to determine which investments to undertake. We may, for example, determine those projects for which the value of the benefits exceeds the cost over some appropriate period of time. Or, if we are comparing alternative ways of achieving some specified objective, we may seek the alternative which satisfies the objective for the lowest total cost. In either case, the question is, should we assign the same weight to a dollar of cost or benefit no matter when it occurs?

Economists unanimously answer no far a relatively straightforward reason. For the government to invest, it must obtain the necessary resources from the private economy, either from those who would otherwise consume them or from those who would otherwise invest them on their own behalf. Private consumers and investors are far from indifferent about when they must give up resources to the government. It resources he would otherwise use are transferred to the government, the private investor foregoes the opportunity of earning a rate of return which, in today's economy, ranges from 10 to 20 percent before taxes. The consumer must give up consumption opportunities. Though we can't measure the value of these opportunities directly, we can observe that consumers who pass up opportunities to invest in interest-earning assets, the lowest and safest of which now yield about 5 percent, must value today's consumption at least as highly as the future interest returns they are passing up.

For both investors and consumers, therefore, giving up a dollar today means giving up both the dollar and the interest return (implicit or explicit) it will bring. If the day of reckoning with the government can be postponed, interest can be earned or consumption enjoyed for at least a while so that when the government's claim for a dollar comes in, something of value—the interest that has accrued—will remain in private hands. To the private sector, therefore, today's dollar is more painful to give up and today's benefits are more valuable than tomorrow's costs and benefits. They should be assigned a greater weight in the government's analyses to reflect the value of the consumption and investment opportunities that the private sector must give up.

Thus, the common sense of using an interest rate concept in government investment decisions is this: the government should obtain a rate of return on its investments at least as large as the value of the consumption and investment opportunities private citizens must give up. Therefore, the government should assess itself an interest charge on the funds it needs that is equal to the opportunity cost of these funds to private consumers and investors. Returns to government investments should be large enough to cover both principal and interest. If the government ignores these opportunity costs and undertakes projects with relatively low rates of return, then society as a whole—public and private—is not receiving the maximum attainable value from its resources; the general welfare will be lower than it could be.

In fact, government agencies should deliberately design their investment projects with their rate of return in mind. Establishing and enforcing appropriate discounting procedures should not only lead to wiser investment decisions but encourage the design and development of better investment projects as well. For example, new defense weapon systems typically involve very heavy outlays in early years but reduced operating costs later on. By pointing out early in the process of reviewing and analyzing a proposed system that tomorrow's savings have less weight than today's cost, we hope to encourage system designers to insure that today's outlays produce the largest possible potential savings and to forgo expensive design frills with little or no payoff.

This line of reasoning should form the basis for the government's discount rate policy. But to say this is far from settling the matter. A large number of issues must be resolved in defining and measuring opportunity cost and in coming up with practical guidelines for policy. These issues have produced most of the debate that has taken place among economists on the question of the "right" discount rate.[1] I would like to review briefly some of these issues

[1] Some economists have argued that an appropriate discount rate is the social rate of time preference. According to this argument, private time preference, that is the strength of the individual consumer's preference for consumption today versus consumption tomorrow, is shortsighted. The government, representing society, should adjust its rate

and try to put them in perspective. This review suggests that practical guidelines for government discount rate policy must recognize the existence of several different analytical situations and perhaps more than one rate.

B. PROBLEMS OF DEFINING AND MEASURING OPPORTUNITY COST

When the government undertakes an additional investment project, it must raise the necessary funds by taxing or borrowing. Depending on how the financing is done, the resources are obtained from both consumers and investors. It can be argued that taxation affects mainly consumption whereas borrowing displaces mainly investment. The question is, how should the government be assumed to finance its new projects, and how do consumers and investors share in providing the resources?

I believe that the government can be assumed to finance its activities out of tax revenues and that in the long run, the alternative to more government spending is lower taxes, not less borrowing. The amount the government plans to borrow each year should be assumed to be determined mainly by how much the government wants to stimulate or restrain aggregate demand by varying the size of its deficit or surplus, not by the level and composition of government investments.[2]

In 1958, Professor Otto Eckstein estimated the reductions in private consumption, private investment, housing and other types of investment when the government obtains resources through taxation.[3] At that time, his estimate of the opportunity cost of public capital obtained through taxation was about 6 percent. However, in private correspondence, he has indicated that using current data with his model would yield a cost estimate of about 8 percent.

Other investigators have calculated the cost of capital to the government by assuming that the government borrows the necessary funds.[4]

They have estimated that the cost of borrowed capital is significantly higher than the interest yield on government bonds. Because government borrowing displaces private investment to a significant extent,[5] the government foregoes the taxes it would collect on the returns to these investments. This cost to the government must be added to the government bond yield less the taxes the government ccollects on this yield. Working along these lines, the GAO estimated that

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downward as an expression of society's willingness to see resources transferred to future generations. Providing for future generations is a "public good;" that is, collectively society is willing to forego consumption today to increase the welfare of posterity but no individual will volunteer to foot the bill himself. The government must give expression to this willingness through its investment projects.

There are three counter arguments to this view:

1. In the case of natural resources which cannot be replaced once they are 'used up' or destroyed, judgment to conserve them should be made on the merits of the case. Manipulating the discount rate for this purpose is not appropriate. In fact, it is probably impossible to determine what an appropriate rate would be in such cases.

2. The best way to insure the welfare of posterity is to adopt a policy to stimulate both public and private investment to achieve higher growth rates today. Moreover, such a policy would seek public projects with the highest returns, not the lowest.

3. The use of a social rate of time preference across the board, rather than in special cases, would mean that a great many relatively unproductive public projects would displace many productive private projects.

[2] It is sometimes argued that the discount rate should be reduced in those periods in which resources are unemployed and their opportunity cost is therefore zero. As a practical matter, discount rate procedures should not be manipulated to reflect highly changeable circumstances such as the extent and nature of unemployment. When the government desires to stimulate private economic activity, it will want to expand investments earning the highest rates of return, not seek low return projects. If there aren't enough of these high payoff projects, an explicit judgment can always be made to finance projects with relatively low returns as calculated by the usual methods.

[3] Otto Eckstein and John V. Krutilla. *Multiple Purpose River Development,* Baltimore: Johns Hopkins University Press, 1958, Chapter 4.

[4] See, for example, *Summary of Use by Federal Agencies of the Discounting Technique in Evaluating Future Programs,* by the Comptroller General of the United States, January 29, 1968, pp. 25–28.

[5] However, the impact of a larger governemnt deficit on consumers and investors will depend on how much the money supply is allowed to increase. To the extent that the money supply increases, the price level will rise and the government's resources will be withdrawn from those consumers whose real incomes are reduced by the inflation. Consumers hurt by inflation are probably those, such as those on fixed incomes, who value present consumption most highly and whose opportunity costs are higher than the return on risk-free bonds.

To the extent that the government as a borrower displaces other borrowers in competing for an available supply of credit, on the other hand, private investment will be reduced. The displaced investment is likely to be interest sensitive investments such as state and local government projects and housing, as well as projects with relatively low returns or high risk. The attractive and highly profitable investments of the private sector will not be much affected by small increases in the costs of credit.

government borowing costs may be as high as 7 to 8 percent, and other investigators have estimated it at closer to 10 percent.[6]

Notice that these calculations look only at the cost to the government, and not the opportunity cost to the economy, associated with the government's borrowing. However, the latter cost is the relevant cost against which to judge government projects. Of course, it would be possible to calculate the opportunity cost to society, assuming that the government borrows, by looking at the rate of return which the displaced private investments earn. Eckstein's 1958 findings on the returns on investments displaced by taxation probably give a good idea of these costs also, and they suggest an opportunity cost of borrowing of about 7–8 percent.

Hence, both a "tax" model and a "borrowing" model come up with answers to the 7–10 percent range.[7] I believe further research will support this result, since both taxing and borrowing affect both consumption and investment to a significant degree.

However, rates of return on private investments include compensation for their riskiness. Estimates of the opportunity cost of resources drawn from the private sector just cited include some risk compensation. Individual government investment projects are certainly not free of risk, either, especially large investments in new weapon systems with a great deal of technical uncertainty. If we assume that the private sector must be compensated for bearing risk, should the return required on risky government investments also include a risk premium,[8] as we assume when we use discount rates that are based on opportunity cost estimates that reflect some compensation for risk?

Economists differ on this question. One view is that the discount rate used in evaluating a project should include as much compensation for risk as the yields on similar investments in the private sector. An opposing view is that no risk premium should be included in the government's discount rate; just as writing a new policy does not add to the total risk borne by an insurance company, an additional government investment does not add to the overall risk on society's total investment. Hence, according to this argument, a risk compensation is unnecessary, and the discount rate should be riskless.

If the latter view is accepted, the discount rate should be the best estimate of a risk-free rate of return available in the private sector, presumably the current yield on long-term government bonds, or about 5–5½ percent.

In the absence of fully satisfactory answers to questions about the appropriate way to handle risk in government investments, the best way to proceed is to adopt 5 percent as the basic discount rate to be used throughout the government and to insure that each project valuation includes an analysis of the uncertainties associated with both costs and benefits. The cost and benefit estimates used in the evaluation should be those that can reasonably be expected in light of these uncertainties.

Several types of risky situations could justify adjustments in the discount rate used for particular projects, however. For example, success or failure on a government flood control project will pay off if it prevents devastation of an area, but it will "fail" if the threat never materializes. However, the government's project, though risky, reduces the riskiness of investments in the threatened area. Hence, the undertaking of a risky government project may reduce the risk on society's total investments. On the other hand, government investment in, for example, a supersonic transport may mean that investment in other forms of passenger transportation becomes more risky. The understanding of a risky government project may increase the risk on society's investments. The former example could be used to defend a lower discount rate on the project in question than the opportunity cost of capital; the latter example could be cited in behalf of a higher rate on the project in question.[9]

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[6] Both of the estimates cited assume that government borrowing displaces private investment dollar for dollar. Because effects on consumption are ignored, the estimates probably overstate the actual cash cost.

[7] It is assumed that the government bond rate reflects consumers' and investors' expectations about future inflation. A downward adjustment in the discount rate is necessary when evaluating projects for which estimates of costs and benefits are in constant dollars.

[8] The fact that government bonds are regarded as risk-free does not mean that bond holders regard government projects as riskless, or that they are in fact riskless. Rather, it reflects the fact that there is no default risk on loans to the government because the taxing and money printing power of the state supports the government's credit rating.

[9] When comparing alternative ways of achieving a given level of benefits or effectiveness, however, adding a risk premium to the discount rate applied to costs has the perverse effect of making the riskier system look better.

Suppose two systems, A and B, which are expected to perform a required mission equally well, and their ten-year systems costs are as below. Based on use of a 10 percent discount

Weapon system	Procurement cost, year 1	Operating cost, years 2 to 10	Total cost undiscounted	Total cost discounted at 10 percent
A	$100	$10	$190	$138
B	37	20	217	138

The best procedure may be to make clear exactly what the risks are, without necessarily trying to quantify them, so that he can decide how best to proceed.

Still another problem is an investment in a project which, though its success or failure may not affect the riskiness of private investments, is so very large that it probably increases aggregate risk because it is a risky project in itself. This is frequently the case in the Defense Department. In such cases compensation for the added risk may well be justified.

C. THE REDISTRIBUTION PROBLEM

Those who bear the cost of government investments may not be the same as those who receive the benefits. Government investment redistribute income within the economy, and many are specifically designed to do just that.

For example, the benefits of a flood control project may accrue mainly to the resident of the particular river basin, though the costs are paid by consumers and investors at large. Similarly, an investment in a program for the disadvantaged such as Head Start will benefit mainly the children who receive the aid but the costs will be widely shared. Many will argue that the discounting procedure, which implies that economic efficiency is the dominant criterion for choosing a project, should be modified when beneficial redistributions take place, perhaps through lowering the discount rate on projects which redistribute benefits in the "right" direction, or else scrapped altogether.

My own view is that this is a problem of analysis. If redistribution benefits are claimed for a program, these benefits should also be subjected to analysis. That is, a redistribution objective should be specified and the costs of alternative ways to achieve it compared. It may be the case that a project which cannot meet other tests of efficiency is also an inefficient way of redistributing economic welfare. Explicit analysis is, I believe, preferable to manipulating the discount rate and will lead to a much clearer understanding of the issues and alternatives.

D. PROBLEMS OF MEASURING BENEFITS

So far we have been talking about undifferentiated government investments whose costs and benefits can in principle be measured. In fact, there are many different types of government investments, and for many of them it is difficult or impossible to measure or compare the value of the benefits, even in principle.

For example, it is impossible to put a monetary value on the benefits of investment in a new defense weapons system. It is not possible, even in principle, to determine how valuable in monetary terms is our assured destruction capability against the Soviet Union or our ability to defeat Warsaw Pact tactical air forces in conventional combat in Europe, still less to put a value on improvements in those capabilities. For a different reason it is impossible to decide the market value of the protection a dike provides to a community, because the individual citizen cannot buy such protection for himself in the market; either everybody enjoys it or nobody enjoys it. Investments in post office facilities can, in principle, be valued because the private citizen could buy as much or as little postal service as he liked.

In situations where there is no market test of benefits, two types of analyses must be done. First, should we buy the service or capability, however we measure the benefits? Secondly, which of the alternative ways of providing this service or capability should we choose? Since this is the characteristic type of problem encountered in the Defense Department, it is worth discussing how we do it in more detail.

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rate, DOD would be indifferent between them, since the present value of each cost stream at 10 percent is $138. But suppose System B (while normally expected to perform as well as A) has a greater chance than A of *not* performing the mission. If, say, two percentage points are added to the discount rate for B, and its costs are discounted at 12 percent, while A is still discounted at 10 percent, System B will be procured, since the present value of its cost is $128. Thus, the riskier system would be procured, even though System A is probably the better choice.

Typically, we measure the benefits or effectiveness of our invstments against some criterion of military need. For airlift and sealift investments, for example, the need is expressed in terms of the desired schedules for moving forces to where they may be needed. For tacitcal air investments, one way the need can be expressed is in terms of delivering ordnance to a target system, against expected opposition, in sufficient quantity to destroy a certain percentage of the targets. We set up tests of effectiveness in each mission area, using perhaps several different measures.

Deciding whether or not additional investments should be undertaken in a given mission area involves complex judgments about the value of the extra effectiveness relative to its cost. Such judgments involve questions both of how much is enough and of how soon do we want or need the capability.

In choosing among alternative ways of achieving a given level of effectiveness, however, formal analysis has an impotant role to play, and the proper use of discounting is an important part of the analysis. We are concerned to know which alternative will provide the desired effectiveness for the lowest total cost. Alternatively, we may be interested in knowing which of several equal cost alternatives gives us the most for our money. Again, the question arises as to whether costs in different years should be equally weighted and again the answer is no. We should not be indifferent between programs which involve high outlays today and programs the costs of which are spread more evenly in time. Because the differences in cost among the alternatives have an opportunity cost to the private economy, an appropriate interest rate should be charged in estimating total program costs in order for the system with the smallest opportunity cost to be chosen.

Many non-defense problems can be analyzed using cost-effectiveness methods. Though the judgments about whether the benefits or effectiveness are worth it are not easy to make judgments focused on the right questions and explicitly drawn issues are likely to lead to better decisions than faulty benefits calculations.

II. Current DoD Policies on the Use of Discount Rates

A. CURRENT PROCEDURES

Department of Defense Instruction 7041.3, dated December 19, 1966, and signed by the Assistant Secretary of Defense (Comptroller) provides specific procedures for evaluating proposed defense investment projects where the sole or primary justification for such projects is economic. Examples of the kinds of proposals to which this Instruction is applicable include, but need not be limited to, the following:

1. Repair vs. replace. (New procurement)
2. Refurbishment to reduce operating and/or maintenance costs.
3. Fuel conversion to reduce fuel costs.
4. Consolidation projects for warehouses, depots, and repair activities, to improve efficiency or reduce costs.
5. Modernization projects to mechanize, improve work flow and layout, and increase capacity which lead to a reduction in costs.
6. Material and supply handling projects to increase efficiency and capacity.
7. Acquisition of Automatic Data Processing Equpipment (ADPE) to increase efficiency or reduce costs.

Note that each of these situations possesses the essential characteristics for an economic analysis: a commitment of resources with the expectation of receiving benefits (i.e., cost savings) over some future period of time. Further, these resources and their attendant benefits can be measured in dollar terms.

The concept of the discount rate used in the Instruction is as follows: A discount rate is management's evaluation of two factors associated with investment analysis.

1. The interest cost of the money.
2. The risk and/or the uncertainty associated with the proposed project and the estimates contained therein.

The benefits, or cost savings, expected to result from the investment are to be discounted at 10 percent. The costs are to be discounted at 5, 7 or 10 percent depending on how the project is financed. However, this Instruction is now in the process of revision and the multiple rate procedure will probably be discarded in favor of a uniform rate applied to both costs and benefits.

The Instruction puts the role of the cost-benefit analysis in perspective as follows: "Although an economic analysis is part of the information that a decision-maker should consider, it rarely provides the complete basis for decision.

At one extreme there are alternative choice decisions which can be made on the basis of an economic analysis. "Lease vs. Buy" and "Replacement Decisions" (replacement of an existing asset with a newer model) fall into this category. Another category of alternative choice decisions involves projects for which the economic implications must be weighed against other, non-monetary, considerations. "Make vs. Buy" decisions involve an economic analysis but also require, for example, a judgment as to whether the proposal is in conflict with the Government's policy of not competing with private industry. Finally, at the other end of the spectrum, there are those projects for which it is difficult or impossbile to quantify the associated costs and/or benefits. Examples of these might include projects to improve personnel health or safety factors. These different categories of alternative choice decisions should be recognized and the weight given to economic analysis should be governed accordingly.

This Instruction also points out that this procedure is not applicable to proposed investment projects justified solely or primarily on the basis of military necessity or combat effectiveness. Where an economic analysis would add to or support the justification for projects of this kind, it is recommended that such an analysis be submitted with the investment proposal.

Our weapon system investments are analyzed in detail. We use discounting procedures in cases where clearly they are called for, such as when the time streams of costs for the systems being compared are different. We have not thought it wise to formalize the use of these procedures as yet because a great deal of judgment must be exercised in each problem to determine which analytical tools are appropriate.

B. EXAMPLES OF THE USE OF DISCOUNTING IN THE DEPARTMENT OF DEFENSE

1. A new armed helicopter for the Army

The Army proposed large-scale procurement of a new armed helicopter to provide fire support for its combat forces. Analyses of this problem showed that the new system performed many of the same types of missions that were performed by the artillery, tanks, mortars and other armed helicopters already in the Army's program. The Army believed that the new helicopter was a needed addition to its fire support capability, though it was expensive.

The Secretary of Defense decided to buy the new helicopters provided that the Army was willing to replace a portion of its previously approved fire support force structure with them. The replaced force structure was to be equal in cost to the new helicopter system over the ensuing ten years. The cost concept to be used was a present value cost: the actual year-by-year cost outlays for both forces discounted at 10 percent. The assumption was that the Army would be willing to accept these terms if the new helicopters were, in the Army's judgment, more capable than the equal cost force they replaced.

The resulting table showing the two forces and their costs had the following format.

COST SUMMARY

[Expenditures in millions of dollars]

	Fiscal year 1969	Fiscal year 1970	Fiscal year 1971	.....	Fiscal year 1978	10-year cost, total	10-year cost, discounted
Cost of new helicopter force:							
Initial investment:							
Equipment							
Initial pilot training							
Annual operating cost							
Combat consumption							
Retirement pay							
Total							
Terminal value of equipment and ordnance							
Net cost of new force							
Cost of forces traded off:							
Initial investment							
Annual operating costs							
Combat consumption							
Retirement pay							
Total							
Terminal value of equipment							
Net cost of forces traded off							
Difference in net costs							

The main contribution of the use of discounting procedures was to insure that a dollar approved for expenditure in FY75 was not weighted equally with a dollar of expenditure of FY69 in comparing the costs of the two forces. As a result, though the new force required extra expenditures initially, the cash savings achieved in later years were large enough to constitute a 10 percent return on the initial investment.

The main issue for both judgment and analysis was whether the new force was more effective over the period than the replaced force. The Army judged this to be the case.[10]

2. A new pipe shop cleaning plant for the Charleston, S.C., naval shipyard

The Navy proposed to construct a new building for the chemical cleaning of pipe components to meet the exacting standards of nuclear submarines and surface ships. At the time of the proposal, the task was being done in a temporary open shed 25 years old. In accordance with DOD Instruction 7041.3, the following calculations were made to justify the project.

(a) Investment required (building, cranes, chemical tanks, expected to last 20 years)	$275,000
(b) Annual savings (lower utilities cost, maintenance and chemical waste)	43,036
(c) Present value of new building's terminal value	36,000
(d) Present value of annual savings and terminal value discounted at 10 percent	402,253
(e) Benefit/cost ratio (line (d)/line (a))	1.46

Investment in the new building makes possible a stream of annual savings compared to continued use of the old facility which represents a return significantly greater than 10 percent.

3. Tactical airlift capability for the Air Force

The Air Force indicated that the high attrition of C–130E aircraft in South Vietnam would mean that the Defense Department would lose the capability of about one C–130E squadron within two or three years. The problem was how to replace this lost capability. Analysis indicated that we had basically three alternatives:

a. Buy another squadron of C–130Es.

b. Operate an existing squadron of C–130Bs (an older model C–130) at a higher utilization rate than we had planned, and modify them as necessary to prolong their useful lives.

c. Keep two C–130B squadrons that we had planned to give to the reserves in the active force structure, but plan to use them at low utilization rates, and modify them as necessary for prolonged life.

The choice was between investment in new aircraft, which would mean lowering operating costs later on, and continued operation of older aircraft with their higher operating costs. The ten year cost summary was as follows:

10-YEAR COST SUMMARY

[In millions]

	Undiscounted	Discounted at 10 percent
Option A—Buy C–130E's	$161.4	$114.0
Option B—Increase use of 1 C–130B Squadron	215.6	132.6
Option C—Keep 2 C–130B squadrons at low use	293.0	180.2

Buying the new aircraft yields returns of better than 10 percent in reduced operating costs. Hence, the decision was made to go ahead with C–130E procurement.

4. A new tactical airlift aircraft for the Air Force

A common problem is to decide whether a new weapon system will have payoffs in increased capability or in reduced costs for achieving given effectiveness which

[10] This conclusion means that the return on the investment was greater than 10%, with the returns in excess of 10% being taken in increased effectiveness.

justify a large initial investment in research, development and procurement. As an example, the Defense Department is considering new types of transport aircraft for use in the combat theater beginning in the mid-1970s. These aircraft will be expensive to develop, but they promise improved performance and lower operating costs. In our analyses, we have sought to construct several alternative tactical airlift force structures, each of which will provide the same capability to move troops, equipment and supplies from selected types of origins to selected types of destinations over the next 15 years. The objective is to see whether a new aircraft will reduce the costs of providing the designated capability enough to repay the investment in development and procurement at a reasonable rate of return.

The following table summarizes the costs of different forces designed to meet one particular set of lift requirements over the next 15 years. For purposes of this comparison, year by year procurement and operating costs were computed, and an interest charge of 10% compounded annually was added. Separately shown are estimated research, development, test and evaluation costs, also calculated on a year by year basis with allowance for interest at 10%. During the development phase of the new aircraft, existing aircraft must be kept in the force. They are replaced only when the new models become available.

15-YEAR COSTS WITH INTEREST AT 10 PERCENT

[In billions]

	No new aircraft	With new aircraft A	With new aircraft B	With new aircraft C
Procurement and operating	$13.3	$11.8	$12.4	$12.2
Research, development, test, and evaluation		1.8	0.9	1.9
Total	13.3	13.6	13.3	14.2

This table shows that all three new aircraft will enable us to reduce the total cost of buying and operating the forces required for the job. Only with aircraft B can we completely write off the development bill at 10% over a 15 year period. However, there are very great uncertainties about the cost estimates as well as about the technical risks. What this analysis is designed to do is to encourage the proponents of new aircraft types to design them so that they are profitable as possible an investment for the Defense Department without sacrificing the ability to meet basic mission requirements. The best time to encourage this type of work is in the very early stages of an analysis when the alternatives are being designed. Had no interest charges been assessed, the new aircraft would, of course, have been much more attractive, and much less effort would be put into economical design.

5. The supersonic transport program

The Department of Defense has in the past participated in economic analyses of the Supersonic Transport Program and has a continuing responsibility to review the program for potential military uses. The following tables shows the potential profitability of the SST program purely as a financial investment: the present value of total program costs to the government is subtracted from the present value of the return flow of funds from the manufacturer. No attempt is made to pass on the merits of the non-financial aspects of the program. All SST costs prior to FY 69 are considered "sunk", and the calculations assume a fresh decision can be made on whether to continue the program.

PRESENT VALUE OF SET INVESTMENT

[In millions]

	Discount rate		
	5 percent	10 percent	15 percent
SST market as calculated by Institute for Defense Analyses (IDA)	−$344	−$528	−$579
SST market as calculated by Federal Aviation Administration (FAA)	218	−239	−421

Based on FAA estimates of the potential size of the SST market, the program breaks even as far as the government is concerned at a discount rate of 6.85 percent. If the opportunity cost of the program's funds is estimated at greater than 6.85 percent, the program will not break even. Using IDA estimates of market size (which assume that sonic boom restrictions will limit sales), the break-even rate is 1.33 percent. If a higher discount rate is used the program will not break even.

The following table shows results from the same calculations but allowing interest charges to accumulate through 1990, rather than discounting program costs back to the present.

SST PROGRAM COSTS TO 1990 INCLUDING INTEREST CHARGES

[In millions of dollars]

	Interest charges at—		
	5 percent	10 percent	15 percent
IDA estimates of market size	−1,057	−4,370	−14,401
FAA estimates of market size	670	−2,143	−10,477

Thus, if the opportunity cost of funds is estimated at 5%, the program will lose a billion dollars by 1990 using IDA estimates of market size but will earn a return for the government of $670 million using FAA market estimates. At 10%, the program will cost the government $4.4 billion by IDA market estimates, $2.1 billion by FAA market estimates.[11]

The choice of a discount rate will significantly influence estimates of the program's profitability as a financial investment. Moreover, this example also shows the explicit analysis of uncertain future benefits. Two different estimates of potential market size are used in caculating profitability. Hence, judgment can be focused on how the uncertainties about the market should affect the investment decision.

Chairman PROXMIRE. Mr. Mackey?

STATEMENT OF M. CECIL MACKEY, ASSISTANT SECRETARY FOR POLICY DEVELOPMENT, DEPARTMENT OF TRANSPORTATION, ACCOMPANIED BY DR. JAMES NELSON, DIRECTOR, OFFICE OF ECONOMICS

Mr. MACKEY. I might begin by saying that somehow, the SST portion of our statement was omitted in the gathering process.

Chairman PROXMIRE. I can understand. [Laughter.]

Mr. MACKEY. Mr. Chairman, with me this morning is Dr. James R. Nelson, who is Director of our Office of Economics in the Department of Transportation. He has been on loan to us for approximately 11 months now, from Amherst College, and has been directly involved in much of the economic analysis which the Department has been trying to undertake in its formative stages. Unfortunately, this will be his last opportunity. He is going back to the academic world at the end of this month.

I am glad to have a chance to be here this morning and to join in the discussion of discounting and the use of quantitative analyses in Government programs. In light of the testimony which you have heard in the past 2 days, I would touch only very briefly on the standard framework of analysis which is normally employed to establish a case for discounting future costs and benefits and to determine

[11] If pre-1968 costs are included in these calculations, the government's cost is $6.5–$9.0 billion.

a rational rate of discount. Instead, my testimony will emphasize the many unusual features of discounting transportation costs and benefits which complicate the forecasting chores of the Department of Transportation.

The Department of Transportation obviously does not have responsibility for the total investment budget of the U.S. Government, although the Federal highway program is one of the larger single elements in this budget. We are not directly concerned with overall investment criteria in the sense that the Treasury, the Bureau of the Budget, or the Council of Economic Advisers would be. The Department does have important areas for potential investment which involve tradeoffs between investment and operating expenses.

But the more important aspect of the use of investment criteria by the Department of Transportation, within its present statutory framework, is its inability to lay down uniform rules for methods of calculating future costs, future benefits, or appropriate rates of discount to convert these future costs and benefits into present values.

The outstanding example of this inability is contained in the DOT statute itself. Section 7(a) instructs the Secretary to "develop and * * * revise standards and criteria consistent with national transportation policies, for the formulation and economic evaluation of all proposals for the investment of Federal funds in transportation facilities or equipment * * *," but this instruction is subject to two major qualifications. Section 7(a) itself contains a list of six conceptions, including very important ones with respect to grant-in-aid and water resource projects. This water resource exception is at least partly balanced by provision for membership of the Department of Transportation in the Water Resources Council, but it nevertheless leaves discounting and other investment criteria with respect to water transportation in a different environment than comparable criteria for Government investment in other modes of transport.

Mr. Chairman, as you will note, part of section 7(a) of our act is particularly limiting in that it specifies in detail the method for calculating waterway benefits in terms of a comparison of waterway transportation rates in the future and existing rail rates or existing truck rates so that there results an inherently unnatural and unrealistic comparison. But it is built into law and the judgments on water resource projects are based on that statutory standard.

In addition, as I will later point out in more detail, the application of uniform rules is rendered difficult by the division of investment responsibility for transport facilities such as highways and certain airports between Federal and State or between Federal and local government agencies, and by divisions both between modes and, within many of the modes, between private ownership and investment—as with railroads, or airlines, or trucking concerns—and public ownership and investment—as with highways and major airports.

The conceptually ideal situation, of course, would be to begin with a unified approach to definitions of benefits, costs, and appropriate rates of discount to be applied to future values. This ideal situation would have special advantages in the field of transportation, due to the degree of substitutability of demand for important transportation modes—such as the demand for freight movement by rail, by barge, or by motortruck—as well as the possibility of trade-offs between

public investment in infrastructure and safety facilities and private investment in operating equipment. A standard discount criterion could even be useful in determining the most economical surfacing to be used on a particular highway. This conceptually ideal situation must, of course, be visualized in terms of *relating* the appropriate discount rate to the development of the entire economy. The very existence of net new investment is incompatible with static assumptions about the economy; and, in particular, the existence of such net new investment in new forms of economic activity is likely to be accompanied by steadily increasing productivity.

In the rest of my statement, I will give some examples of this relationship of discount criteria to other dynamic investment criteria as well as of some of the problems created by the mixture of competition and complementarity prevalent among modes of transportation with different types of ownership and control.

I would like to give a summary of the present discounting practices of the operating administrations within the Department of Transportation.

First, the Bureau of Public Roads might be expected to have the most important decisions with respect to appropriate discount rates, because its annual investment budget greatly exceeds that of all the other model agencies in our Department combined.

But the Bureau's investment funds are derived from the highway trust fund, so that the inflow into the highway investment pool is immediately determined by the receipts of specified taxes and not by a showing with respect to discounted costs and benefits.

Moreover, the great majority of the Bureau's investment expenditures are distributed to individual States to be used according to set formulas along with State highway money. Neither the State-by-State distribution nor the percentage Federal share in each type of highway directly reflects costs, benefits, or discounts of future values to arrive at present values. State highway departments use discount rates ranging from 0 to 8 percent.

The Federal Highway Administration has also agreed to use standard rates for sensitivity analysis as provided by the Bureau of the Budget.

These standard rates are generally 7.5 percent, 10 percent, and 12.5 percent, as Mr. Hoffman indicated earlier.

The Federal Aviation Administration has based its discounting on Bureau of the Budget Circulars A–54 and A–76. Where it has employed discounting procedures, and this has not been in all of its projects, it has used interest rates which essentially reflect the cost of Government borrowing as reported by the Treasury Department. Over the past few years these rates have risen from 4.2 to 5.5 percent. Some recent sensitivity studies have used the same rates already mentioned for the Bureau of Public Roads; that is, 7.5, 10, and 12.5 percent.

Although the Urban Mass Transportation Administration has been active in providing capital grants for local transportation purposes, it has not engaged in direct investment activities. It has not established a discounting policy. Nor has discounting been utilized by either the Federal Railroad Administration or the St. Lawrence Seaway Development Corporation. The Coast Guard is just beginning to con-

sider interest rates in its economic studies, and in a pending polar study it is using the rates recently suggested by the Bureau of the Budget.

That completes the review of our current practices. I would like to mention briefly the problem which confronts the Department in connection with economics of safety. Virtually all of the Department of Transportation programs are heavily safety oriented, and they involve determinations of some value to be placed on human life. It is always difficult and it is not very popular, we find, to try to assign values. It is very difficult conceptually and analytically. Nevertheless, it is a necessary part of any rational analysis of the kind of programs which the Department of Transportation has. I think perhaps the most significant point to mention is that as we view the value of individual life in terms of economics and in terms of the changing social environment, it appears to us that we would need constantly to increase the outlays for any given assurance for saving human life. The value, both from the production and the consumption standpoint, I suppose you would say, of human life is increasing. We are at work trying to find ways to take this into account in our analysis.

I would like to skip some now. The next part of my statement refers to problems which result from the private and public nature of the investment decisions. Mr. Hoffman went into this in some detail. It is particularly significant to us in Transportation because of mixed ownership. The multiple decisionmaking process in public investment is important to us.

Due to the highway trust fund, the United States has now come within sight of a nationwide express highway system built to minimum standards in accordance with an articulated plan. Federal funds were available for highways for a generation before the highway trust fund was created.

But State and local governments still receive the lion's share of the funds derived from taxes on automobile and trust use; and State and local governments dominate in providing both the funds and the criteria for new highway investment. This dominance in determining criteria is especially marked if we believe that the Interstate Highway System, with 90 percent Federal financing, confers general benefits which are hard to quantify, while projects of more local significance may be more susceptible to detailed economic analysis.

This multiple decisionmaking has produced sharp contrasts in discounting policies. As I mentioned, a number of States use zero discount rates in the process of evaluating the costs and benefits to be expected from new highway investment. Other States use discount rates over the entire range from 0 to 8 percent. These extreme differences in policy do not necessarily imply that the zero interest-rate calculations produce larger highway programs, because the total size of such programs may be determined by receipts from use taxes or other budget constraints. But, if a given investment fund proves to be inadequate at a zero discount rate, then it must be parceled out among individual projects on the basis of benefit-cost ratios a good deal higher than unity. A combination of a zero discount rate and high benefit-cost ratios is sure to distort both the geographical distribution and the physical characteristics of highway investment. The very word "in-

vestment" implies the importance of time. Yet a zero discount rate assumes that time has no importance.

The same general phenomenon occurs in different forms in financing aviation investment. The Federal Aviation Administration, a component of the Department of Transportation, systematically employs discounting to determine the present values of future costs and benefits. Yet most investment in airports is made locally, on the basis of investment criteria which are typically unannounced even if they are known. Local airport finance may enforce some discounting rules in practice: An airport financed by revenue bonds must automatically convert some future benefits into cash flows and effectively discount these future cash flows by applying applicable rates of interest against them. But many airports are not financed by revenue bonds. Also, the very choice between revenue bonds and obligations pledging full faith and credit produces a further option in interest rates which may be used for discounting in addition to the option created by the fact that local obligations, free of Federal taxes, typically involve interest rates lower than those available to the U.S. Treasury.

Again, Mr. Chairman, the problems involved in the consideration of taxes in the discounting process have been considered rather thoroughly. I shall not go into those in any detail, except to say that in Transportation, there may be some basis for distinctions between the way we consider property taxes and the way we consider income taxes. This is because of the use which transportation facilities generally make of high-quality land which would be available for other uses if transportation facilities are not built, and also because of the relation of the benefits produced by certain transportation facilities to the locality in which the facility has to exist. This is a complication that we have to deal with. I do not have any particular solution to offer on how to cope with it.

Turning to the special case of railroad investment, the Department of Transportation operates the Alaska Railroad. The city of Cincinnati owns, but does not operate, the Cincinnati Southern. Otherwise, the railroad map of the United States is dominated by private ownership.

The next part of my statement gives us a little history of this. There are still massive problems for rail investment created by the competitive environment in which railroads operate. Many railroads are in a position to avoid payment of Federal incomes taxes on part or all of their income, due to tax loss carry forwards. This helps to improve their competitive position vis-a-vis public investment by reducing or eliminating the spread between their gross and their net return. But these tax loss carry forwards are also a factor in the growing phenomenon of footloose railroad cash. The roadbed may be immobilized, but the cash flow derived from depreciation, net income, and sale of miscellaneous assets is not. Therefore, the problem of railroad investment in the face of competition may be further subdivided into two different problems: negatively, competitive forces have cut into railroad earnings, and continue to hold them down; positively, the opportunity cost of converting railroad cash into railroad investment seems to be rising as alternative uses of the cash become relatively more attractive.

To sum up: The problem of discounting costs and benefits of new

railroad investment goes much deeper than indicated by a simple contrast between "public" and "private" considerations. If railroads were experiencing the exuberant growth which characterizes highway or airport construction, many of the most glaring contrasts between railroad and other transport investment criteria would be greatly reduced. The problems of private ownership, of divided ownership, of obsolete physical capital, and often of obsolete balance sheets, combine to make the development of acceptable criteria for railroad investment a matter of deep concern to the Department of Transportation as well as to the railroads themselves.

In conclusion, I would like to say that we in the Department are in general agreement with those who support the discounting techniques as a part of our analytical process. We feel that the discount rates which we have used are probably too low and should be reexamined. But I would like to add that many of the problems which are encountered in analyzing transportation investment illustrate that you cannot solve the basic issues simply by changing the discount rate. The opportunity to nullify the effects of raising the discount rate by changing the consideration, the identification, or the evaluation of costs and benefits is very great. This has been illustrated particularly in the water resources area. So while we are in favor of moving in the direction of better discounting procedures, we do not want to lose sight of the problem of improving the overall quality of our analysis, the better identification of benefits, the better description of them, and the better quantification of them.

(The complete statement of Mr. Mackey follows:)

PREPARED STATEMENT BY CECIL MACKEY

My testimony today will touch only briefly on the standard framework of analysis which is normally employed to establish the case for discounting future costs and benefits and to determine a rational rate of discount. Instead it will emphasize the many unusual features of discounting transportation costs and benefits which complicate the forecasting chores of the Department of Transportation.

Standard analysis of discounting is concerned with one aspect or another of the general question: how much to invest? It is always concerned with investment, or disinvestment, because the whole point to the use of interest or discount rates is to obtain comparable present values for streams of costs and benefits which are expected to have different time-shapes. Specifically, for problems involving positive investment, at least some costs are expected to precede benefits. For individual projects, a standard question takes this form: given a flow of anticipated future benefits, should we incur costs now, or wait? If we decide not to wait, should we incur heavy costs now in order to gain lower costs in the future, or should we minimize present costs in return for heavier future outlays? More generally, this kind of analysis can be spread over many projects, to determine the optimum size for total investment budgets or the optimum mix for total investment programs.

The Department of Transportation obviously does not have responsibility for the total investment budget of the U.S. Government, although the Federal highway program is one of the larger single elements in this budget. We are not directly concerned with overall investment criteria in the sense that the Treasury, the Bureau of the Budget, or the Council of Economic Advisers would be. It does have important areas for potential investment which involve trade-offs between investment and operating expenses.

But the more important aspect of the use of invesement criteria by the Department of Transportation, within its present statutory framework, is its inability to lay down uniform rules for methods of calculating future costs, future benefits, or appropriate rates of discount to convert these future costs and benefits into present values.

The outstanding example of this inability is contained in the DOT statute itself. Section 7(a) instructs the Secretary to "develop and * * * revise standards and criteria consistent with national transportation policies, for the formulation and economic evaluation of all proposals for the investment of Federal funds in transportation facilities or equipment * * *", but this instruction is subject to two major qualifications. Section 7(a) itself contains a list of six exceptions, including very important ones with respect to grant-in-aid and water resource projects. This water resource exception is at least partly balanced by provision for membership of the Department of Transportation in the Water Resources Council, but it nevertheless leaves discounting and other investment criteria with respect to water transportation in a different environment than comparable criteria for government investment in other modes of transport.

In addition, as I will later point out in more detail, the application of uniform rules is rendered difficult by the division of investment responsibility for transport facilities such as highways and certain airports between Federal and state, or between Federal and local government agencies, and by divisions both between modes and within many of the modes between private ownership and investment (as with railroads, or airlines, or trucking concerns) and public ownership and investment (as with highways and major airports).

The conceptually ideal situation, of course, would be to begin with a unified approach to definitions of benefits, costs, and appropriate rates of discount to be applied to future values. This ideal situation would have special advantages in the field of transportation, due to the degree of substitutability of demand for important transportation modes—such as the demand for freight movement by rail, by barge, or by motor truck—as well as the possibility of trade-offs between public investment in infrastructure and safety facilities and private investment in operating equipment. A standard discount criterion could even be useful in determining the most economical surfacing to be used on a particular highway. This conceptually ideal situation must, of course, be visualized in terms of relating the appropriate discount rate to the development of the entire economy. The very existence of net new investment is incompatible with static assumptions about the economy; and, in particular, the existence of such net new investment in new forms of economic activity is likely to be accompanied by steadily increasing productivity.

In the rest of my statement, I will give some examples of this relationship of discount criteria to other dynamic investment criteria as well as of some of the problems created by the mixtures of competition and complementarity prevalent among modes of transportation with different types of ownership and control.

The Bureau of Public Roads might be expected to have the most important decisions with respect to appropriate discount rates, because its annual investment budget greatly exceeds that of all the other model agencies in our department combined. But the Bureau's investment funds are derived from the Highway Trust Fund, so that the inflow into the highway investment pool is immediately determined by the receipts of specified taxes and not by a showing with respect to discounted costs and benefits. Moreover, the great majority of the Bureau's investment expenditures are distributed to individual states to be used according to set formulas along with state highway money. Neither the state-by-state distribution nor the percentage Federal share in each type of highway directly reflects costs, benefits, or discounts of future values to arrive at present values. State highway departments use discount rates ranging from zero percent to eight percent. The Federal Highway Administration has also agreed to use standard rates for sensitivity analysis as provided by the Bureau of of the Budget. These standard rates are generally 7.5 percent, 10 percent, and 12.5 percent, as Mr. Hoffman indicated earlier.

The Federal Aviation Administration has based its discounting on Bureau of the Budget Circulars A–54 and A–76, and accordingly has used interest rates which essentially reflect the cost of Government borrowing as reported by the Treasury Department. Over the past few years these rates have risen from 4.2 percent to 5.5 percent. Some recent sensitivity studies have used the same rates already mentioned for the Bureau of Public Roads: i.e., 7.5, 10, and 12.5 percent.

Although the Urban Mass Transportation Administration has been active in providing capital grants for local transportation purposes, it has not engaged in direct investment activities. It has not established a discounting policy. Nor has discounting been utilized by either the Federal Railroad Administration or

the Saint Lawrence Seaway Development Corporation. The Coast Guard is just beginning to consider interest rates in its economic studies, and in a pending polar study it is using the rates recently suggested by the Bureau of the Budget.

Now to return to more general considerations affecting the position of the Department with respect to discounting, and to the net values derived therefrom:

1. The economics of safety

Probably the most widespread and pervasive set of responsibilities of the Department of Transportation are those related to transportation safety. These responsibilities extend all the way from air traffic control by the FAA to the Coast Guard's role in boating safety. And the most extreme form of the problem of safety involves an attempt to guarantee that there will be a future—not simply to apply a proper rate of discount to it.

Thus the investment of most general interest to the Department of Transportation is the individual's investment in his own life. And here it should be noted that standard discounting procedures for reducing larger future estimates to smaller present values may require at least some offset. For, in a dynamic economy, the average individual of a given age is worth steadily more through time. So the stream of future benefits to be discounted is not constant, but rising, even for just one hypothetical individual of constant age. Translated into investment policy, this means that we should constantly increase our outlays for a given assurance of saving human life.

Another corollary of the economics of safety has to do with the reduction of uncertainty. Most discussions of discounting assume a given degree of risk in comparing different investments. But the precise function of investments in safety is to reduce the risk of death or accident accompanying an individual's travel.

Therefore the most general aspect of the Department of Transportation's interest in discounting criteria is in connection with preserving our national investment in people.

2. The unit of investment decision

It is customary to assume that investment is either "private" or "public". Private investment is usually supposed to take place in an environment characterized by a considerable degree of competition, although it is often recognized that a business firm contemplating a new investment may bear in mind the dangers of spoiling the market by depressing prices with the additional units of output it expects to produce. But public investment is usually expected to be monopolized, in the sense that it is performed by something called "the government" which is responsible for the investment decision and all its consequences. Finally, there is no body of economic discussion relating to the special problems of competing public and private investments—railroad way and structure versus highways, or, in a much more limited sense, some railroad way and structure versus airports—nor is there any received economic doctrine with respect to the complementary relationships between private investments such as planes or motor vehicles and public investments such as airports or highways. This section of my comments will sketch in only a few of the anomalies which result from these divisions of investment responsibility.

a. *Multiple decision-making in public investment*

Due to the Highway Trust Fund, the United States has now come within sight of a nationwide express highway system built to minimum standards in accordance with an articulated plan. Federal funds were available for highways for a generation before the Highway Trust Fund was created. But state and local governments still receive the lion's share of the funds derived from taxes on automobile and truck use; and state and local governments dominate in providing both the funds and the criteria for new highway investment. This dominance in determining criteria is especially marked if we believe that the Interstate Highway System, with 90 percent Federal financing, confers general benefits which are hard to quantify, while projects of more local significance may be more susceptible to detailed economic analysis.

This multiple decision-making has produced sharp contrasts in discounting policies. As I mentoned, a number of states use zero discount rates in the process of determining the costs and benefits to be expected from new highway investment. Other states use discount rates over the entire range from zero to eight

percent. These extreme differences in policy do not necessarily imply that the zero interest-rate calculations produce larger highway programs, because the total size of such programs may be determined by receipts from use taxes or other budget constraints. But, if a given investment fund proves to be inadequate at a zero discount rate, then it must be parcelled out among individual projects on the basis of benefit-cost ratios a good deal higher than unity. A combination of a zero discount rate and high benefit-cost ratios is sure to distort both the geographical distribution and the physical characteristics of highway investment. The very word "investment" implies the importance of time. Yet a zero discount rate assumes that time has no importance.

The same general phenomenon occurs in different forms in financing aviation investment. The Federal Aviation Administration, a component of the Department of Transportation, systematically employs discounting to determine the present values of future costs and benefits. Yet most investment in airports is made locally, on the basis of investment criteria which are typically unannounced even if they are known. Local airport finance may enforce some discounting rules in practice: an airport financed by revenue bonds must automatically convert some future benefits into cash flows and effectively discount these future cash flows by applying applicable rates of interest against them. But many airports are not financed by revenue bonds. Also, the very choice between revenue bonds and obligations pledging full faith and credit produces a further option in interest rates which may be used for discounting in addition to the option created by the fact that local obligations, free of Federal taxes, typically involve interest rates lower than those available to the U.S. Treasury.

b. *The ragged edge between public and private investment*

The tax differential mentioned in the preceding paragraph is, of course, even more obvious if public and private investments are compared. A locally-financed transportation investment may disregard both direct and indirect income tax payments. Income of the project itself is not taxable; and interest paid to bondholders is free of Federal income tax. A Federally-financed project involves indirect Federal income tax payments by holders of Federal securities which are the counterparts of the investment expenditure, but the project pays no income taxes directly. Private investment financed by bonds has the same Federal income tax position as Federal investment; but private investment financed by sale of new equity capital involves both direct and indirect income taxation by all relevant levels of government. To complicate matters still further, equity capital created by ploughing back earnings may greatly reduce the indirect tax liabilities of stockholders who take the capital-gains route to keep themselves in funds or who have no need to sell stock.

This description could, of course, be applied to the differences in income tax liabilities of private and of different kinds of public investors anywhere in the economy. Its particular significance for transportation arises from the interrelationships of public and private investment in transport investment. Where the two are complementary, as they are in aviation, the practical results may be just the reverse of the over-extension of airports relative to airplane investment which pure discount theory would lead one to expect. Hard-pressed local governments may refuse to incur further debt even if it is incurred to finance an investment which seems almost sure to be profitable. And revenue bonds may not be saleable in one big lump for a huge new airport. But the most difficult cases are not those of investment complementarity between the private and public sectors. These most difficult cases involve investment competition, in the sense of investment in facilities to provide competitive services. The outstanding example of this competition is that of highways and railroads. But the rail investment problem has so many other aspects that it requires special treatment of its own.

3. The special case of railroad investment

The Department of Transportation operates the Alaska Railroad. The City of Cincinnati owns, but does not operate, the Cincinnati Southern. Otherwise the railroad map of the United States is dominated by private ownership. Therefore it may seem paradoxical to single out railroad investment policy in a statement devoted to Federal Government standards for discounting future costs and benefits. Moreover, most important present-day problems of railroad investment cannot be attributed simply to public investment in highway facilities for the specific purpose of facilitating freight movement. The contrasting attitudes of the American Trucking Association and the American Automobile Association on truck size and weight limits are enough to indicate that truck and passenger car uses of

highways are not automatically complementary. But the passenger automobile now dominates short- and medium-distance intercity passenger transportation as, in numbers, it dominates in the use of most highways. Therefore any system for the allocation of highway investment would have to assess an important share of the total against passenger transportation. Both the provision of highway facilities for trucks and the competition with rail freight which this provision makes possible are to some extent by-products of the provision of facilities which would be demanded in any case by drivers of passenger automobiles.

Moreover, although many segments of the national rail net are subject to competition from waterways operators who pay no user charges, this competition is specialized with respect to both area and commodity.

There are still massive problems for rail investment created by the competitive environment in which railroads operate. Many railroads are in a position to avoid payment of Federal income taxes on part or all of their income, due to tax loss carry-forwards, which helps to improve their competitive position vis-a-vis public investment by reducing or eliminating the spread between their gross and their net return. But these tax-loss carry-forwards are also a factor in the growing phenomenon of footloose railroad cash. The roadbed may be immobilized, but the cash flow derived from depreciation, net income and sale of miscellaneous assets is not. Therefore the problem of railroad investment in the face of competition may be further subdivided into two different problems: negatively, competitive forces have cut into railroad earnings, and continue to hold them down; positively, the opportunity cost of converting railroad cash into railroad investment seems to be rising as alternative uses of the cash become relatively more attractive.

As if these problems were not complicated enough, there exists a further railroad investment problem which is a product of both history and technology. Historically, most railroads financed themselves to the maximum possible extent by the issuance of mortgages on their fixed assets. These often contain "after acquired" clauses which subject any further fixed assets to the original lien. Even without such provisions, loans against rolling stock provide the lender with more mobility and hence more security than loans against investments in way and structure. Historically, also, most railroads supplied themselves with whole systems of branch lines, and elaborate patterns and stations and yards, all built on the assumption of minimum hauls for local drays and wagons. The motor truck has revolutionized terminal services, and eliminated the need for much railroad fixed plant. Technical improvements in railroading must struggle against a financial, investment, and operating structure which combine to throw a deep shadow of the past into the present.

Finally, each individual railroad enterprise may be both too big and too small to achieve maximum credit in security markets for investment in technological advance. Individual railroads involve massive capital investments reflected in high balance sheet valuations of assets. Specific improvements due to new investment may lose most of their effect on earnings ratios due to the massive size of this asset denominator. Conversely, most individual railroads are too small to realize for themselves all of the beneficial systems effects of new investments.

To sum up: the problem of discounting costs and benefits of new railroad investment goes much deeper than is indicated by a simple contrast between "public" and "private" considerations. If railroads were experiencing the exuberant growth which characterizes highway or airport construction, many of the most glaring contrasts between railroad and other transport investment criteria would be greatly reduced. The problems of private ownership, of divided ownership, of obsolete physical capital, and often of obsolete balance sheets combine to make the development of acceptable criteria for railroad investment a matter of deep concern to the Department of Transportation as well as to the railroads themselves.

4. Trust funds, and pay-as-you-go

Federal highway programs have always been on a pay-as-you-go basis in the sense that no new bonds were ever issued as a specific offset to Federal highway contributions. But the major present Federal commitment to highways, via the Highway Trust Fund, is pay-as-you-go in a much more direct and meaningful sense. Receipts are earmarked for highway investment, and are thereby enclosed in what amounts to a budget within the budget.

The basic idea of a trust fund involves segregation of particular receipts from the general budget. But a trust fund need not involve the further principle

of pay-as-you-go. Investment could be financed by borrowing, with future trust fund receipts hypothecated against payment of bond interest and principal. Many state highway budgets once operated on this basis. So the following remarks will not be directed toward trust funds in general, because trust funds in general have no particular relationship to the problem of discounting future costs and benefits. Instead, attention will be focussed on the special features of Federal funding of its contribution to the Interstate Highway System, via a combination of a trust fund and pay-as-you-go.

If the provision of highways had to respond to a growth in demand as rapid as that now facing airports, a pay-as-you-go type of trust fund would involve unusually *high* discount rates if it were the only source of investment. Conversely, a pay-as-you-go trust fund for a relatively mature industry would involve successive investments which could be justified only at lower and lower discount rates for future benefits. The essential problem with any trust fund, therefore, is that it simply extrapolates the past into the future.

This analysis cannot be applied directly to the Federal Highway Trust Fund, because the proceeds from this fund are used as a supplement to the larger funds already available to states and localities for the specific purpose of financing construction of the Interstate Highway System. Upon completion of this system, however, the incompatibility of a pay-as-you-go trust fund with the whole idea of appropriate rates of discount for future benefits will have to be faced.

5. Money prices and shadow prices; user charges and tolls

A benefit is a benefit, whether it is charged for or not. But the "benefit" numerator in benefit-cost calculations may assume very different values depending on the presence or absence of a specific charge for the service enjoyed. A "user charge" may also take the form of a specific charge for a specific service, in which case it might properly also be called a "toll"; or it may represent a general charge for the use of the service in general.

Neither the distinction between money prices and shadow prices nor the distinction between user charges and tolls is peculiar to charging for transportation. Moreover, neither distinction seems to have any direct relevance to the problem of a proper rate of discount for use in converting future into present values. But there are substantial indirect connections between these concepts and both transportation and discounting. The world of transportation not only involves a mixure of public and private enterprise. It also involves a jumble of real prices and shadow prices, of general user charges and specific tolls. To revert to the railroad illustration: if all railroads were publicly-owned, the case for charging rates only sufficient to cover operating costs would be better than for other forms of transport; for, as long as the rail system contains excess capacity, extra use does not entail the costs of additional investment. Elimination of all spreads between rates and operating costs would enlarge total benefits derived from the use of railroads as well as the problems of covering railroad financial charges. Conversely, the land and air space used by the most convenient large airport in a metropolitan area may be vastly preferable to those available anywhere else in the area; and expansion of the airport may be possible only with sharply-rising costs. In crowded metropolitan areas, even a public body might expect to earn large economic rent on its most favorably-situated facilities. In terms of the relationship of pricing, benefits, and investment policy, the combination of private ownership of excess capacity and public ownership of very scarce resources may produce results which are far from perfect.

Even if the type of ownership is matched against the presence or absence of excess capacity at zero prices, there remains the fact that what matters is not the appropriate or proper discount rate, as such, but the appropriate or proper net relationship of discounted benefits and costs expressed as present values. The benefits to be derived from use of a facility at a zero price will normally exceed those to be anticipated from future use at a positive price unless special problems on congestion are created as total use increases. Once congestion appears, the whole level and distribution of benefits will be affected by the use of specific tolls, to control use of facilities, on the one hand, or by the use of general user charges, on the other hand.

Chairman PROXMIRE. Thank you, Mr. Mackey.

Mr. Levine?

STATEMENT OF ROBERT A. LEVINE, ASSISTANT DIRECTOR FOR RESEARCH, PLANS, PROGRAMS, AND EVALUATION, OFFICE OF ECONOMIC OPPORTUNITY, ACCOMPANIED BY MRS. BETTE MAHONEY, STAFF ECONOMIST

Mr. LEVINE. Thank you, Mr. Chairman.

I would like to commence by introducing Mrs. Bette Mahoney, who is our staff economist in this field.

Mr. Chairman, I would like to submit my statement and make an oral statement.

Chairman PROXMIRE. In that case, your prepared statement will be printed in full in the record.

Mr. LEVINE. Since my remarks deal mainly with qualifications on our use of this kind of analysis, I will start by emphasizing that we need this kind of analysis in the poverty program. In the current state of our knowledge we treat this analysis as an art rather than as a science; that is, even though we have a single measurable objective, the erosion and end of poverty in the United States, we do not have any single system on the benefit side where we can compare different sorts of contributions to this single objective. Frankly, sir, we are not near it.

For this reason and for reasons of various of the specific qualifications I shall mention and that are mentioned in the written statement, the discount rate is not yet of crucial importance to either our analysis or, I think, the analysis of other human resource programs. There is too much else to be done before sensitivities to different discount rates become crucial.

One of the chief qualifications I want to mention is very simply the difficulty of conceptualizing some of our benefits. In three of our major categories of programs under our program budgeting system, for example, training programs, manpower programs, benefits are easy to conceptualize, at least. We know we should be measuring increased earnings due to a training program. When we move to another category, education, it is slightly less easy to conceptualize. We do not really know the contribution of education to increased earnings and therefore to the erosion of poverty.

In some other fields—community action, for example—when we talk about institutional change, we know from so-called soft sociological analyses that community action is essential to the end of poverty; we do not know how to measure the immediate results which will give us the contribution to this ending of poverty. I should add in this connection that we are doing work with esoteric techniques such as content analysis, pattern analysis, and so forth, in an attempt to measure the soft ends of our program and put them on a basis where we can at least measure increments of one program against another. But we have not yet reached this happy state.

Even in programs where we can conceptualize, there are difficulties of measurements as such. I think there are very few human resource programs that have very good data systems at this time. Perhaps the best one I know is OEO's Job Corps program, where the experience of the young people in these Job Corps centers is fairly carefully

recorded and tabulated and where, on a sample basis, followup is carried on by polling organizations on a scientific sampling basis. The Job Corps can do this because: First, the program itself costs enough so that the additional cost of a good data system seems to justify itself; second, Job Corps is more centrally controlled than most human resource programs, and the data system can be imposed by central direction.

For other good reasons, the trend in human resource programs is toward decentralization and local control. I think we must realize that when we decentralize and control locally, we are sacrificing somewhat on the availability of data or the possibility of our demanding data for these programs.

Given, though, that we can do and have done some conceptualization and that we can do and have done some measurement, what is the implication of these measurements and analyses for our programs as compared to other programs? I think it would be very difficult and wrong to make direct comparisons between our benefit-cost analyses and those for the physical resource programs of the Federal Government.

As suggested in the paper, we have set up some definitions of consumption and investment benefits from the human resource programs. By investment benefits we mean those benefits which bring economic returns in the increased product sense, and this is only one of the objectives of any one of our programs, increasing the contribution to the national economy of our clientele. It is an objective, but it is only one. It is a measurable objective, which is measurable against the other programs.

In addition to these, we have the whole set of other benefits which we call, for convenience, consumption; benefits having to do with the distribution of the resources, goods, and income in our economy and benefits which are not of the type which typically can be analyzed by benefit-cost analysis. I believe these benefits have not really been adequately handled by any form of economic analysis at this stage. For this reason, the whole set of other social goals put into our program and other human resource programs by the political process, which is the proper way to put them into these programs, must be handled analytically, different from the benefits which are the benefits of many of Mr. Mackey's Transportation programs.

All of this leads to several qualifications. I have frequently tried to make qualifications about our use of benefit-cost ratios. The first is that in our kind of program, a benefit-cost ratio less than one, less than unity, does not mean that a program is unsuccessful. There are usually many intangibles which we define into this consumption category which cannot be computed into benefits; whereas the costs are all too tangible.

Further, even though a ratio of less than one might indicate that transfer payments are cheaper than a specific resource program such as the training program or programs which lead to increased earnings on the part of a recipient and contribute to the commonweal, there is a clear social and political preference favoring other programs as compared to transfer payments, and allowances must be made for this.

Let me give you an example of one of our studies discussed in this submission. We did a benefit-cost study of the Job Corps, done by

Prof. Glen Cain of the University of Wisconsin. We did not have the problem of trying to justify a benefit-cost ratio of less than one. The range of investment portion of the benefit-cost ratio was in the order of 1.1 to 1.5, and we used the number that about 1.2 was the best estimate of the——

Chairman PROXMIRE. What was the discount used?

Mr. LEVINE. They were discounting the estimated future earnings attributable to the Job Corps program.

Chairman PROXMIRE. What percent, what interest?

Mr. LEVINE. The numbers we used for discount rate were 5 percent and 7 percent. As I said in the paper, the effective discount rate was 3 percent compared to 5, and 5 percent compared to 7, because we believe it is in this particular sort of training program that it is necessary to take account of the overall increase of general labor productivity at roughly 2 percent a year, which has historically been occurring in our economy. We take this into account by reducing the discount rate for purposes of computation, although the conceptual and theoretical discount rate used here is 5 and 7 percent.

In any case, we did arrive at these benefit-cost ratios on the order of 1.2, but we did not allow for benefits which are some of the chief benefits claimed by the Job Corps, benefits which we could not measure, what they call the socialization process, the ability of these kids to get along with other kids and therefore to get along with fellow workers. We did not allow for their learning about the world of work. We did not allow, in the case of the Women's Job Corps, for future family stability, which is very crucial to the problem of poverty, which would stem from the training they get in the Women's Job Corps.

All of these components are immeasurable. They are on the uncertain side of my dichotomy of social benefits. For these reasons we have made a guess, that perhaps a true benefit-cost ratio, if you discounted the consumption benefits the same way, would be something on the order of 2 rather than 1.2. That is a pure guess. You cannot do it mathematically.

The second qualification, the state of the art, and state of data in our field, are both primitive enough that it is almost always unwise to compare programs unless the ratios are computed in a single specific study for the purposes of such a comparison. We have done one such study, a sensitivity study, comparing the Upward Bound program for senior high school students to go to college and the Headstart program, which presumably is to get similar kids at a much younger age. What we wanted to know is what would be the effect of a discount rate using estimated future earnings increase as a benefit measure between two programs, one of which paid off in earnings immediately after the program was finished—that is the Upward Bound program—as compared to one which could not conceivably pay off in the earnings until 10, 11, 12 years later. This study was done and the kind of estimate we came up with was that, given the partially known benefits of Upward Bound, which gave us a pretty good benefit-cost ratio for Upward Bound, the Headstart effectiveness would have to be on the order of 1 to 2 increased years of education attributable to the Headstart program to equalize them.

Frankly, this surprised me. I think if Headstart works at all, it is going to be an easy thing to achieve, and I would have guessed the

discount rate would have killed Headstart. Again we are using the same range of discount rates, Mr. Chairman.

Chairman PROXMIRE. Let me just interrupt to say that your assumption that it would have killed Headstart is on the further assumption that you just cannot crank in all the benefits of Headstart. The benefits that you have alluded to in these other respects, with regard to stability in socialization and therefore reducing the crime rate and that kind of thing.

Mr. LEVINE. Not completely, really.

Chairman PROXMIRE. As part of it, though; because I understood you to say your benefits were primarily related to specific increases in earnings.

Mr. LEVINE. Yes, sir.

Chairman PROXMIRE. Which certainly is only part, and perhaps a small part, of the benefits.

Mr. LEVINE. That is true. This applies, I think, perhaps to both programs, the intangible benefits. My prestudy guess, which proved wrong, that the discount rate would kill Headstart, however, was based purely upon the idea that any comparable set of benefits would be killed by 10 years of discounting, 10 or 11 years of discounting.

Chairman PROXMIRE. You found out that was not true?

Mr. LEVINE. We found out this was not true. Let me then make a point on that basis. It is going to be true for some programs. This leads us specifically to a final point I would like to make, which is on the discount rate as such.

I am not sure what discount rate should be used even on the investment portion of programs like ours. Because there is a conventional analysis, we use a discount rate we believe to be in the opportunity cost range, this 5 to 7 percent, for our kind of program. I have not thought this all the way through, but it may be that because the American people, with our kind of program, have exhibited a clearly different kind of time preference, a time preference which can be expressed in the phrase, "Let us do this once and for all, and do it in a fundamental way, which will cure something for the long run," in the long run implying a weight on the distant future which ordinary discount rates will not give you—it may be that for some programs of this nature, there is a political preference expressed for a low discount rate. In a sense, the American people are saying that comparing benefits of similar programs, getting away from the comparability of these programs to others, comparing benefits of similar programs to one another, it may be that the political preference which must be honored here is to do things in a way which values the distant future much more heavily than any economic use of discount rates on economic benefit programs will ordinarily give you.

Chairman PROXMIRE. I wonder if that is the case or if you simply should extend your benefits over a longer period? After all, in some of our physical programs, we extend benefits for 100 years. You could—it is true that the benefits would diminish rapidly if you have a higher discount rate. I am not sure that there is necessarily a preference for great-grandchildren. After all, in many ways, life in this country has been getting easier and education greater and leisure more abundant, and so forth. This trend seems likely to continue. The children and those of us who are living now are probably the ones who will have a tougher time than future generations.

Mr. LEVINE. I am not sure, either, Mr. Chairman, but the extension of a benefit for 100 years at 6 percent, the hundredth year is still not terribly important. I think we can design the mechanical system, the mathematical system, to take account of what we believe to be the true preference structure. All I am suggesting here is that for our kind of program, complex as it is, partly economic, partly noneconomic as it is, perhaps the discount rate should be looked at in a different way. It might come out numerically similar or numerically different, depending on what the true preference structure is. But I am not sure that the opportunity cost discount rate is the proper one. That is the note I would like to end on.

(The prepared statement of Mr. Levine follows:)

PREPARED STATEMENT OF ROBERT A. LEVINE

OEO, and particularly my office which has the cost/benefit analysis function, has been concerned with such analysis and associated discounting questions for several years. In the recent past, members of my staff have conducted four studies, three of which may be categorized as Benefit-Cost studies and the fourth, similar in purpose, as a Cost-Effectiveness study. These studies were of the Job Corps, Upward Bound, a Family Planning Program, and a comparison of Upward Bound, Follow Through and Head Start. I will use material from two of these studies as examples in my discussion.[1]

However, I should emphasize that to date the question of the discount rate *per se* has not been a critical one at OEO. The simple truth is that the study of human resources and the quantification of benefits derived from programs involving such investment is in its infancy. The really big problem we are concerned with now is that of pure measurement of benefits and cost in human investment programs; and until we have good benefit and cost figures, the discount rate is not so important. Great sophistication on discount rates is really not needed in human resource problems until one has developed sophistication on the cost and benefit side.

Let me give an example. In many ways, training programs are the easiest of human investment programs to measure. Yet, even here the practical problems are staggering. It is simple to specify exactly what we want to measure in a manpower program. Essentially the individual can anticipate some level of income before training. We expend money in his training (the cost) and thus expect an increase in his income. The difference between his income before training and after training represent the benefits. But how do we measure them? Does his last pretraining wage serve as a good proxy for his future income stream were he not trained? Does his first post-training wage become his future earnings after training? Frankly, there is much disagreement here. How can we measure these benefits?

And, if the questions are hard in the training field, one can imagine the problems in programs working with very small children, with a Community Action Program or with criminal rehabilitation. However, until we can measure these kinds of benefits and the relevant costs with greater sensitivity, extreme sophistication in assigning discount rates is not a terribly important problem.

In fact, we have substantial hesitance about the extent to which human resource programs can be compared to physical resource programs on the basis of benefit-cost analysis. This hesitance is in part due to the difference in sophistication and accuracy associated with measuring the benefits of these programs. It is also due to the large "consumption" element associated with human resource programs.

The benefits which accrue from a program are twofold: (1) those which yield an economic return; and (2) those which satisfy tastes and preferences. For convenience, we call these different types of benefits, investment and consumption

[1] The two studies are: *Benefit/Cost Estimates for the Job Corps* by Glen G. Cain and *Comparison of Head Start, Follow Through and Upward Bound* by Bette Mahoney and Lewis Rosen. Mr. Cain performed the study of the Job Corps while on a year's leave from the University of Wisconsin to the Research and Plans Division in my Office. He is presently, as he was before he joined my staff, a member of the staff of the Department of Economics and Institute for Research on Poverty at the University of Wisconsin. Mrs. Mahoney and Mr. Rosen are presently Economists on my staff.

benefits. The investment benefits can theoretically be measured in the market place directly by contrasting the value of increased productivity with the resource cost of creating these benefits—the standard basis for benefit-cost analysis. Consumption benefits cannot be easily measured directly, but may be an important element of program impact for human resource programs. Thus, it is possible that considerations like justice and equity, consumption benefits in our terminology, would lead to expenditures on programs which are not justified by the economic or investment benefits alone. Indeed, such consumption benefits ordinarily form a major portion of the justification for human resource programs. But not for the more purely economic physical resource programs and herein lies a crucial difference which makes comparison between the two difficult or meaningless.

The costs of programs are theoretically easier to measure. The costs to the individual beneficiary himself are the opportunity costs of his participation. Thus, for example, if the results of a program were that all students remained in school an additional year, the foregone earnings associated with that additional year of school must be incorporated. The cost to society is the foregone output which could have been produced by the resources used in the program. In our example, both the foregone production of the students undertaking an additional year of school and the equipment, teacher output and the like are resource costs to society. The costs to the government are straightforward. They are the budgetary costs expended on the program.

We believe that the Federal Government must look beyond its own budgetary process in determining whether an investment should or should not be made. Once having determined that an investment is a good one for society, it is useful to see what transfer payments between individuals are necessary so that we may assess the political desirability of such transfers. The assessment of the political desirability is traditionally the function of the President and the Congress. The benefit-cost analyst has little to add in making these decisions except to make the extent and nature of the transfers explicit in reports of the studies.

It is at this stage that discounting plays an important role in the analysis of costs and benefits of programs. The traditional use of discounting in benefit-cost analyses of human resource programs is to determine the present value of future benefits. However, discounting may also be used to make different costs comparable. For example, as shown in Mahoney and Rosen's comparative study of Head Start and Upward Bound, an essential difference between these two programs is the length of time which intervenes between the incurring of cost in each program and the onset of returns. Upward Bound costs are incurred just a few years before participants enter the labor force, while Head Start costs are incurred eleven years earlier in a youth's life than this.

For purposes of such comparisons, it can be assumed that the target population is the same for the programs and that the programs are substitutes for one another. The assumption is that a child is to be treated once—either as a pre-elementary school child in Head Start or as a high school student in Upward Bound. The comparison is to determine at what point we would be indifferent between providing the child with either program.

Discounting eliminates the distortion which would accompany a dollar comparison of costs incurred at different points in time. Were it assumed that Head Start and Upward Bound will have the same upward impact on lifetime earnings, then the choice between programs (as investments) would rest on a comparison of their costs. If returns are identical, the two programs will be equivalent if the costs (properly discounted) are the same. If we simplify by assuming that the primary economic benefit derived from Head Start and Upward Bound is that associated with educational gains, then a measure of educational level may be used as a proxy for the economic benefits (although this strict measure of quantitative incremental educational attainment ignores a quality impact which is one of the bases of the Head Start program).

At present, there exist some estimates of the educational attainment of Upward Bound students. These estimates are incomplete primarily because the program is new enough that no graduate has had time to complete college. In any case, these quantitative educational gains estimates, in conjunction with per-student costs to the Federal Government for Upward Bound and Head Start permit some "cost effectiveness" estimates to be calculated. Such a calculation indicates the importance of discount rates.

The question is posed as follows: Given the estimated educational gain of Upward Bound participants, how much educational gain must Head Start pro-

duce so that the two programs will yield identical gains per dollar? The estimated net gain produced by Upward Bound is one and one-fourth years. The cost per student to the Government of a full-year Head Start program in 1967 was $1,050; the cost per student of Upward Bound in fiscal year 1967 was $1,254. Using interest rates of 4, 5, and 6 percent, the Head Start costs can be brought forward 11 years and made comparable with Upward Bound costs: the adjusted costs are $1,616, $1,793, and $1,993 for 4 to 6 percent respectively. Thus, for Head Start and Upward Bound to be equally "cost effective," Head Start would have to produce educational gains of 1.61, 1.79, or 1.99 years over a full school career, depending on the discount rate. The measure of cost-effective gains in this type of analysis is very sensitive to the discount rate used. The lower the discount rate the smaller the required gains from Head Start.

This leads us to the issue of the appropriate rate of discount. In general, it is our view that the opportunity cost of investing in the public sector is the foregone return in the private sector and not the cost to the Treasury of borrowing money. The rates of 4 to 7 percent used in the evaluation of our programs were chosen as representative of a safe private investment, although cogent arguments have been made by some for real rates of interest as high as 9 to 10 percent. In any case, the higher rates of many of today's safe investments include an inflation rate. That is, part of the actual interest rate reflects the real return on investments but the expectation of inflation raises the interest rate by an amount that reflects higher prices expected in the future. Since the benefits of programs are measured in real terms, the appropriate discount rate is that which measures the real returns on investments and not the nominal rate which includes a price-change factor. To the extent that similar programs can be compared to one another a uniform discount rate is appropriate.

Although differences in the discount rate can make a difference in program evaluation, differences in the measurement of benefits may still be much more critical. For example, in Professor Cain's study of the Job Corps, two methods of estimating benefits in the form of improvements in labor market earnings were used. One method consisted of comparing the post-program earnings of ex-Corpsmen with those of a group of young men who had been accepted into the Corps but did not participate. The second method estimated the gains in reading and mathematics skills by Corpsmen and translated these educational gains into expected future lifetime earnings using a careful study of the relation between earnings and education by Giora Hanoch. Using an effective discount rate of 5 percent, the benefits measured by the first method were 42 percent higher than an estimate using the second method but with the same discount rate. A comparison of the benefits calculated by the first method using two different effective discount rates showed the benefits using the 5 percent rate to be only 39 percent higher than the benefits using the 7 percent discount rate.

Note that I have been using the term "effective discount rate" when referring to the rates used in the Job Corps study. There has been some confusion about the rates used in the evaluation of our programs. The rates of 5 and 7 percent were used in the evaluation of our programs. The rates of 3 and 5 percent tabulated in the Comptroller General's report as the rates used for evaluating our programs, were used for calculation purposes only. They are not the effective discount rates.

Since the Job Corps was evaluated in terms of the improvement in labor productivity of the Corpsmen, we have argued that the rate used to discount future earnings from labor should allow for the secular growth in wage rates. This does not mean that a growth factor should be attached to every set of prices measuring the benefits of investment projects. Aside from the influences of inflation or deflation, product prices may rise or decline over time and it is difficult to judge the expected long-run trend. But, when estimating future wages on the basis of current wages, a growth factor generally should be applied to the current wage levels. A secular rise in real wages in the near future is a realistic expectation. This secular rise will be due to that technological progress and capital deepening which will be reflected in a large part in a more rapid growth in the demand for labor than in the supply of labor.

We estimate that the secular growth stemming only from the rise in the price of quality constant labor is approximately 2 percent a year. The increase in the marginal value of labor is representative of the real increase in the productivity of the labor. Thus, it is expected that the difference between what a Corpsman is expected to earn over his lifetime, as measured in present benefits, and what he would have been expected to earn without Job Corps, will increase at a rate equal to the secular growth in real wages. Our estimates of the bene-

fits measured in present increments should have been inflated by two percent a year before they were discounted. To simplify the calculations, the improvement in labor productivity was discounted by three and five percent instead of increasing these benefits by a two percent growth rate and then discounting by five and seven percent. Mathematically, the two procedures are identical. Thus, the *effective* discount rates used were 5 and 7 percent and not the 3 and 5 percent used in the calculation.

The inclusion or exclusion of the growth rate of real wages does not alter the comparison of the use of different interest rates and different measures of benefits but it does highlight the difficulties in measuring the benefits from human resource programs. To further highlight these difficulties, let us assume that the appropriate measure of benefits is that differential in income which would be received over the lifetime of the individual. Direct analysis of the impact on lifetime earnings is impossible if evaluation is to be undertaken within a reasonable amount of time.

One possible way of calculating the benefits is to use the well-documented correlation between lifetime earnings and educational level. Thus, it is possible to use the difference in educational attainment between participants in the programs and nonparticipants of equal qualifications (age, sex, race, socioeconomic background, natural ability, etc.) and then use the correlation between educational level and lifetime earnings to provide a dollar measure of program returns. The use of educational level as a direct measure of lifetime earnings implies that the programs have no economic impact unless they lead to higher educational attainment.

A second possible way of calculating the benefits, also used in the Job Corps study, measures some initial differences in income between program participants and a control group and makes some assumptions about the pattern of future differentials. Potential assumptions are numerous and past patterns of such differentials not very well documented.

Thus, differences occur by using alternative procedures of estimating the same benefit—differential lifetime earnings. Further, this is not the only benefit of a program. Given the present state of the art of measurement, there are many intangibles which cannot be translated into dollar benefits. For example, there are many benefits in addition to the increased earnings of the participants of Job Corps. Some of the gains are measurable in principal but have yet to be measured. Possible reductions in crime and welfare rates are examples. Others may never be measurable, but are still important, such as the benefits to earnings capabilities gained from what Job Corps calls the "socialization process"—the ability to get along with other people in a work situation. Other gains are even less tangible but are perhaps the most important of all. An example here would be effectiveness of Women's Job Corps in maintaining the stability of the future families of girls currently passing through the program.

In conclusion I would like to say that the discount rate and discounting play an important role in the process of evaluating human resource programs. However, the art of identifying and measuring benefits, in the near future, is likely to have much more of an effect on our evaluations. This does not mean that the questions surrounding discounting should not be answered but only that, in the human resource area, the attention of our analysts must be directed primarily at those most basic questions of benefit calculations.

Chairman PROXMIRE. Gentlemen, these have been very, very interesting as well as diversified presentations.

Mr. Enthoven, or Mr. Lynn—I do not know which would like to respond to this, perhaps both of you—I infer from your statement that any discrete undertaking which has either cost or benefit effects accruing in the future requires discounting for an appropriate appraisal of its current worth. Do you agree with that?

Mr. ENTHOVEN. Yes, sir; we do agree with that.

Mr. LYNN. Very much.

Chairman PROXMIRE. So that any agency which has a capital budget to allocate must undertake this kind of analysis if it is to efficiently allocate this budget among alternatives.

Mr. ENTHOVEN. I believe that is correct, sir.

Chairman PROXMIRE. Mr. Mackey, would you agree to that?

Mr. MACKEY. Yes, sir.

Chairman PROXMIRE. I have here a letter from Mr. Turner in response to an inquiry of him, in which he says:

Replying to your letter of February 9, the Bureau of Public Roads does not use discounting techniques in administering the Federal aid and direct Federal highway construction programs. In addition, we do not plan to use discounting techniques in the future.

How can you defend the U.S. Government policy of allocating this multibillion-dollar highway capital budget without recourse to such analysis?

Mr. MACKEY. I would not purport to defend it, Senator.

Chairman PROXMIRE. Well, what can we do about it? Would it not make sense for Congress to require its States and municipalities to initiate, at least to institute PPBS before they can qualify for Federal funds?

Mr. MACKEY. I think that would be one approach. It might be quite a reasonable one. I think there is certainly an alternative approach which I hope that we will be able to accomplish even in the absence of that kind of congressional action. We have just recently initiated a review of all of the discounting procedures within the Department. They vary widely, and I would hope that in a relatively short time we would have a far more consistent policy, and maybe some of the plans of some of our various components would change.

Chairman PROXMIRE. Well, I hope you can do this as soon as possible. Of course, the difficulty with our highway program is that it tends to be somewhat insulated from the discipline, even the relatively feeble discipline the Government can exercise, let alone the discipline that private corporations have to exercise in order to survive in that you have regular source of trust fund income, primarily from the gasoline tax. That does not, it seems to me, justify its exemption from the use of resources which, after all, are secured by taking money from the taxpayer which otherwise could be invested, would be invested to a considerable extent, either in consumption or an investment in the economy.

Mr. MACKEY. This is one of the main problems I was trying to get at in my discussion of the highway trust fund. I think you know, too, there have been a number of instances in the transportation field where the Congress itself has been considerably more reluctant than the executive branch to try to apply similar types of rational analysis. We are prepared to move as far as we can as rapidly as we can to apply this across the board.

Chairman PROXMIRE. You note in your statement that there are a number of other legal restraints which keep the Department of Transportation from instituting sound economic analysis. You mention section 7 of the Department of Transportation Act. Would you outline what some of these constraints are?

Mr. MACKEY. You mean under section 7?

Chairman PROXMIRE. Yes.

Mr. MACKEY. There are six items which are included in section 7 where we are not allowed to develop investment criteria. The two most important of those are the water resources area and grant-in-aid programs. Since the highway program and the Federal aid airport program are grant-in-aid programs it would seem that this applies. We do not have a definitive legal opinion as to the scope of section 7 in its

applicability. But the legislative history indicates that the Congress was clearly trying to carve out some areas where they do not want us to go, do not want us doing this kind of analysis.

Chairman PROXMIRE. Is this the controversy about using current rates rather than costs in evaluating waterway projects?

Mr. MACKEY. That is the second paragraph of section 7(a). The first paragraph of section 7(a) lists the exemptions, and the second paragraph says specifically what rates shall be used in the evaluation of waterway programs and projects. It is the argument of current rail versus future waterway rates.

Chairman PROXMIRE. The requirement is that you use current rail rates, which would seem to me to be a transparently unfair comparison.

Mr. MACKEY. Obviously.

Chairman PROXMIRE. In fact, I voted against the Transportation Act creating your Department because I thought it was so unconscionable. I spoke very vigorously about this on the floor. Congress, as you indicated, had another view and they passed an act putting this kind of unfairness right in the law.

Mr. MACKEY. That was not part of the original administration proposal for the Department Act.

Chairman PROXMIRE. Will you submit for the record an answer to the following question: What are the primary constraints which now hinder the implementation of a sound economic analysis in your Department which could be relaxed by congressional action?

Mr. MACKEY. Yes, sir.

Chairman PROXMIRE. What kinds of legislation would you find most helpful in removing these impediments to sound economic analysis of the Department of Transportation expenditures?

Mr. MACKEY. I shall be glad to.

ANSWERS TO QUESTIONS ASKED BY SENATOR PROXMIRE OF MR. MACKEY

The questions were:

1. What are the primary constraints which now hinder the implementation of sound economic analysis in the DOT which could be relaxed by Congressional action?

2. What kinds of legislation would you find most helpful in removing these impediments to a sound economic analysis of DOT expenditures?

There are three primary features of DOT legislation which may operate as constraints to the implementation of sound economic analysis in the Department. These are:

1. Sections 7(a) and 4(b)(2)(B) of the Department of Transportation Act.
2. Laws relating to the Federal Aid Highway Program.
3. The Federal Airport Act.

Part I contains explanations of how each constraint might affect the implementation of sound economic analysis in DOT and how certain legislation could improve conditions. Part II contains a discussion of administrative and non-economic considerations which might alter the nature of the legislation.

PART I: CONSTRAINTS ON IMPLEMENTATION OF ECONOMIC ANALYSIS

Provisions in the DOT Act

The language of Section 7(a) of the Department of Transportation Act limits the Secretary's role in developing investment criteria for the formulation and economic evaluation of proposals for the investment of Federal funds when those proposals are concerned with certain types of projects.

Section 4(b)(2) of the same Act is also pertinent. It states that "Nothing in

this Act shall be construed to authorize, without appropriate action by Congress, the adoption, revision, or implementation of—

(A) any transportation policy, or

(B) any investment standards or criteria."

During the last several years, the Executive Branch, through the Bureau of the Budget has evolved a system (PPBS) for planning Federal expenditures in an economically efficient manner through the setting of what amount to investment criteria. These criteria are applied in most government Departments and agencies as an administrative requirement. There would not appear to be special reasons for imposing particular restrictions such as those in Sections 7(a) and 4(b)(2) on DOT's authority to manage its programs.

Laws Relating to the Federal Aid Highway Program

The Federal Aid Highway Program as it is currently structured under Title 23 would appear to contain the following three principal constraints on the implementation of sound economic analysis.

1. The law provides that Federal Highway expenditures be determined by the amounts collected from motor vehicle user taxes as they are placed in the Highway Trust Fund. Such pay-as-you-go trust fund financing schemes can be restrictive in the following two ways:

i. The trust fund equation of expenditures to amounts received from user taxes may not guarantee an economically efficient total amount of expenditure to the extent that might be possible if the receipts were from a competitive market and the taxes were annually adjusted.

ii. The pay-as-you-go arrangement may build a further inflexibility into the system. In any program in which future receipts accrue as a result of capital expenditures the agency should be allowed to borrow against future earnings at some rate of interest. Under a more flexible system, a program with a rate of growth (and rate of increase of capital stock) higher than the interest rate would spend in a given year more than it collects, while a low growth program would collect more than it spends.

2. Another type of inflexibility, essentially independent of the trust fund concept, may arise from the fact that amounts allocated to specific States and specific programs within States are distributed according to formulas in proportion to areas, populations, and miles of postal route without explicit regard to the relative benefit/cost relationships of projects among or within those States. Furthermore, the funds which States receive for constructing Interstate Highways are apportioned in proportion to the estimated cost of completing the system in each State, which would hardly be expected to provide an incentive for economic allocation with the State since the State itself contributes only ten percent.

3. Finally, the fact that the funds for highway construction are allocated within each State by the State Highway Department or equivalent agency tends to make it more difficult for DOT to implement economic analysis since these agencies are not under its administrative control.

Broad legislative changes needed to relax the above apparent constraints might be along the following lines:

Money collected from road user taxes might be placed in the Treasury and not in a special fund.

Road user taxes might be revised on a continuing basis according to the long run marginal cost due to the movement of different types of motor vehicles. Special congestion taxes might also be levied where appropriate and feasible.

Grants might be allocated to States based on benefit/cost considerations of capital investments towards which the grants would apply.

The DOT, in cooperation with the States might help develop benefit/cost criteria for the evaluation of highway investment.

The total amount of grants might be determined by the results of benefit/cost studies of capital investments.

The Federal Airport Act

Although the Federal Airport Act contains a method of allocation of funds similar to the highway laws in that most of the fundings is allocated by a fixed formula based on area and population of States, it does not, however, contain the trust fund features of the highway laws and it provides more Federal administrative control over individual projects by means of the National Airport

Plan formulation. It also allows the Federal Aviation Administrator to allocate 25 percent of the annual appropriations at his discretion.

In order to provide more flexibility for implementation of economic analysis it might be necessary to allow the Administrator to allocate the full amount of appropriations at his discretion, i.e. according to uniform investment criteria set by DOT.

PART II: ADMINISTRATIVE AND NON-ECONOMIC CONSIDERATIONS

Section 7(a)

As explained in Part I, the amendment of Section 7(a) of the Department of Transportation Act would facilitate implementation of effective economic analysis. There does not appear to be any important administrative or non-economic reason why the Act should remain as it is.

Laws Relating to the Federal Aid Highway Program

The concept of a trust fund related to user charges contains the desirable feature of allowing for long-range programing of highway expenditures. This feature could be retained without much distortion provided that the level and structure of user charges feeding the fund are reviewed at relatively frequent intervals with an eye to revision in the light of changes in National transportation demand. The pay-as-you-go nature of the fund could possibly be revised, however, so that bonds might be issued against future user charges revenues, and the total amount of annual construction might be determined by economic studies of transportation demand. The pay-as-you-go formula is currently mitigated to some extent by the provision that Federal funds can be used to repay State bonds for highway construction.

Perhaps the best feature of the distribution formulas is that they provide a generally predictable source of funds for each State for its planning purposes. But a portion of these funds might still be allocated at the discretion of the Secretary using guidelines which give priority to States with projects having high benefit/cost ratios. Also the distribution of expenditure as among Interstate, primary, secondary, and urban extension roads within a State could be somewhat more flexible than provided by the current law (which provides a separate set of funds for Interstate Highways, and which allocates 45 percent of another set of funds to primary, 30 percent to secondary, and 25 percent to urban extensions and does not allow either of these three apportionments to increase or decrease by more than one-fourth within a State through transfers).

As to the restrictions caused by lack of direct administrative control of State Highway Departments, there appears to be logic in retaining this feature of decentralized planning since a large portion of projects, particularly in urban areas, are of essentially local concern.

The Federal Aid to Airports Act

The distribution formula serves the same general purposes here as in the highway case. However, the current 25 percent allocated at the discretion of the Federal Aviation Administrator might likewise be increased to allow further flexibility without eliminating the automatic allocation completely.

Grant Programs in General

Eventually, grant programs regarding urban transportation and ultimately intercity transportation should be put on a common basis. A decision-making body at the local level which is choosing between alternatives, one of which involves 90 percent Federal financing (an Interstate highway), and the other of which involves competition with other areas for a small amount of grant money (mass transit), is likely to be biased in its choice. Legislation of a scope broad enough to change the current situation should be designed to improve the incentive structure for grant recipients to induce them to implement economically efficient systems. This kind of incentive structure would reinforce the effect of investment criteria established by DOT.

Chairman PROXMIRE. Mr. Levine, in your testimony, you claim that the interest rate is of comparatively minor importance in evaluating public investment in human resources and that benefit estimation is the main bottleneck. This being the case, what do you consider to be the crucial next move to either improve the conceptual basis for bene-

fit estimation or the empirical measurement of the concepts which we already have?

Mr. LEVINE. The next crucial move has to be data systems. I mention in my remarks some obstacles to this in terms of decentralization. Nonetheless, I think we have work to and we are working on designing methods of getting data in. I think we ought to use more sampling, perhaps, rather than trying to get uniform data which ends up in warehouses when we get it at all, rather than try to get universal data. I think the design of data systems which will provide the necessary data in sufficient quantity, sufficient range, is basic to everything else in the human resources programs.

Chairman PROXMIRE. What plans does your agency have for improving the reliability of benefits in human resources?

Mr. LEVINE. Well, again, this goes to the data. We are going into sampling. We are going into some evaluation of programs on a sample basis because the operating systems are not providing data that will enable us to do this kind of analysis. One immediate effort is to go out for a contract that will compare five manpower training programs. This is not just our Department, this is the Department of Labor and ourselves in cooperation. We compare the MDTA training program, Job Corps, the Neighborhood Youth Corps, the new JOBS, J–O–B–S, the National Alliance of Businessmen program, and the new careers program on a basis which will get followup data and current experience data on the participants in these programs, compare their characteristics, and then their subsequent experience, to make estimates of future earnings and therefore to do comparative benefit-cost analyses on these crucial training programs.

That is our most immediate program, and I think most exciting, that we have along these lines.

I mentioned our efforts to harden soft data in the community action area. We are engaged now in a full-scale fieldwork which will provide data for analysis of the Headstart program, the full year and the summer Headstart programs, both as to their immediate effectiveness with children and to their effectiveness going into the first years of the child's education. These are a few examples of the kinds of plans we have to do this analysis.

In each case we are using sample data. That may be, so far as our kind of program goes, the only way to do it.

Chairman PROXMIRE. I cannot think of anything you could do that would be more important. I really cannot. I think this goes to the very heart of it. We know we are going to have limited funds for these things. We have been through this. A lot of people feel we are going to fall into a great windfall of Federal money that will be available when the Vietnam war is over. Unfortunately, this is just not true. The competent people in the Defense Department—Secretary Nitze told us in the Appropriations Committee that he would estimate that we would be fortunate if the Defense budget is kept at a $75 billion level. It is now $82 billion, so $7 billion is not much of a saving.

We know the enormous cost of housing which is going to burgeon. We know in so many other areas where the demands for Federal funds are going to increase at a very, very rapid rate. We also know how the

people who pay taxes are reacting and the great power they have in the Congress, properly so.

So that there is just going to be a great pressure on finding out what programs have a good payoff, what do not, and determining on the basis of the fairest, most objective kind of comparison rather than any political pressure which are the best programs, and then move ahead on them.

So I just hope you can put a lot of time and effort into this.

I think the Defense Department has been the real pioneer in this. I suppose anybody just thinking about it 10 years ago or 15 or 20 years ago, you simply cannot apply it to Defense. It is something where there is no fair comparison. You cannot really use the kinds of analyses that are appropriate for private enterprise in our Defense expenditures. Yet it has been applied, as you know, I think, with brilliant success; with great economic effect, and with an ability to increase our firepower, for example, with a relatively modest increase in cost. It can be done so effectively there; it seems to me it can be done even in your area, which I admit is puzzling, difficult, and which has, as you say, a great problem in estimating benefits. But I think you should do it in two ways: No. 1, you should extend it just as broadly as your imagination can, challenge these assumptions all along the line.

Then, No. 2, you should make your findings available to the Congress when these programs come up so that we have an opportunity to consider the alternatives, so that we do not just cut deeply in the Department without knowing precisely what the effect will be and without knowing what the alternatives are. This is the only way I think we can get effective efficiency and economy in our governmental operations.

Mr. LEVINE. I certainly agree, Mr. Chairman. Let me emphasize I was not saying we cannot do it; we are doing it. The specific rigorous methods are slow in coming. The cost-benefit method of thinking has, I think, been pervasive in a lot of our work, both internal and in our presentation to Congress. We have tried to present programs as alternatives, using qualitative statements where quantitative were not available.

We have also done, as I indicated, quantitative work and, in fact, this has been supplied for 2 years now to our legislative committees. I would not like to leave the impression that we are in the state the Department of Defense was in 20 years ago, but we are certainly not in the state the Department of Defense is in now.

Chairman PROXMIRE. HEW has done some good work in this area, too, as you know. They also have a problem not unlike that of the Department of Transportation in some of these other areas, where you are dealing with physical production which can be measured more objectively and precisely and compared in terms of benefits. They do not have as much of that, yet they have made some real progress.

Mr. Chartener has been a real force there in the past. I guess he is over in Commerce now, but he was in the Health, Education, and Welfare Department.

Mr. LEVINE. Yes, sir.

Chairman PROXMIRE. I would like to come back to Defense, and I very much appreciate, Mr. Enthoven, your emphasis on the fact that cost effectiveness is an aid to judgment and not a substitute for it.

There is no question about that, and with your experience in the Department of Defense, you have found that to be true. You have many instances, I am sure, where you found that one system seems to work out better on a cost-effectiveness basis, but there are other reasons that could cause you to choose the one that has proven itself less. But at least you have these guidelines in front of you; is that not the case?

Mr. ENTHOVEN. Yes, sir.

Chairman PROXMIRE. And you have found that discipline, I take it, essential?

Mr. ENTHOVEN. Essential for the definition and defense of the public interest.

Chairman PROXMIRE. You seem to go a little lower in your discounting range. You said a 5- to 10-percent range for opportunity cost for Government investment. Yesterday, Dr. Eckstein—and you all know what an authority he is—said 7 to 8 percent, Harberger said 12 percent; Mr. Lynn said 7 percent and up, as I understood him.

Why did you go as low as 5 percent?

Let me just say that when we discussed this yesterday, it was brought out that 5.5 percent in Eckstein's view is just about the minimum we can expect for the riskless interest rate in terms of what the Federal Government borrows on a long-term basis. He just does not think it will go much lower than that, unless we get unemployment, which we do not expect.

Then you have to add to that, as Mr. Lynn pointed out, your taxes forgone. When you do that, you come up to a minimum, it would seem, of 7.5 percent.

How can you go as low as 5?

Mr. ENTHOVEN. When I said 5 to 10 percent, Mr. Chairman, I was merely describing my impression of the range of expert opinion today. For one thing, one could make a case for a rate as low as 5 percent, if one were to adjust current interest rates for the fact that they reflect expected inflation. For another thing, some economists argue that the Government should use a riskless rate in evaluating its investment.

Chairman PROXMIRE. That was disputed with great vigor yesterday by the economists who were here. They contended that—I think Eckstein's argument was that it would not go much more than 75 basis points, which would be three-quarters of a percent, below this present level in the future.

Mr. ENTHOVEN. I would not want to argue for anything like the 5-percent rate myself, Mr. Chairman. I personally believe that a much more accurate estimate of the opportunity cost of capital is somewhere in the range of 8 to 10 percent.

Chairman PROXMIRE. You cannot think—or can you think of any justification for the operation of the Corps of Engineers, which is in your Department, with regard to their present operation, which is about 3¼ percent, for public works projects, and which, for water resources projects, will be 4⅝ percent? Is there any possible economic justification for that, in your view? I do not mean to be putting you on the spot.

Mr. ENTHOVEN. I must admit I have not studied that particular question recently, Mr. Chairman. But that does seem to me to be a very low rate. If we expect other projects in the Government to be designed around a higher rate, then that is too low.

Chairman PROXMIRE. It is just too low, obviously. It may be that we are forgetting some of the benefits here or overstating the costs. But if you have a calculation which includes the costs——

Mr. ENTHOVEN. Yes, sir.

Chairman PROXMIRE (continuing). And includes the benefits, all the benefits, then it seems to me very hard to justify going much lower than, as you say 8 to 10 percent; 7 percent anyway. It does not mean you do not go ahead even though you have a benefit-cost ratio of less than unity, but at least you go ahead with your eyes open. You know what you are doing.

Mr. ENTHOVEN. I agree, Mr. Chairman. I do not think that a department should be allowed to use an unrealistically low rate on the basis of alleged nonquantifiable benefits. It would be better to use a realistic rate and then to define, describe, and defend the nonquantifiable benefits, and present them for the judgment of responsible officials in the executive and legislative branches.

Chairman PROXMIRE. Mr. Lynn, how would you—or would you describe for the committee the procedures by which the Government analysts can make explicit allowances for risk and uncertainty in the benefit-cost streams?

Mr. LYNN. I think it is important to distinguish between the concepts of risk and uncertainty.

Chairman PROXMIRE. All right.

Mr. LYNN. Various programs may be subject to foreseeable kinds of risks; such as, that the costs will be somewhat higher or somewhat lower than we estimate, or that the particular performance characteristics will vary somewhat about the expected values that we have set for them.

Chairman PROXMIRE. That is the uncertainty aspect.

Mr. LYNN. That would be what I would consider the risk aspect; that is, we can define probabilities for various of these different states occurring and perhaps develop formal distributions of both the cost estimates and the performance estimates.

On the other hand, there are other kinds of uncertainties, for example, that the requirements may be very different than we estimate or that the system may not work at all, or that the whole environment within which we are looking at our problem may change in some major way. I do not think there is any way to fold such uncertainties into a discount rate adjustment. I think the best thing to do with those kinds of situations is to analyze cost and effectiveness under different circumstances, and then make judgments on the basis of alternative possible outcomes, rather than trying to subsume every consideration in the discount rate.

Chairman PROXMIRE. So that you would stick with the discount rate we have been discussing rather than vary the discount rate depending on the risk and uncertainty involved, and you would try to provide for the risk and uncertainty in the benefits?

Mr. LYNN. Well, both the analytical and the practical problems of handling risk are very subtle.

Chairman PROXMIRE. I think from the political standpoint, that a consistent rate would be much more desirable. If you can get a rate and apply it for everybody, you are in much better shape, it would seem to me, than if you get a rate that varies all over the place.

We have this horrible example now, where it goes all the way from zero in a few cases, 3 percent and 3¼ percent in an enormous amount of investment, up to 10 percent for you, where we have most of our investment, to 12 and 15 percent in other areas. This is so confusing that it just seems to me you cannot get the kind of discipline necessary so that Congress knows what it is doing.

Mr. LYNN. Yes; I believe there are very great virtues in consistency. To the extent that an agency or a proponent of a particular system argues that special considerations apply, I believe these considerations are best treated by making them explicit by showing alternative costs and benefit estimates rather than by trying to fold these questions into the discount rate. I agree with you on that point.

Chairman PROXMIRE. Let me ask you gentlemen: On Tuesday, the committee heard testimony which distinguished between public investments which displaced private investments and those which did not. For those investments which did displace private investment, it was recommended that the rate of return in the pertinent private sector be used for discounting rather than the social opportunity cost of capital over the whole economy. For those investments that displaced resources in general, the use of the social opportunity cost of capital over the whole economy was recommended.

Does this distinction strike you as being pertinent? Start with Mr. Enthoven, or Mr. Lynn, or both of you answer.

Mr. ENTHOVEN. I think that the correct position for the Government in general, Mr. Chairman, is to use a single rate—our best estimate of the opportunity cost of the capital used by the Government—as the norm. However, using that rate as a point of departure, it might be appropriate to use a different rate in some cases in which there are special circumstances that justify it. But the deviation from the norm should be identified and defended explicitly. Now the example you mention—in which public investment displaces private—might be such a case. I am not sure. The governing criterion should be the maximum social product. Moreover, I do not think the issue of public versus private enterprise should be hidden behind an interest rate argument. I think it should be made explicit and debated on its own merits. Perhaps Dr. Lynn has thought about it.

Mr. LYNN. I think there is a real problem with trying to identify the opportunity cost of a particular kind of Government investment with a return on a similar type of private investment. One of the virtues of the opportunity cost concept is that it forces one to be concerned with what the foregone opportunities actually are, never mind what the characteristics of the specific project under review may be.

Now, in some instances it may very well be the case that if the Government undertakes a project, the private sector will not.

On the other hand, if the Government undertakes the project, the foregone opportunities are more likely to be spread very broadly rather than to be focused on particular industries. I think that adhering to the discipline of the opportunity cost concept and of a sound measurement of opportunity cost is a much better procedure than trying to make pair-wise comparisons between public and private projects of all kinds.

Chairman PROXMIRE. Mr. Mackey?

Mr. MACKEY. I think in our area there are some attractive aspects of trying to identify the more or less business-oriented aspects of Government. But I am not sure that you gain much in the long run. Some of the investment we undertake is clearly very similar to what business undertakes. We go at it in a very businesslike way; others, we do not.

You get into a great many questions. One, for example, is what if the public investment you are undertaking is really due to the fact that you have a private monopoly, either in that field or some other field, and you have to get into it. Questions of this sort tend, in my mind, at least, to detract from the usefulness of this kind of distinction. So I guess where I come out is I am probably more inclined to say that the social opportunity costs applied across-the-board may make more sense.

Chairman PROXMIRE. Mr. Levine?

Mr. LEVINE. I am less certain than the rest of my colleagues about the importance of a single discount rate covering all programs and all purposes. I feel this way because I think our problem is a very real problem. I think the answer that applies to your question is it depends upon what policy question you are asking. If the policy question is one of a nature comparing two programs with similar use of resources—in our field, for example, a public housing program versus a private housing program—I think that the appropriate discount rate might be the cost of private capital in the mortgage market. For the same public housing program, however, if you could compare it to another sort of antipoverty program, a different discount rate might be appropriate. I am not scared of having two different discount rates for two different purposes. So I think for some purposes this would be justified, for some policy decisions. For other policy decisions, the proper discount rate might be the overall opportunity cost of capital to the Government.

Chairman PROXMIRE. How about the utilization of resources aspect of this question in light of a different assumption? Would you change your views on this if we did not make the assumption I assume all you gentlemen are making and that the economists yesterday made, that we are operating, if not at full employment, fairly close to it or at least at the level of unemployment at which any lower level would result in unacceptable inflation? Supposing we had a situation of unemployment that was very high and of utilization of plant capacity which was quite low, so we had available resources, we would not be displacing resources when we engage in Government activity.

How would this affect the discount rate, if it would?

Mr. ENTHOVEN. Well, if we have significant unemployment, it makes sense for the Government to spend more or tax less to correct it. If you used a lower discount rate, that would stimulate public investment. If that were done, however, it ought to be justified explicitly as for that purpose, and there should be a uniform policy.

Chairman PROXMIRE. How would you do that? This is quite a serious problem. Yesterday Dr. Eckstein made the assumption that we just cannot get below 5.5 percent unemployment. He felt that if you were below that, we would not stand for it, Congress would not stand for it. He may be right or he may not be right. In the 1950's we had periods where it was 7 percent. We have had periods where our plant capacity has been utilized at 75, 70 percent.

Obviously, these idle resources could be used on some quite marginal Government projects and make a contribution to economic growth.

Mr. LYNN. I think one important purpose of a discount rate is to discriminate between profitable projects and unprofitable projects. That is a somewhat different problem than deciding on the overall level of investment the Government may want to undertake to stimulate private demand.

Chairman PROXMIRE. So that what you might do under some circumstances is only invest where you have a benefit-cost ratio of maybe 1.5 or 2 to 1, and other circumstances, you may go below unity?

Mr. LYNN. In my view, that would be a more practical procedure than trying to manipulate the discount rate to track a very changeable set of circumstances. It is much easier to change your ideas about what is an acceptable cutoff ratio; if you have significant unemployment problems, lower the ratio.

Chairman PROXMIRE. It has been suggested to the committee that the next step in achieving a consistent interest rate policy would be for some Federal agency to undertake a study to implement the methodology for estimating the social cost of capital over the whole economy. Would you gentlemen agree with this recommendation?

If this is not the first step, what would you think—what would be the next step?

Mr. LYNN. In my own personal judgment, there are still a lot of unresolved questions in coming up with a fully acceptable concept for measuring the social opportunity cost.

Chairman PROXMIRE. That, of course, is what the agency would have to do.

Mr. LYNN. I simply have not thought about who should do it, but I do think there are advantages to trying to reconcile the different ideas and opinions that people have about the right concept and how to go about measuring it. I do not know who might do it, but I think such a study would be useful.

Chairman PROXMIRE. Mr. Mackey?

Mr. MACKEY. I guess I share the opinion. I think it would be useful to have. I do not know who would do it, whether it would be the Bureau of the Budget or whether they should try to find a single agency and encourage this agency to do it.

Chairman PROXMIRE. One certain criterion such an agency should have, it should not have an ax to grind. Obviously you should not pick an agency with an ax to grind. Certainly you should be represented. But something like the Council of Economic Advisers, the Bureau of the Budget, some agency which has a degree of objectivity as well as a professional competence in this area should be in charge.

Mr. Levine?

Mr. LEVINE. I certainly would like to see such a study covering the human resource field. As I have indicated, I have some doubt about the need for consistency between these and others, but there is certainly a need for consistency of discount rate and, for that matter, methodology of cost-benefit work in the fields covered by HEW, the Department of Labor, and ourselves.

I have seen one set of studies which somebody tried to compare, where there was a simple difference, that savings to the Government

in one study were subtracted from costs and in the other study were added to benefits. You get different ratios that way. When subtracted from costs, you might get a negative ratio. There are all sorts of methodological inconsistencies.

Chairman PROXMIRE. What you are saying is you want a competent agency to make the study?

Mr. LEVINE. Yes, sir.

Chairman PROXMIRE. However, as Dr. Otto Eckstein said yesterday, he thought it was also important that you have an agency to put this into effect like the Bureau of the Budget, that would have authority and power, could make its position effective.

Mr. LEVINE. I would not presume to choose the agency. In the manpower training study I mentioned before, we are achieving that by having joint sponsorship of the two agencies.

Chairman PROXMIRE. I am talking about something different from that. What we are interested in from a congressional standpoint is having this done in a comprehensive way. I understand perfectly your feeling that human resources are a special and different kind of case than physical resources. That is a strong case.

It may well be that we would have to work on some kind of differentiation. Nevertheless, I would persist that you ought to have one agency or one group that would make this study. Then, whether or not we would decide or the Budget Bureau, the President or the Congress would decide to cover human resources in this way is another decision.

Mr. LEVINE. I was not arguing against that at all, Mr. Chairman. I was just backing it up by saying in my narrower field, I see a need for at least a study covering that field.

Chairman PROXMIRE. Let me ask, presuming that the study was able to measure effectively the opportunity cost of capital, would you gentlemen think that the publication on an on-going basis of this basic risk-free rate as a guide to all Federal agencies would be a helpful move for sound decisionmaking?

Mr. ENTHOVEN. I think it would be helpful, Mr. Chairman. I have introduced the discount rate as a factor to be considered in particular decisions and gotten the reaction that I was pulling a rabbit out of a hat as an argument in a particular case. Then I have had to explain and defend the whole theory of interest rates. An authoritative Government-wide position on interest rates would make it possible for practitioners in particular areas to refer to it. Then they would not have to argue the whole issue of discount rates and their relevance in each particular case. I do think, of course, that it will always be necessary to consider the specifics in each case, including the risks and the other special factors involved.

Mr. MACKEY. Mr. Chairman, I would like to say that the degree of acceptance of concepts like discounting appear to me to vary widely within any large organization. As you pointed out, within our own organization, the Department will have some differences of opinion. Apparently the Department of Defense has some. I would think in considering a study like this, one of the alternatives might be finding some way to have it done in effect for the Congress more directly than within the executive branch itself, because ultimately, even a more serious problem than broad-scale acceptance within the executive

branch may be acceptance within the Congress and the willingness to make decisions on it there. Perhaps some combination of the Joint Economic Committee and the Appropriations Committees getting together to agree that this is necessary—actually, you make the final decisions beyond what we have made.

Chairman PROXMIRE. Well, in view of your experience with the kind of restraints that have been put on your department that we talked about earlier, I can understand that view. Frankly, as one who has been up here in the Senate for more than 10 years—nearly 11 years now—I am convinced that if this is going to be effective with Congress, when you get the great diversity of views and interests the Congress represents focused in this area, it has to come from the President of the United States. He just has to do it.

We discussed yesterday the fact that the Interior Committee, which has such a tremendously important role to play in water resource projects, consists of people who come overwhelmingly from Idaho and Nevada and Arizona and in the House, Colorado, the Western States that have a crucial stake in water projects. They would like to see the lowest possible discount rate applied. These are the people to whom Congress has delegated policy with regard to water.

Even on the Appropriations Committee, the Interior Subcommittee—I happen to be a member of that, but most of the Members gravitate toward that subcommittee because they want to represent their State's resources needs as effectively as possible. It is perfectly understandable.

Under these circumstances, I just do not think you are going to get effective action in the Congress unless the President of the United States takes a clear and decisive position, as only he can, on a policy which will do justice to all people in the society, in the Nation, by recommending something that is consistent.

That is why it would seem to me that the executive branch has to be heart and focus of this operation. Although we up here on the Hill can help, we would like to go into battle with the administration behind us.

Mr. MACKEY. I am sure your observation and my views are influenced by the experience we have had, which is correct. But when the administration attempted to take this kind of leadership in the whole field of transportation, which is a very significant one in terms of social and economic impact and dollar level of expenditures, that kind of leadership was not welcomed with open arms. I just think you have a great problem of acceptance no matter what kind of leadership the executive branch is able to take unless there is a little more concern on the part of Congress.

Chairman PROXMIRE. Of course, you cannot expect that leadership to be welcomed with open arms, recognizing the makeup of Congress. You have to keep fighting and coming back and getting up off the floor again and again. It is pretty rugged, but this is the way you do it, I would think, if it is going to be done at all.

Let me get into something a little more explicit and direct. This is the last area.

Mr. Lynn, I would like to have you give me a little more specific detail on your analysis of the supersonic transport. Your table entitled "Present Value of SST Investment" (see p. 149)—you have minus 344,

minus 528, minus 579; does that mean that the SST market, as calculated by the Institute for Defense Analysis, would not have been economically viable even with a 5-percent discount rate for the SST?

Mr. LYNN. That means that under the recoupment formulas that the Government has decided upon to regain the cash value of its investment, it would end up in a negative position at the end of the period under consideration.

Chairman PROXMIRE. What was that period?

Mr. LYNN. To 1990. If the IDA market estimates are accepted, the Government would end up in a negative position and the size of it would depend on which discount rate you chose to use.

Chairman PROXMIRE. Even if you take the FAA analysis, which is about as biased as you can get, if you apply the 10-percent discount rate, which would seem under these circumstances—and if I have ever seen a risky investment, believe me this is it, from the technological standpoint and all other kinds of standpoints—you would end up in a negative position even by 1990; is that correct?

Mr. LYNN. That is correct.

Chairman PROXMIRE. Negative what, minus $239 million?

Mr. LYNN. That is the negative present value at 10 percent?

Chairman PROXMIRE. Yes. If you adopt the 15 percent, which would be much more appropriate, it would be $421 million out of the taxpayers' pocket.

Mr. LYNN. That is correct.

Chairman PROXMIRE. The break-even point is 6.85 percent?

Mr. LYNN. Yes, sir.

Chairman PROXMIRE. I take it it would be pretty hard to justify a break-even point of 6.85 percent for something like the SST.

Mr. LYNN. I might add that the estimates here assume that all of the costs of the program prior to fiscal 1969 are counted as sunk costs. Our calculations here look only at those outlays we would have to undertake beginning with the next fiscal year.

Chairman PROXMIRE. In other words, you are not even including those costs?

Mr. LYNN. No, sir.

Chairman PROXMIRE. Brother, they are sunk.

Well, thank you, gentlemen, very, very much. This has been, I think, a fitting climax to our hearings. Perhaps I should not have brought the last item up. But you have done a fine job. We appreciate it. You have given us some examples which I think we are very much indebted to you for.

I would like to state at this point that additional materials and statements will be included in the appendix, as is our usual custom.

The committee will stand adjourned.

(Thereupon, at 11:55 a.m. the hearings in the above matter were concluded.)

APPENDIX

STATEMENT OF PAUL A. AMUNDSEN, EXECUTIVE DIRECTOR, AMERICAN ASSOCIATION OF PORT AUTHORITIES

The public port industry of the United States, as represented by this Association, consists of some 70 deepwater port systems, on all coastlines under development by agencies of state or local governments. Within the 70 are numerous multi-port complexes involving State-wide port authorities.

This Association recognizes the problem before the Subcommittee on Economy in Government of the Joint Economic Committee in weighing a realistic and perhaps more uniform approach to the rate of return on the Federal dollar invested. We sense that the concern of the Committee lies in the general range of water resource projects identified with conservation, flood control, irrigation, and other humanitarian concepts wherein there is much latitude and few guideposts, so that realistic investment norms are sought as an aid to the policy-maker.

It is our general feeling as public agencies that the importance of water resources is such that the Federal government should not expect a rate of return on investment in them any higher than the actual average interest cost to the Treasury of funds it borrows on a long-term basis.

But specifically, we feel that the Committee should be aware of the rather spectacular economics of ship channels, which are also "waterway projects" and should exercise great caution in the use of arbitraries which might affect the more substantial local investment, and, indeed, the national economy to the extent it is dependent upon world trade, together with a major job market.

We would hope that through these hearings, the Committee, and, indeed, the Congress and various departments of the administration can be made more aware of a most attractive national investment.

The port authorities are responsible for the development of piers, wharves and docks over which flows the foreign trade of the United States. Port facilities of the country are provided, in the main, through local public funds under general obligation bond issues, or revenue bond issues, or operating revenues, or appropriations by State and local governments.

During the two decades following World War II approximately $2,127,464,000 has been invested by the local agencies in direct port facilities.

Correspondingly, the Federal government investment in the deepwater ports of the United States, mainly in the form of ship channels, has totalled about $1.2 billion during the same period of time.

Thus it may be seen that on a national average taken over two decades local government is putting into port facilities for foreign commerce very close to $2.00 for every $1.00 invested by the Federal government.

To complete this general picture, almost $55 billion in two-way foreign trade (1966 figures) flows through this port system annually.

More than $2.5 billion was collected by the Federal government in Customs for the fiscal year ending July 30, 1968 on imported goods flowing over these facilities.

According to a port by port survey, recently undertaken by The American Association of Port Authorities, approximately 600,000 jobs are directly involved in the ports in handling this export and import trade. These include such people as stevedores and longshore labor, towing, pilotage, freight forwarding and customs brokers, warehousing and packaging, banks and marine insurance, and the like.

In a broader sense, a study by the Marine Administration of the Department of Commerce several years ago reported that 2,500,000 workers were employed in export related industries in states having port facilities, with almost a million additional workers supported by activities connected with U.S. imports.

Turning to the relationship of these facts to the matter before the Committee, it would seem that the provision of navigable channels for world shipping is not an optional matter, from the viewpoint of the Federal interest. The channels *must* be provided to carry an annual flow of $55 billion worth of merchandise with all its beneficial impact on the national and local economies and level of employment. Examined from this standpoint, the investment guideposts become academic. Norms should be the most nominal that can be established consistent with general policy. Channels may, indeed, be viewed more as a part of a trading nation's *operating expense* than from the standpoint of direct investment.

But the Federal investment in channels for ocean shipping remains, despite the above philosophy, a very profitable one. By any standard an investor who can, for his dollar, attract two additional dollars of partnership venture capital and obtain a rate of return of more than 400% per year on his annual investment is in a good business. This is precisely what has happened to the Federal dollar invested in channels for world shipping over the twenty year cycle referred to above . . . in terms of Federal investment in channels, local port authority investment in piers, wharves and related facilities, and Customs receipts to the Federal government.

Viewed from the investment standpoint, again the norms should remain nominal. Harbor improvements are authorized under cost-benefit ratios and are just as sensitive to the interest rate as are any other waterway projects. But they have, in addition, a competitive factor which should not be overlooked by the Committee.

The United States port system, the finest in the world, has been built by free competition among the port communities of all seacoasts. While this competition is for cargo traffic, it exists as well in the area of Federal appropriations for channels. There are just so many Federal dollars appropriated for this work, and the question of which ports obtain the work goes back to the cost-benefit ratio.

Therefore, any radical change in the rate of interest applied to cost on the one hand and benefit on the other will penalize a series of port communities by altering their competitive position from the standpoint of channel appropriations. Should the result be a diminished flow of cargo, economic impact on these communities could be severe and should not be underestimated.

The cargo though even a small port community can generate, in that community, as much as $50 million a year in direct income. For a larger port, the figure can range between $250 million and $300 million in community income.

We would hope that the Committee, as it weighs the broader problem, would take no action which would curtail Federal sponsorship of necessary and justifiable harbor improvements.

CONGRESS OF THE UNITED STATES,
HOUSE OF REPRESENTATIVES,
Washington, D.C., August 17, 1968.

HON. WILLIAM PROXMIRE,
Chairman, Joint Economic Committee, Congress of the United States, Washington, D.C.

DEAR MR. CHAIRMAN: In my opinion, the development of our land and water resources is vital to the continued economic growth of this country. If the projections of population growth are anywhere near correct, we are not allocating an adequate proportion of our annual expenditures for this purpose.

The concept of using the so-called opportunity cost of money, which I am told would be in the neighborhood of 10 to 15 percent in the economic analysis, would effectively stop the development of all land and water resource projects.

I would like to cite the following example of a project in my state which is recent enough to reflect current procedures of the Corps and at the same time has been in operation long enough to demonstrate the trend of the commerce being developed.

For fiscal year 1955 initial construction funds were provided for modernization of locks and dams 1 and 2 on the Green River in Kentucky. At that time the cost of the work was estimated at $14,399.00. The report of the Corps was predicated on the movement of 2,250,000 tons of coal annually; on this basis, the Corps reported the benefit-to-cost ratio as being 1.5 to 1. The hearing record for fiscal year 1955 before the Appropriations Committee shows that there was a demand for Green River coal by both the TVA and AEC. At that time it was pointed out that AEC could save 40¢ a ton on coal for their Portsmouth plant alone. Similarly, the savings to TVA to certain of their steam plants of 30¢ a ton was indicated. In the case of AEC, firm contracts for 15 years had been signed with the Ohio Valley Electric Corporation for the delivery of 1,780,000 tons annually. Under the terms of the contract, if the coal could be furnished from the Green River fields the price to AEC would be 40¢ a ton less than the alternative source. The savings to the AEC under that contract alone would be $8,500,000 in 15 years. In both of these cases, the savings in transportation costs would accrue directly to the Federal Government, because TVA and AEC are Federal agencies.

Bearing in mind that the estimated tonnage used in the economic justification for this project was 2,250,000 tons. Actual tonnage on this waterway was:

1957	2,693,350	1962	8,494,301
1958	4,794,960	1963	7,764,284
1959	5,170,118	1964	10,363,520
1960	5,446,365	1965	11,309,727
1961	7,590,542	1966*	11,677,155

*The latest year for which tonnage is available.

Actual deliveries of coal to AEC and TVA were far greater than the estimates, and consequently, the direct savings to the Federal Government are substantially greater than the estimates. While time does not permit a determination of actual shipments to these Government facilities for incorporation in this letter, I shall attempt to secure this information and forward it to you at an early date. The principal point I wish to make is that this project not only was economically justified by a wide margin, but the savings to the Federal Government in transportation costs alone will more than pay the entire cost of modernizing these structures. Clearly, it is a wise and prudent investment of Federal funds.

Taking the Corps' estimate of costs and benefits and using the lower figure of the so-called opportunity cost of money—10%, the benefit-to-cost ratio would have been 0.56 to 1.0, clearly an uneconomical project.

I sincerely hope that the sub-committee will find it possible to fully consider this and other similar cases that may be presented before taking final action.

Sincerely,

WILLIAM H. NATCHER.

WARRIOR-TOMBIGBEE DEVELOPMENT ASSOCIATION,
Birmingham, Ala., August 20, 1968.

Mr. HENRY P. CAULFIELD, Jr.,
Executive Director, Water Resources Council,
Washington, D.C.

DEAR MR. CAULFIELD: This is in response to your notice in the Federal Register under date of July 26, 1968:

We have followed with considerable interest the proposals made before the Joint Economic Committee that interest/discount rates used in the evaluation of costs of water resources projects be substantially increased. Giving the proposals only superficial consideration or looking at them from only a single view point, makes them *seem* plausible.

There must be available to the Committee economic studies on which the vast Appalachia program is based which would demonstrate that much of that program is not economically feasible even when the present low interest/discount rate is used. The Appalachia program, as well as others having to do with general sociological improvement of the areas which they cover, I believe were enacted (unless I am badly mistaken) to provide long-range social and economic benefits rather than immediately traceable economic benefits.

Should application of drastically increased discount rates for water-related public improvements be made obligatory, many will go by the board. Among them could be those with which this Association is most concerned—the remaining projects on the Warrior River and tributaries—all of which lie within the area encompassed by the Appalachia Bill and which have had the support of the entire Alabama delegations in the House and the Senate. Thus, on one hand, Congress will have enacted programs to raise the economic and social level of an area and, on the other hand, if the drastically higher discount rates are established, will have instituted rules to negate these benefits.

I believe that the members of the Joint Economic Committee want to be fair and, therefore, would want to hear equally the opinions of economists with opposing points of view regarding the *social* and economic advantages and disadvantages of both the low and high discount rate.

We would very much appreciate your making this letter a part of the record of the Committee.

Sincerely yours,

C. M. KILIAN,
Executive Vice President.

STATEMENT OF ASSOCIATION OF AMERICAN RAILROADS

CONSISTENT DISCOUNT PROCEDURE FOR PUBLIC EXPENDITURE ANALYSIS

My name is Burton N. Behling. I am Vice President, Economics and Finance Department, Association of American Railroads (AAR), Washington, D.C. The AAR is a voluntary association and represents railroads accounting for 98 percent of the operating revenues of all linehaul railroads in the United States. I appreciate the opportunity of submitting this statement on behalf of the AAR concerning "Consistent Discount Procedure for Public Expenditure Analysis." This Committee is to be commended for conducting these pioneering hearings. I am confident the hearings will foster improvements in evaluating public investments by focusing attention on the critical role of interest rates used in such analyses.

INTRODUCTION

Historically, there has been no uniform method for computing interest rates for use in evaluating public investments. This deplorable condition has resulted in the misallocation of resources between the public and private sectors of the economy as well as among various public investment undertakings. Moreover, the lack of a uniform interest rate formula makes it almost impossible for the Congress to evaluate the relative economic efficiency of alternative public investments recommended by the various Government Departments.

My statement briefly discusses the following interest rate concepts that have been used or proposed for use in evaluating public investments:

1. Coupon rate on long-term Treasury securities.
2. Yield on long-term Treasury securities.
3. The social rate of time preference.
4. The opportunity cost of capital.
5. Cost of long-term Treasury securities adjusted for taxes forgone.

For the purpose of this statement, the relevancy of the five concepts of interest rates listed above are evaluated on the basis that the appropriate interest rate for use in evaluating public investments should provide the most efficient allocation of the Nation's limited resources between the public and private sectors of the economy as well as between the present and future generations.

I have assumed that the public investment of resources should meet the test of economic efficiency, although recognizing some government programs involving social goals or objectives need not meet this test. However, this does not preclude the use of the discounting procedure for evaluating public expenditures for strictly social goals.

After determining the most relevant interest rate concept for use in evaluating public investments, I have suggested a rate of interest for use by all Government Departments.

COUPON RATE ON LONG-TERM TREASURY SECURITIES

Senate Document No. 97, 87th Congress, 2nd Session, provides that the discount rate for use in evaluating water and related land resource projects be based on 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 application of this formula currently results in an interest rate of 3¼ percent for evaluating the costs and benefits of water and related land resource projects.

There is no question that this formula results in understating the real cost of borrowing by the U.S. Treasury. It is equally clear that returns in the private sector are substantially greater than 3¼ percent. Consequently, the use of this formula has resulted in the misallocation of the Nation's resources. There is general agreement among economists that an interest rate based on the coupon rate of long-term Treasury securities is not relevant for the purpose of evaluating public investments.

YIELD OF LONG-TERM TREASURY SECURITIES

On July 26, 1968, the Water Resources Council proposed a new formula for computing the interest rate to be used in the formulation and evaluation of water and related land resource projects. The Water Resources Council proposed that the discount rate be determined as follows:

"The interest rate to be used in plan formulation and evaluation for discounting future benefits and computing costs, or otherwise converting benefits and costs to a common basis, *shall be based upon the average yield during the preceding fiscal year* on interest-bearing marketable securities of the United States which, at the time the computation is made, have terms of 15 years or more remaining to maturity: provided, however, that in no event shall the rate be raised or lowered more than ¼ percent in any year." (Underscoring added.)

The Water Resources Council computes the proposed discount rate to be 4⅝ percent and recommends it be used in plan formulation and evaluation of water and related land resource projects during the remainder of fiscal year 1969. It should be noted that the proposed discount rate of 4⅝ percent is based upon the average of bid prices for fiscal year 1966. This contradicts the formula quoted above which provides that the interest rate to be used in fiscal 1969 be based on 1968 yields. The Council adopted the bid prices for fiscal 1966 to meet the needs for a deflated discount rate, since the Federal bond markets for the past two years have reflected rising expectations with regard to inflation.

Although this formula is a substantial improvement over the procedure provided by Senate Document No. 97 and is a step in the right direction, it, too, does not accurately reflect the real cost of long-term borrowing by the United States Treasury. The use of this formula will continue to result in the misallocation of the Nation's resources since the returns in the private sector of the economy are substantially greater than 4⅝ percent.

The Water Resources Council proposes that the current coupon rate of 3¼ percent be used to evaluate projects which have been authorized by or will be authorized by Congress prior to the close of the second session of the 90th Congress, and where the appropriate state or local governmental agency or agencies have given satisfactory assurances by December 31, 1969, to pay the required non-Federal share of project costs, unless Congress decides otherwise.

The proposal to continue to use the coupon rate of interest (3¼%) in evaluating authorized projects, even though no construction has commenced, has no economic merit and will result in the misallocation of the Nation's limited resources. I am confident there are a number of authorized projects with marginal benefit-cost ratios based on an interest rate of 3¼ percent which could not meet the test of economic efficiency if evaluated on the basis of an interest rate of 4⅝ percent. Moreover, this proposal places the Congress in the position of having to appropriate funds for water and related land resource projects on the basis of a dual standard.

THE SOCIAL RATE OF TIME PREFERENCE

According to this concept, public investments provide benefits to future generations and it is unlikely that the current cost of capital provides the correct interest rate for evaluating public investments. Thus, it is contended that current interest rates do not permit future generations to express their preference and the Government should adjust the current rate downward because of the willingness of present consumers to shift or redistribute income to future generations. There is little evidence to support a finding that people collectively approve the redistribution of income to future generations. Moreover, there are no readily available data for use in computing the social rate of time preference.

If this concept were followed without considering the opportunities foregone in the private sector of the economy, it would result in the misallocation of resources since public investments made on this criteria would displace private investments, for which the returns are much greater. If we are collectively concerned about the well-being of future generations, efforts should be made to stimulate those investments that will result in economic growth, which will obviously increase the well-being of future generations.

OPPORTUNITY COST OF CAPITAL

The opportunity cost of capital is based on the returns foregone in the private sector of the economy since the Government must obtain its capital through taxes or borrowing. In the private sector, the opportunity cost for investors is currently

estimated to range from 10 to 20 percent before taxes. The opportunity cost of consumers is at least equal to the rate that they can receive on riskless Government bonds, currently estimated to be about 5½ percent. Judged by interest rates consumers are willing to pay, rather than forego current consumption, the opportunity cost of capital to consumers is considerably higher, ranging upwards from 7 percent.

An interest rate reflecting the opportunity cost of capital will result in the most efficient allocation of resources in the public and private sectors of the Nation's economy. An interest rate which is below this level will divert resources from the private to the public sector and result in the misallocation and wasteful use of resources. Conversely, the use of an interest rate in excess of the opportunity cost of capital in the private sector will discourage public investments and encourage private investments and consumption, resulting in the misallocation of resources.

The use of the opportunity cost concept will stimulate both public and private investments and economic growth, which will increase the incomes of future generations. Consequently, the opportunity cost of capital in the private sector is the most relevant interest rate for use in evaluating public investments.

GOVERNMENT ACCOUNTING OFFICE (GAO) COST OF TREASURY BORROWING

The GAO in a hearing before this Committee on January 29, 1968, calculated the cost of Government bonds to be approximately 7½ percent. The GAO essentially computed the cost of Government borrowing by modifying the average coupon rate and yield rate on long-term Treasury bonds by making an allowance for taxes foregone, corporate and personal, as a result of Government borrowing. Although the GAO is to be commended for its efforts to calculate a meaningful interest rate, it has certain inherent weaknesses. For example, as noted herein, the coupon rate on long-term Government bonds has no relevancy and I question its use by the GAO in calculating an average rate of interest. Moreover, if an adjustment is made for corporate and personal taxes foregone, similar adjustments must be made for property and sales taxes.

The calculation made by GAO does not accept the concept of opportunity cost or the yield on long-term Government bonds. Surprisingly, it results in an interest rate for Government borrowing which closely approximates the average opportunity cost of capital in the private sector. The GAO formula for calculating the cost of Government borrowing requires numerous technical adjustments and is inferior in principle to the concept of the opportunity cost of capital.

RECOMMENDED RATE OF INTEREST FOR USE IN EVALUATING PUBLIC INVESTMENTS

As previously noted, I consider the opportunity cost of capital in the private sector results in the most efficient allocation of resources between the public and private sectors of the economy as well as between the present and future generations. I have not had the opportunity to calculate the opportunity cost of capital in all relevant sectors of the private economy. However, in the interest of being conservative, the minimum meaningful opportunity cost in the private sector should not be less than 5.5 percent, based on returns consumers (taxpayers) can obtain from riskless Government securities. It is also clear that the return to private investors will conservatively average about 12 percent. It is suggested that the relevant interest rate for use in evaluating public investments is in the range of 8 to 10 percent.

Recognizing that historically public investments, particularly water and land resource projects, have employed interest rates that were much too low, the interim use of an interest rate of 5.5 percent, with a subsequent upward adjustment, is recommended. This will allow a period of time for the various Government agenices to adjust and make the transition to a more relevant, but higher, discount rate. Undue delay in adopting a relevant interest rate would only result in the wasteful use of the Nation's limited resources.

NEED FOR FURTHER STUDY

The fact that various Governmental agencies use different interest rates for evaluating public investments clearly indicates the need not only for further study but the need of the Executive Department to provide the necessary leadership in this area. Although the proposal of the Water Resources Council is a step in the right direction, as noted herein, it obviously will not result in the most efficient

allocation of the Nation's limited resources. I recommend a continuing study of the appropriate interest rate or rates to be used in evaluating public investments be made the responsibility of the Bureau of the Budget or the Council of Economic Advisers. Not only do they have the professional competency to make the study, but they are not directly involved in construction or investment programs.

CONCLUSION

Although the interest rate used to evaluate public investments is of critical importance, we should not overlook the fact that there is no substitute for the proper analysis of benefits and costs resulting from public investments. For example, at the current time there is a legal constraint in evaluating the benefits resulting from inland navigation projects. This constraint is contained in Section 7 of the Department of Transportation Act of 1966, which requires that navigation benefits be computed by comparing current rates of overland carriers with estimated barge rates on projects being studied. There is general concurrence among knowledgeable transportation economists that this procedure cannot result in the proper evaluation of benefits resulting from navigation projects. This can only be done by comparing the long-run marginal costs of all carriers.

STATEMENT OF BOARD OF COMMISSIONERS OF THE PORT OF NEW ORLEANS

DISCOUNT RATES FOR USE IN THE FORMULATION AND EVALUATION OF WATER RESOURCE PROJECTS

The following statement is submitted in behalf of the Board of Commissioners of the Port of New Orleans (an Agency of the State of Louisiana) on the subject of the application of economic criteria and discounting procedures in formulating and evaluating Federal water and related land resource projects. The interest of the Board, based upon its direct responsibilities, obviously is concerned primarily with channel and harbor development projects for the benefit of deep-water navigation. However, the development of the inland waterway system of the Mississippi River and Tributaries which provides a major transportation network connecting the mid-continent area of the Nation to the Port of New Orleans and the Gulf Intracoastal Waterway, as well as other shallow draft channels also are within the Board's area of interest. Furthermore, the safety of the Port and City of New Orleans, as well as the entire State of Louisiana, is dependent upon the Federal works for river flood and hurricane protection.

This Board is gravely concerned with the proposals to increase drastically the discount rate for use in water resources development projects, the effect of which would be to reduce the benefit-ratio ratios on future potential improvements. In the economic analysis of water resource projects, an increase in the interest rate has a double-barrelled effect on the benefit-cost ratio. First, as the interest rate goes up the interest charge on the borrowed money increases and therefore the annual cost increases. Second, the present value or worth of future benefits are drastically reduced as the discount rate increases.

The order of magnitude of the effect of increased discount rates may be shown by the following example. A project having an assumed economic life of 50 years may show a benefit-cost ratio of 1.5 to 1 at 3% interest. If this project has a substantial portion of its benefits accruing in the later years of its life, a higher discount rate will drastically reduce the future benefits. Therefore, an interest rate of 4% will reduce the benefit-cost ratio from 1.5 to 1.2. When the interest rate is increased to 5%, the benefit-cost ratio drops to 1.0; and increasing the interest rate to 6% results in an unfavorable benefit-cost ratio (below unity).

In recent years, relatively few projects reported by the Corps of Engineers for authorization have a benefit-cost ratio in excess of 1.5. The impact of a proposed higher interest rate in evaluating waterway projects therefore becomes readily apparent.

It is noted that the discount rate for use in plan formulation and evaluation of projects for waterway development has been 3¼%; however, the Water Resources Council has announced a proposed new formula for computing rates under which the rate for fiscal 1969 would be 4⅝%, an increase of 1⅜ percentage points. Furthermore, it is indicated by the announced policy of the Water Resources Council that the interest rate shall be subject to recomputation each year, with the provision that the rate shall not be raised or lowered more than one-quarter of one percent per year.

The impact of the proposed increase from 3⅛% to 4⅝% cannot be fully evaluated on the basis of information currently available. However, no doubt this drastic adjustment will affect adversely a number of important projects which are now in the final reporting phase by the Corps of Engineers. Certain of these projects will fall in the category of those having an unfavorable benefit-cost ratio unless corresponding adjustments are made in the evaluation of benefits.

The gradual adjustment of the interest rate for use in cost analyses may be fully justified. However, a sudden increase in the interest rate which is to be applied only to the projects for waterway improvement is discriminatory and prejudicial to the orderly expansion and development of the Nation's water resources.

It is understood that consideration is being given to a radical increase in the interest rate to 7½% and that upwards of 10% to 15% has been advocated.

Such a higher rate is excessively and unreasonably high and certainly its application to water resource projects would be damaging to the National interest.

The Corps of Engineers has been notoriously conservative in evaluating the benefits of channel and harbor improvements. Furthermore, the economic analysis of waterway resources projects has not evaluated secondary or social and expansion benefits. The benefits attributable to a project from a regional, State or local viewpoint are not fully evaluated under current procedures. Unless and until the procedures are revised to allow the full evaluation of benefits to include the direct and indirect benefits, the tangible and intangible benefits and also the regional, State and local benefits, the increase in interest rates will be unbearable. Furthermore, the procedures for the evaluation of public works projects generally ignore national objectives which are particularly prominent in the development of channels and harbors required for the operation of the ports of the United States.

It is recognized that for many years the various Government agencies engaged in water resources development have used their own judgment as to the interest rate to be used for Federal and local investments in the evaluation of proposed projects. This practice has led to inconsistencies among agencies in the application of benefit-cost analysis. The elimination of these inconsistencies and the application of uniform economic criteria and techniques to measure the economic worth of Government expenditures is to be desired. However, the direction of movement now indicated would burden the waterway projects with an unreasonable rate of interest without offsetting changes in evaluation of benefits.

The Board of Commissioners of the Port of New Orleans is gravely concerned with abrupt and imprudent action in the adjustment of interest rates to be used in the cost analysis of channel development which will cause a severe cutback in Federal sponsorship of necessary and justifiable harbor improvements. The results will be extremely detrimental to the growth and expansion of the maritime and port industries of the United States.

STATEMENT OF THE PORT OF NEW YORK AUTHORITY

(By Austin J. Tobin, executive director)

I am pleased to have this opportunity, at your invitation to express the views of The Port of New York Authority regarding the current deliberations by the Joint Economic Committee on the possibility of increasing the interest rates used in public investments by the Federal Government. The questions posed in your letter of July 24 would seem to be directed toward the whole spectrum of Federal projects. Since there are considerations here that go well beyond the purview or expertise of the Port Authority, I should like to address my comments particularly to the matter of waterway improvements by the Army Corps of Engineers in which we have a particular and direct interest.

Our concern is not so much with an increase in the interest rates on waterway projects above the present 3⅛ per cent level as it is with the amount to which this rate would be raised and the possibility that a higher rate might be recommended for waterway improvements than for other federal works projects. Certainly, a 10 to 15 per cent level, referred to in the past as a possibility, would, in my opinion, be both unreasonable and completely irrelevant to an economic analysis of national waterway improvements.

There certainly is no correlation between the rate of return earned on high risk enterprises in the private sector and the interest or discount rate which should be used in evaluating the efficacy of public projects dedicated to serve the public interest. Yet, the suggestion that a 10 to 15 per cent interest rate be used is based on just such a theory. An increase of this magnitude could only result in the elimination of urgently-needed improvements and thus be of incalculable harm to the national interest. Indeed, waterway development has and continues to be a matter of vital national transportation policy which can at best be only imperfectly evaluated by the limitations of benefit-cost analysis techniques. Historically, waterway improvements have produced direct and indirect benefits substantially greater than those initially predicted by the Corps. Many such projects would never see the light of day if subjected to an excessively high interest rate, since the present worth of benefits would be reduced and costs correspondingly increased, thereby possibly creating benefit-cost ratios of less than 1.0 for many vital projects.

I do not believe that it is appropriate for us to suggest a specific interest rate to be used in justifying waterway improvements. If the rate level is to be raised, the Port Authority strongly urges that it be to a reasonable level appropriate for public investments. In our view, such a rate should be no higher than the actual average interest cost to the Treasury of its long-term borrowing, with such cost to be determined on the basis of yield rates to investors in long-term Federal securities. But in no event should the rate for waterway projects be higher than the levels used by other agencies of the Federal Government in the economic analyses of similar public enterprises. In this connection, and in response to your question #4, we believe that calculations of interest rates on a continuing basis, and adopted by all Federal agencies for application to projects of the same general nature would be most appropriate and desirable. In other words, a uniform interest rate should apply equally to all comparable public projects, whether they be for flood control, reclamation, harbor channels, waterway improvements, or others.

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