

Discount Rate Policy

King County Office of Management and Budget

June 1, 2005 Proposal for Executive Policy Consideration

I. Scope

This policy provides guidance for analysis used to support decisions to initiate, renew, or expand programs and projects that would yield costs or benefits over many years.

II. General principles

Projects can generate cost and revenue streams over different periods of time. To make those streams comparable, the net present value is calculated. When calculating costs and benefits that occur over a series of years, it is generally accepted that future costs and benefits should be discounted as a result of the time value of money. A higher discount rate reduces the weight of future costs and benefits. Typical cash flow streams have initial costs and benefits that accrue later. In the typical case, higher discount rates reduce the relative value of future benefits. In other circumstances, costs may occur over the life of a project and a higher discount rate may result in a more favorable evaluation.

III. Discount Rate Policy

In most situations, a real discount rate of 7 percent should be employed – a typical private marginal pretax rate of return. A different real discount rate is appropriate when indicated by evaluations that calculate the social rate of time preference or the social opportunity cost of capital.

Should an evaluation use an extreme discount rate of less than 3 percent or more than 10 percent, ample justification should be provided. In all cases, departments should use sensitivity analyses to quantify the impact of alternative discount rates.

IV. Inflation

Inflation should be consistently included or excluded (but never mixed) in values used in analysis. This also applies to the selection of the discount rate.

a. Real discount rate

If an analysis uses constant-dollar values, then the discount rate should be calculated as: $R_n = (1 + R_r)(1 + R_i) - 1 = R_r + R_i + R_r R_i$ where, R_n is nominal rate, R_r is real rate and R_i is inflation, thereby subtracting expected inflation from the nominal discount rate. Solving for the real rate, $R_r = [(1 + R_n) / (1 + R_i)] - 1$

b. Nominal discount rate

A nominal rate should be used to discount nominal values.

- c. Real summary
An analysis should generally restate results in both real and nominal terms, especially for projects of more than five years in duration.

V. Project lifetime

In all cases when the base-case real discount rate of 7 percent is not used, discount rates should be based upon rates for federal financial securities with maturities that correspond to the project lifetime.

VI. Uncertainty

- a. Reporting of cause and effect
Models involve uncertainty in order to simplify complexity and achieve comprehension. Expected causes of uncertainty and expected results of such causes should always be documented; whenever possible, sensitivity analysis should also be undertaken. In general, uncertainty is best addressed through expected value calculations of cost and benefit and not through discount rate adjustment.
- b. Certainty equivalents
In general, risk aversion places a premium on lower but certain rates of return. Certainty equivalents account for this preference by determining the point of indifference between certain and uncertain amounts. Certainty equivalents eliminate the need to account for risk in the discount rate, and should be used whenever possible. In such a situation, use a risk-free discount rate and certainty equivalent values.
- c. Adjusting the Discount Rate
A project that has initial costs and uncertain later benefits should include sensitivity analysis using higher discount rates, especially when the risk has not been accounted for with certainty equivalents. A project with initial benefits and uncertain later costs should include sensitivity analysis using a lower discount rate. These methods will bias caution when higher degrees of risk are present.

VII. Appendix

These guidelines and the discount rate policy are intended to assist departments with common methodological issues. The budget office is available to provide technical assistance on any project evaluation or for further clarification.

a. General cases

There are two general types of projects, those that require a decision to invest financially, and those that address social or environmental needs.

1. Financially Oriented Programs

In this case, the social opportunity cost (SOC) of capital should be used. This is the loss of private investment, or the rate of return that balances the opportunity cost of the next best project to zero. When calculating SOC, externalities such as taxes and subsidies should be considered, as they will affect the rate. Subsidies will lower the rate and taxes will increase the rate. These types of projects typically could be done by the private sector, often involving production of some output that could be contracted. The decision here is whether an investment should be made, instead of whether or not a service should be provided. This rate should also be used if the decision to provide certain benefits has been made or is mandated. These projects generally do not impact society in any significant way.

i. CAPM and WACC

The standard approach to SOC calculation is the capital asset pricing model (CAPM) in conjunction with the weighted average cost of capital (WACC). CAPM assumes that all efforts are made to diversify risk, and reflects an opportunity cost of capital approach.

ii. APT

Another method for calculating SOC is arbitrage pricing theory (APT). This is a multifactor theory and more difficult. CAPM is a special case of APT, involving only the market risk premium and the movement of certain securities in relation to the stock market.

2. General public goods

Social rate of time preference (SRTP) is defined as the value society attaches to present, as opposed to future, consumption. The SRTP rate is used for discounting future benefits and costs, and is based on comparisons of utility across different points in time or across different generations. SRTP is preferred for discounting most government projects that impact society, and especially those that involve a social or environmental service. This is the rate that makes society indifferent between consumption today and tomorrow.

i. SRTP

SRTP is difficult to calculate. As consumption grows over time, so does the marginal utility of consumption, and so SRTP changes.

ii. SRTP ~ SOC

Although SOC is generally higher than SRTP, in more perfect markets they are frequently the same. Therefore, SOC is an acceptable proxy for SRTP. For a standard cost-benefit stream, SRTP amplifies a positive result obtained with SOC. If a standard project appears positive under SOC, it should appear even more so using SRTP.

iii. Risk-free return

Another approach to SRTP approximation is to simply use the return on a risk-free long-term investment.

b. Project type

1. Lease/purchase decisions

When deciding between a lease or a purchase option, net benefits should be compared using a federal risk-free rate. Sensitivity analysis should also be performed using the standard 7 percent rate.. (When using the standard 7 percent rate, the advantage of the County's tax-subsidized borrowing rate can be taken into account by discounting the cash flows associated with the debt service on a project.)

2. Asset sales

A risk free rate adjusted upward for risk and private tax liability (typically one percentage point each) is appropriate when considering the sale of assets. In some cases, it may be appropriate to use a lower rate to evaluate forgone government revenue and a higher rate to evaluate private returns, reflecting the dilution risk the public sector spreads across many taxpayers. Sensitivity analysis should include a risk-free rate and the rates of comparable assets in the private sector.

3. Cost reduction/avoidance analysis

This type of project should use a discount rate equal to the predicted growth of government expenditures. This approach should be taken within the context of large aggregates like the current expense subfund and is unlikely to be appropriate at the agency level. Smaller projects directed at reducing costs should use a risk-free rate. This applies when marginal funds are obtained from reallocation of resources or borrowing and not from tax increases.

4. Human life and health projects

The value of human life defies conventional valuation. Commonly, the value of a life is equated with its contribution to society. In other instances, human life is valued intrinsically. In the first case, a low discount rate should be used, reflecting per capita improvements in human productivity over time. In the second case, a somewhat higher but still below market discount rate should be used to value future human lives reasonably close to current levels.

5. Cost effectiveness

Cost effectiveness analysis is a method that holds benefits as given and then compares the costs of two or more competing methods of achieving set benefits. Similarly, an analysis may assume a fixed cost and compare the benefits of competing projects. In these situations, a risk-free rate can be appropriate. Agencies should

consult the budget office before conducting an evaluation under this section; such projects are often misclassified.

c. **Shadow price**

The shadow price of capital is the preferred method to describe a project's resource allocation effects. Shadow pricing involves converting costs to consumption changes and then using the social rate of time preference to discount future consumption levels to present values. Shadow prices however, are not directly observable in the market and involve a great deal of speculation and complex calculations. For this reason, shadow pricing should not be used for project analysis without the explicit involvement of the budget office.

d. **Sensitivity Analysis**

Sensitivity analysis should always be done using multiple discount rates.

1. **General Framework**

At a minimum, analysis should include rates at least two percentage points above and below the actual rate used, and determine the internal rate of return (the rate that yields zero net benefits). A report should document the causes that could push the discount rate in either direction.

2. **Wage effect**

If the benefits of a project are highly correlated with income, extra caution should be exercised in project evaluation. A higher discount rate should be used to reflect the risk inherent in long term income projection.

3. **Low rates**

A low risk-free rate will tend to make risky, correlated costs look more appealing than they really are, especially in a cost-effectiveness study. For analyses of this nature, higher discount rates should be used.