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Rebutting Arrow and Lind: why governments should use market rates for discounting

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1. Historical perspective

The radical proposition of Arrow and Lind (1970) – that governments should use risk-free rates instead of market rates to discount their risky investments – can best be understood by first considering the work in its historical context.¹ During the late 1960s and early 1970s, a debate was raging between the leading economists of the time about the cost of risk to the government, and related, the identification of the social discount rate. Recent advances in general equilibrium theory (notably, Arrow & Debreu, 1954; Debreu, 1959) allowed for more general welfare analyses of policy than had been undertaken previously; underscored the benefits of risk-sharing as well as the aggregate limits on risk-sharing; and clarified the role of market prices in aggregating the risk preferences of society. Such analyses also highlighted the potentially salutary role for governments in improving risk-sharing when markets are incomplete.

On one side of the debate were authors who took the position that governments should rely on market prices in evaluating the cost of investments. Diamond (1967) analyzed an economy with technology risk and a stock market. Perhaps not surprisingly, he concluded that if markets are sufficiently complete for stock prices to reflect the social cost of risk, then those prices are also relevant to the government in evaluating its investment policy. Hirshleifer (1964, 1966) reached similar conclusions and argued forcefully for the use of market prices by governments.

Other leading economists of the time advocated the position that was subsequently formalized in Arrow and Lind. Samuelson and Vickrey (in Jorgenson et al., 1964) argued that because of the large and diversified portfolio held by the government, the marginal return from public investment overall is virtually risk-free, and hence should be evaluated at the risk-free rate rather than the higher market rate demanded by less diversified investors. (The government's own borrowing rate is usually taken as a proxy for the risk-free rate.)

The specialness of the assumptions required to formalize the idea that the cost of market risk is irrelevant to the government – in particular, that there is no aggregate uncertainty affecting the value of government investments – was acknowledged by Arrow and Lind: 'The results...depend on returns from a given public investment being independent of other components of national income' (p. 373). Arrow and Lind defended that assumption with the assertion that correlated risk is likely to be insignificant for many government investments.

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The crux of the difference between the two camps was already well-understood at the time. For instance, Sandmo (1972) writes that the Hirshleifer view can be reconciled with Arrow and Lind's conclusions only by recognizing that:

...the two sets of arguments are based on entirely different assumptions concerning the relationship between private and public investment with respect to risk. Arrow and Lind assume that the returns on private and public investment are uncorrelated; indeed this assumption is crucial for their main result. The Hirshleifer view, however, is clearly based on the assumption that for each type of public investment it is possible to find a private industry such that the returns are highly correlated (p. 287).

Sandmo goes on to note that for the modern economies of Europe and the US, Hirshleifer's view is likely the more plausible. Importantly, he observes that the contributions of Sharpe (1964), Lintner (1965), and Modigliani and Miller (1958) – a body of work that forms the underpinning of modern financial economics – are highly relevant to this debate but rarely cited in the context of public investment.

The closely related question of whether there is a well-defined social (risk-free) discount rate, and whether it could be gleaned from market prices was also being debated at that time (see Sandmo & Dreze, 1971, and references therein). Proxies for the pure rate of time preference derived from capital market prices (e.g., Treasury rates) also may lead to suboptimal government investment decisions when markets are insufficiently complete. The broad conclusion of those theoretical investigations was that, in the presence of distorting taxes and other sources of market incompleteness, the rate of time preference appropriate for evaluating all public investment projects is not unique. Hence, the same concerns about market incompleteness which cause Arrow and Lind to question the relevance of the market price of risk for the government also bring into question the use of government borrowing rates as proxies for the social discount rate.

2. The economic case for using market discount rates

The conclusions of Arrow and Lind rest on the presumption that government investments are free of aggregate risk. That assumption is clearly violated for many if not most of the investments made by governments around the world. For example, in the United States, the federal government's credit-related investments – which include trillions of dollars of mortgage guarantees, student loans, and pension and deposit guarantees – have close analogs that are priced in competitive markets, and payoffs which are sharply lower during downturns. Most real government investments also have private sector analogs and are subject to aggregate risk; for example, government-owned electricity generation or transmission facilities have a similar exposure to demand shocks as do private utilities.

However, even if Arrow and Lind were to acknowledge that government investments are susceptible to aggregate risk, there remains the question of whether the price of the aggregate risk which is relevant to government investments can be inferred from capital market returns. Specifically, Arrow and Lind conjecture that the observed market risk premium is primarily compensation for diversifiable risks rather than for aggregate risk. If that were true, and if governments were to more effectively diversify such risks than private firms, then using a market discount rate that includes compensation for diversifiable risk would result in systematic undervaluation of government investments.

The question of whether market participants require a significant premium to bear diversifiable risk is an empirical one. There was much less evidence available to resolve

the issue when Arrow and Lind were writing, but subsequently, numerous studies have examined whether diversifiable risk is priced in financial markets. The weight of the cross-sectional evidence on asset returns suggests that diversifiable risk does not explain the market risk premium. Tests of the Sharpe and Lintner Capital Asset Pricing Model (CAPM), which decomposes asset returns into a market and idiosyncratic component, show that idiosyncratic risk has little or no explanatory power for the cross-section of stock returns. Tests of more modern asset pricing models also offer little support for the idea that differences in idiosyncratic risk explain the cross-section of returns (e.g., Fama & French, 1992). Such empirical findings are consistent with the observation that wealthy individuals, whose preferences are likely to be the primary determinants of asset market prices, hold diversified portfolios. Further, even small investors can diversify financial risk quite inexpensively using mutual funds. Overall, the evidence seems to weigh against the supposition of Arrow and Lind that market prices overstate the cost of aggregate risk to the government because investors put significant weight on diversifiable risk.

Some observers have also interpreted the inability of parameterized versions of standard neoclassical general equilibrium models to account for the historically high average spreads between risky securities and short-term Treasury rates (the 'equity premium puzzle') as evidence of capital market imperfections. Taking into account individual risk exposure, however, does not appear to explain that puzzle (e.g., Heaton & Lucas, 1996). In fact, the robust predictions of economic theory put very few quantitative restrictions on price levels or returns. Hence, observed market premiums are difficult to interpret as evidence for or against the efficiency of financial markets in spreading risk.

Although the debate over government discount rates has largely moved from academic to policy circles, the view that market rates should be used to discount risky government investments appears to be the predominant one among present-day financial economists. For example, the Financial Economists Roundtable, a group of prominent senior financial economists, endorsed that position in the context of government credit assistance in its 2012 policy statement.

3. The practical case for using market discount rates

A critical assumption implicit in the analysis of Arrow and Lind is that governments behave benevolently, only making worthwhile investments and optimally allocating the associated risks. More nuanced theories of political economy, or a casual look at government investment practices, suggest this assumption is routinely violated. When principal-agent or moral hazard problems significantly impede the efficient functioning of governments, a major consideration in setting the rules for evaluating government investments is aligning the incentives of policymakers with welfare maximization. The case is outlined here for why the use by governments of below-market discount rates creates serious incentive problems that tend to lead to overinvestment and excessive financial risk-taking by governments.

To explore the practical implications of the choice of government discount rates, it is natural to focus on the budget process, which is the mechanism by which policymakers make tradeoffs between competing uses of scarce resources, including the risk-bearing capacity of society. Government accounting rules determine how budgetary costs are calculated, including the selection of discount rates.²

Perhaps the most significant hazard of governments using a risk-free rate (or their own borrowing rate) for discounting is that it creates a money machine for politicians. In the

extreme, all public spending could be financed on paper by issuing government debt and using the proceeds to finance stock market investments. The apparent gain would be the equity premium times the principal invested, discounted over the assumed life of the investment at a risk-free rate. In general, the more market risk associated with an investment, the larger this potential ‘budgetary arbitrage’.

While extreme forms of budgetary arbitrage are rare (but not unheard of),³ more subtle versions of the same phenomenon occur routinely in the US, where federal credit programs are accounted for as Arrow and Lind would suggest – by projecting future cash flows and discounting them at Treasury rates. Investments in risky loans and loan guarantees look cheap for a government when the price of market risk is neglected.

There are many examples of credit programs that appear profitable or costless to the government because of the use of Treasury rates for discounting. For instance, on mortgages insured by the US Federal Housing Administration, borrowers are able to obtain loans on more favorable terms than what would be offered by competitive private financial institutions. The program nevertheless shows a budgetary profit because the cost of market risk is not recognized in that accounting.

Another example is Title XVII of the Energy Policy Act of 2005 which provides qualifying developers of innovative fuel technologies with federal loan guarantees. The Act requires that the loan guarantees have a zero budgetary cost. To satisfy that requirement, the guarantee recipients pay an upfront fee that covers the estimated government cost. The value of the subsidy to the recipients – many of which are utilities and other large firms that without support would have access to capital markets – is the difference between the market value of the credit guarantee and value calculated using Treasury rates. Growing awareness of this legislative mechanism to create ‘free’ subsidies has resulted in an increasing number of proposals designed to exploit it.

The overall impact on the budget deficit of discounting credit programs at Treasury rather than market rates is significant. Congressional Budget Office (2012) estimated that government loans and loan guarantees newly issued in 2013 would generate budgetary savings of \$45 billion over their lifetime when their costs were calculated using Treasury rates, whereas those same loans and guarantees would have a lifetime cost of \$11 billion using a market or fair-value approach to assessing cost.

Relatedly, the use of government rates for discounting encourages the provision of subsidies in the form of credit assistance over what may be a more suitable alternative in a given instance. Governments can provide assistance to target groups of equivalent value to recipients via credit subsidies or in non-credit forms. Neglecting the market price of risk lowers the budgetary cost of credit assistance relative to that of economically equivalent grant or benefit payments, providing policymakers with an incentive to over-rely on credit assistance. For example, the increasing reliance over time on student loans (which also appear to make money for the government) relative to grant aid to students may be an example of that phenomenon.

The use of Treasury rates for discounting also makes it more difficult for the government to disinvest when it is optimal for it to do so. That is, even if an asset can be sold at a fair market price, governments may avoid a sale if it would entail a substantial budgetary cost. That consideration is salient in discussions of privatizing the mortgage giants Fannie Mae and Freddie Mac. The two companies were purchased by the government during the financial crisis of 2008, and most policymakers would like to return them (or successor entities) to private control. Both firms currently appear profitable to the government when the priced risks associated with mortgage guarantees are not included in cost estimates.

Feasibility, transparency, consistent application across programs and auditability are all practical concerns in choosing a rule for selecting discount rates. Some government officials favor using government rates for discounting because it is simple and familiar. However, the simplicity is at least in part illusory. Often the biggest challenge in estimating the net present value of an investment is projecting its future cash flows. Whereas benchmarks do not exist for valuations based on risk-free rates, estimates that employ market-based discount rates allow the reasonableness of the assumed cash flows to be implicitly tested by comparison with market prices. Furthermore, using the same discount rates across different programs favors high-risk programs and therefore does not meet the goal of consistency across programs.

Considerations of transparency, consistency and auditability suggest limiting the discretion of policymakers and government analysts in the selection of discount rates.⁴ One way to do that, but at the same time emulate market rates, is to adopt private sector standards for applying a 'fair value' approach to selecting discount rates. The fair value of an investment is defined as the price that would be received if it was sold in an orderly transaction (one that occurs under competitive market conditions between willing participants and does not involve forced liquidation or a distressed sale). In estimating fair values, current private sector accounting standards require firms to use the most accurate approach for cost estimates, and suggest broad approaches that apply to a variety of situations. By adopting the private sector standard, the government would impose on itself the same transparency requirements that it imposes on private sector financial institutions. Aligning federal and private sector guidelines for fair value computations would allow the government to draw on technical assistance from the many private accounting and valuation firms that assist private financial institutions to comply with fair value reporting requirements. The availability of private sector expertise would also make estimates more auditable, and could be used to help to ensure discipline and defensibility, and to standardize practices across agencies.

4. Conclusions

In this essay I have made the case that:

- (1) The assumptions underlying the Arrow-Lind theorem were highly controversial from the start, and their conclusions do not represent the mainstream view of financial economists today;
- (2) A large body of empirical evidence casts doubt on the critical assumption that markets demand a significant premium for diversifiable risks; and
- (3) In practice, the incentives of policymakers are seriously distorted when market prices are ignored when evaluating the cost of government investments.

If these conclusions are correct, a natural question is why Arrow and Lind's paper has had such staying power. I can only offer speculative answers. One is that, with a few notable exceptions, academic economists appear to have lost interest in writing on the topic of government discount rates.⁵ Another is that the practice of using government borrowing rates for discounting is in the interest of policymakers, who benefit from being able to show government investments that are popular with constituents as profitable. Many government analysts, who receive little training in finance, do not appear to recognize the physical impossibility of financing risky investments with risk-free government debt, thereby failing to realize that taxpayers are effectively equity holders in risky government

investments. Furthermore, under the dominant regime of cash-accounting, interest is a visible cost but risk-bearing by taxpayers is not.

Finally, it must be emphasized that in instances where market incompleteness clearly is of first order importance, it may be possible for economists to identify compelling reasons to use alternatives to market discount rates. For example, for policies whose payoffs extend beyond the time horizons usually covered by financial markets, and whose benefits accrue primarily to unborn generations, the choice of discount rates is far from obvious. However, discounting at the risk-free rate is unlikely to be the answer either. For example, in the current discussion over how to discount the benefits from abating greenhouse gasses, Arrow (1995) argues for using a discount rate of zero based on considerations of intergenerational fairness. Given the growing scope and scale of government investment activities and the high stakes involved, a return by more academic economists to these fundamental questions would appear to a valuable investment for society in itself.

Notes

1. The discussion here draws on Lucas and Phaup (2010).
2. Most governments budget on a cash basis for most investment activities, a practice that makes the choice of discount rates moot. However, in some cases budgeting is done on an accrual basis that requires a choice of discount rates. In the US, most real investments are accounted for on a cash basis but by law, direct government loans and loan guarantees are budgeted for on an accrual basis using Treasury rates for discounting. For a discussion of international government accounting practices for investments and their consequences, see Lucas (2013).
3. Something akin to a money machine appears to be operative in Brazil, where the government has issued large amounts of government debt and channeled it to highly risky investment projects through loans to state-owned banks (Garcia, 2013).
4. Some have suggested seeking a middle ground where the components of the market risk premium that are relevant to governments are identified and the rest discarded (e.g., adjustments for taxes). However, the considerable amount of discretion that would entail, as well as the lack of agreement on which components of the risk premium are relevant, suggest this would be a problematic approach.
5. For example, Bazelon and Smetters (1999) and Elliott (2011); Lucas (2012) provides additional references and surveys the literature on government valuation.

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