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Introduction

Deborah Lucas

Following the collapse of US housing prices and the financial turmoil that followed, the federal government is on course to intervene in financial markets to an extent unparalleled in US history. A partial tally includes a \$29 billion, no recourse loan from the Fed to rescue Bear Stearns and its subsequent interventions to restore liquidity to the money markets; the federal takeover of Fannie Mae and Freddie Mac and their exposure to the credit risk on \$5 trillion of residential mortgages; loans in excess of \$100 billion to insurance giant AIG; and the passage of legislation granting open-ended authority for the Treasury to purchase up to \$700 billion in troubled assets from financial institutions.

Long before these extraordinary events unfolded, the US Federal Government already functioned as the world's largest financial institution. Its central role in credit and insurance markets manifests itself through such diverse activities as: guaranteeing loans for housing, agriculture, education, small businesses, and trade; making direct loans for education, housing, and rural utilities; insuring bank deposits, defined benefit pension plans, crops, and real property; providing pension benefits to federal civilian and military employees; promising Social Security and other contingent social insurance payments; implicitly or explicitly guaranteeing the obligations of government sponsored enterprises (GSEs) like the Federal Home Loan Banks and the farm credit system; and acting as a steward for environmental assets and liabilities.

A prerequisite for effective financial management—and for meaningful

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public oversight—is accurate metrics for assessing costs, benefits, and risks. This is the logic behind the increasingly stringent rules governing financial reporting for corporations and the trend toward requiring publicly traded firms to provide fair value estimates for their financial securities. Having reliable measures is arguably even more important in the public sector, where costs and risks that are not officially accounted for can be largely invisible to policymakers and to the public, or at least ignored more easily, leading to the overprovision of activities whose costs are underestimated in the budget process and other official estimates.

Despite the size and importance of federal involvement in financial markets, the costs and risks of most federal financial activities are only partially measured and are poorly understood. In important respects (e.g., the absence of capital budgets, risk adjustment, and sophisticated internal costing systems), federal accounting for financial risk and value lags well behind private-sector standards. The political process provides few incentives for improving disclosures, even when a financial crisis spurs calls for reform. Also, with a few notable exceptions, academics have devoted relatively little attention to improving the measurements of federal financial costs and risks. Programmatic complexity and the difficulty of obtaining data from federal agencies create substantial barriers to entry for researchers, and the topic has remained outside of the mainstream of economic inquiry.

The purpose of this volume is to begin filling these gaps. The chapters and discussions highlight how the rules of federal budgeting obscure the economic cost of federal financial obligations. They also provide more comprehensive estimates of the costs and benefits of a wide variety of federal financial activities and develop new methodologies to improve such measurements. The analyses encompass a broad spectrum of federal programs—housing and government sponsored enterprises, catastrophe insurance, student loans, Social Security, and environmental liabilities. Although not inclusive of the full scope of federal financial obligations, collectively, these studies demonstrate how the logic of financial economics can be informative about a broad range of federal activities and the potential for academic research to better inform public discourse on these issues.

A fundamental theme running through this volume is that market prices, or “fair value” estimates, are the best measure of the opportunity cost to society of government expenditures and that federal obligations should therefore be evaluated using them. Most economists accept the premise that using market prices (as opposed to “administrative” or “historical book” prices) is the best approach, but there is still resistance to this idea in some parts of the federal budgeting community and among many actuaries. In fact, some budget practitioners may view nonmarket estimates as natural, because federal law stipulates that credit obligations be budgeted for using risk-free rates for discounting. Whether this rule should be modified and what the effects would be are critical issues that are addressed by some of

the chapters in this volume. More broadly, an aim of this book is to clearly present the case for market prices in a way that is accessible to an audience of both economists and noneconomists.

In the wake of the financial crisis and the criticisms that arose about fair value accounting for private financial institutions in distressed markets, some readers may be skeptical about the wisdom of introducing similar rules into federal accounting. Yet, these events have not invalidated the principles that are the foundations for the view that market prices are the best available measure of value. The practical resiliency of this idea and the absence of a more compelling alternative is demonstrated by several recent developments in private-sector and public-sector accounting regulation: the Federal Accounting Standards Board (FASB) continues to support fair value accounting for financial securities, albeit with new circuit breakers to mitigate problems that can arise when markets are illiquid. International accounting standards, slated to be adopted in the United States, also firmly embrace fair value principles. Most notably, federal budget agencies have recently emphasized fair value estimates for the cost of new obligations arising from the financial crisis, precisely because not adjusting for market risk produces less credible cost estimates.¹

These basic themes are further elaborated on in chapter 3, “The Cost of Risk to the Government and Its Implications for Federal Budgeting,” by Deborah Lucas and Marvin Phaup. The authors lay out the economic case for incorporating the cost of market risk in government decision making, describe how risky securities are currently accounted for in the federal budget and how this likely biases real resource allocations, and survey the results of recent research on the cost of market risk for federal obligations.

The analysis begins by addressing both the philosophical and practical impediments to incorporating the cost of risk into federal budget estimates. As noted previously, while the idea that market risk is a legitimate cost is now widely accepted in the private sector and by most academic economists, the concept has not gained such wide acceptance among policymakers nor in the federal budgeting community. The authors revisit the lively debate that took place in the late 1960s and early 1970s between the leading economists of the time over whether the risk of activities undertaken by the government should be treated as a cost. They suggest that more recent developments in financial economics support the idea, which also had considerable currency in the early debate, that systematic or market risk represents a legitimate cost to taxpayers and that this cost is best measured by market prices. Further, they make the case that the logic supporting the use of market prices

1. For instance, the legislation that authorized the Troubled Assets Relief Program (TARP) explicitly overrode the standard Federal Credit Reform Act (FCRA) practice of using the risk-free rate for discounting—it called for using risk-adjusted rates. The Congressional Budget Office has also adopted risk adjustment in accounting for the government’s assumption of Fannie Mae and Freddie Mac’s obligations.

is largely robust to considerations of various market frictions and market incompleteness.

The use of market prices is also justified on consistency grounds. In fact, the vast majority of expenditures are recorded in the budget at market prices. Cash transfers arising from Social Security benefits, food stamps, and so forth are accounted for at a market price; by definition—the real value of a dollar is what one gets by spending it on a consumption bundle. Federal purchases from the private sector for military hardware, the labor of the federal workforce, buildings, computers, electricity, and so on are all expenditures that occur at market prices. While the Federal Government caps certain expenditures such as Medicare reimbursements to doctors, nevertheless, the transactions occur at market prices. Thus, using market prices puts financial obligations on a consistent basis with other forms of federal spending.

Also important is that the practical alternatives to market prices—reporting historical cost or discounting expected cash flows at risk-free rates—are subject to the same criticisms. These alternatives also rely on market prices: risk-free rates are derived from the market prices of US Treasury securities, and historical book values are stale market prices. Hence, if one cannot trust markets to determine value, the leading alternatives are equally problematic.

The rules for accounting for federal financial obligations are complicated. Various categories of obligations are accounted for very differently, and distinct biases arise in each instance. Credit is accounted for on an accrual basis, whereas insurance and investments are on a cash basis. Accrual costs for credit exclude the market price of risk and also certain administrative costs. This tends to understate the full cost of credit and creates a bias toward using risky loans or loan guarantees in preference to direct grants and other forms of assistance for which cost is measured more comprehensively and at market prices. For investments in publicly traded securities (e.g., equities), a different sort of distortion arises from the use of cash basis accounting. Securities purchased at market prices entail no net transfer of resources from the government, but under cash basis accounting, such transactions appear costly, because the large initial outlays are not offset by expected dividends or interest payments in the budget window.

To illustrate the practical importance of these effects, the authors survey the existing studies estimating the size of the distortions caused by omitting the cost of risk in specific federal activities. The results suggest that the size of the omissions in many cases is sizeable; for instance, the estimate by the Congressional Budget Office (CBO) in 2005 of the present value of shortfalls for the Pension Benefit Guarantee Corporation increases from \$32 billion to \$63 billion when market risk is taken into account.

Catastrophic risks such as terrorism, hurricanes, earthquakes, and floods are often explicitly or implicitly insured by the Federal Government. These events, which regularly trigger billions of dollars in emergency spending,

nevertheless are treated as surprises every year that require supplemental appropriations outside of the normal budget process. In chapter 4, “Federal Financial Exposure to Natural Catastrophe Risk,” David Cummins, Michael Suher, and George Zanjani draw on a wide variety of government and private-sector data sources to document the size and causes of these expenditures from 1989 to 2008. Their analysis suggests that these expenses, which have been escalating rapidly, are to a large extent predictable and therefore could be better accounted for and controlled. They also make a persuasive case for the likely continuing high rate of federal spending growth for catastrophes.

One reason for the steady and protracted cost growth is the increasing value of infrastructure exposed to catastrophe. Disaster relief expenditures have been the most significant component of federal catastrophe exposure. Another driver of cost growth is the political process. While some of these obligations are explicit in the law—for instance, the Stafford Emergency Assistance and Relief Act of 1988 requires federal aid when state and local resources are overwhelmed by a major catastrophe—much of the assistance that is provided is “discretionary.” However, the authors argue that the strong expectation of public assistance, combined with the ad hoc way in which the decision to grant aid is made in the legislative process, effectively means these expenditures are mandatory.

Projections of future average expenses and their probability distribution are developed using two approaches: a commercial catastrophe model and historical catastrophe loss data. Under conservative assumptions, assistance related to hurricanes, earthquakes, thunderstorms, and winter storms is projected to be about \$20 billion in a normal year and could exceed \$100 billion in a bad year. The \$20 billion far exceeds the regular appropriations for the Disaster Relief Fund, which averaged only about \$1 billion over the period from 2001 to 2005. Capitalizing the expected expenditures over the next seventy-five years, the liability to the Federal Government is estimated to be comparable in magnitude to the shortfall projected for Social Security over the same horizon.

To further the goal of increasing homeownership, federal housing policy makes extensive use of credit and tax incentives. As recent events have underscored, these activities involve substantial federal cost and risk. Chapter 5, “Housing Policy, Mortgage Policy, and the Federal Housing Administration,” by Dwight Jaffee and John Quigley, reviews these programs and estimates the value of indirect and off-budget activities supporting homeownership. The analysis emphasizes the Federal Housing Administration’s (FHA) mortgage insurance programs and revisits their rationale and future role in light of the rapid rise and subsequent fall of the subprime market.

Federal housing policy is executed through a complex array of institutions and programs, including the tax code, the Federal Housing Administration, the Veterans Administration (VA), and government sponsored enterprises

such as Fannie Mae, Freddie Mac, and the Federal Home Loan Banks. A comprehensive look at these programs reveals that off-budget policies primarily provide subsidies for middle- and upper-income homeowners and home purchasers, whereas programs subject to Congressional budget appropriations are directed toward lower-income and rental households.

Jaffee and Quigley calculate that tax expenditures—relative to a baseline of the tax treatment of commercial real estate—represent by far the most expensive subsidies to housing. Specifically, housing services are treated asymmetrically to rental housing, and the first \$0.5 million of realized capital gains is tax exempt. Depreciation, maintenance, and repairs, however, are not deductible. The net effect for 2007 is estimated to be \$32.5 billion in foregone revenue from imputed rental income less expenses. The mortgage payment deduction adds another \$78.1 billion in tax expenditures. The property tax exclusion represents \$15 billion of cost, and the capital gains exemption represents \$43 billion. Overall, tax expenditures in 2007 were about \$166 billion, or about seven times the tax expenditures for all other housing programs. The value of subsidies related to the GSEs is harder to evaluate, as is their incidence. Surveying the literature that estimates the GSE subsidy, they suggest that the annual cost is on order of \$10 billion.

The much less costly programs serving the low-income market have evolved from the first Public Housing Act of 1937, which financed construction aimed at the “elimination of substandard and other inadequate housing,” to the current emphasis on Section 8 housing vouchers that provide rent subsidies to about 1.9 million households to obtain privately provided housing, at a reported cost of \$37.7 billion in 2007.

The FHA and VA insurance and guarantee programs had their origins in the Great Depression. Mortgages at the time were short term, had low loan-to-value ratios, and required a balloon payment at maturity. The crisis left most borrowers unable to refinance and caused others to default, leading to the bankruptcy of many lending institutions. In 1934, Congress established the FHA to oversee a program of home mortgage insurance, predicated on “economically sound” self-amortizing, long-term mortgages. This led to standardization of mortgage products and underwriting procedures nationally. In its early years, the program served the vast majority of homeowners and involved little redistribution. The VA loan program came into existence near the end of World War II and grew to be a more highly subsidized benefit, providing a federal guarantee for up to 60 percent of mortgages made to eligible veterans. Over time, the FHA program evolved toward providing guarantees to low-income borrowers attracted by low down payment requirements and less stringent credit requirements.

The two programs reached their peak volume in 2003, with \$165 billion and \$66 billion of mortgages insured by the FHA and VA, respectively. By 2006, the volume had declined to \$54 billion for the FHA and less than \$25 billion for the VA in insured mortgages. The decline in the importance of

these programs in terms of the share of total mortgages outstanding was more dramatic and began in the 1960s. Quigley and Jaffee show that what took their place was the (re)development of private mortgage insurance and the concurrent expansion of Fannie Mae and Freddie Mac. At the same time, FHA and VA growth was impeded by fixed nominal limits on the loans insured, and in recent years, by competition from the rapid growth of subprime lending. The higher credit quality end of FHA lending has also been increasingly captured by Fannie and Freddie, which have expanded into these riskier products. The authors argue that the fundamental reasons behind these dramatic changes include improved credit scoring models in the private sector and a philosophical shift and lack of contract innovation on the part of the FHA. The recently heightened concern about predatory lending suggests a new role for the FHA in setting standards for nonpredatory practices and perhaps in offering a higher-quality product to compete with private offerings.

In chapter 6, “Valuing Government Guarantees: Fannie and Freddie Revisited,” Deborah Lucas and Robert McDonald consider some of the methodological issues surrounding estimating GSE subsidy values using a derivatives pricing approach and provide new estimates of the subsidy to Fannie and Freddie, taking these considerations into account. Existing estimates of the GSE subsidy value—made under the relatively stable market conditions of the last decade—vary enormously, ranging from \$200 million to \$182 billion. The wide range reduces the credibility of cost estimates and suggests the need to reconsider what is driving these differences. The takeover of Fannie and Freddie by the Federal Government and the prospect that they may remain fully federal entities for an extended time period underscore the need for improved tools to evaluate and monitor their costs and risks.

Past estimates of the GSE subsidy value are based on two broad approaches: spread based and derivatives based. The former focuses on the interest rate differential, or spread, between the borrowing rates for the GSEs versus similarly risky but unguaranteed financial firms, whereas the latter relies on the observation that a default guarantee is equivalent to a put option on the assets of the firm and hence can be valued using derivative pricing techniques. In general, spread-based analyses produce much larger estimates of subsidy value. One reason for the discrepancies is that the two approaches answer slightly different questions. The derivatives approach looks only at the cost of providing insurance against default, whereas the interest rate spread also takes into account other advantages the GSEs may have in terms of liquidity or regulatory preference that lower their cost of capital. The analysis highlights a further reason that spreads may overestimate the cost to the government: at times, insured firms have an incentive to avoid default to preserve future guarantee value, making them less likely to default than an otherwise similar uninsured firm.

To rigorously explore the question of whether and how the presence of a repeated government guarantee changes the relation between a firm's equity value and the value of its operating assets, the authors develop a theoretical valuation model. Understanding this relation is important, because in derivative-based approaches to valuing debt guarantees, the unobservable value and volatility of assets is inferred from the observable value and volatility of equity. If the presence of the guarantee changes these relations—for instance, by affecting equity dynamics—the inferences could be biased.

In the model, it is assumed that an insured firm can continue indefinitely to issue insured debt in an amount based on the value of its operating (i.e., nonguarantee) assets, as long as it comes up with sufficient cash to cover its obligations at each debt maturity date. It will do so as long as staying in business is better for equity holders than declaring bankruptcy. The theoretical analysis reveals that in fact, the presence of the guarantee does not fundamentally change the relation between the volatility of levered equity and the underlying assets, leaving intact the standard equations underlying derivatives-based pricing. It does, however, create a wedge between the value of operating assets and the market value of debt and equity equal to the present value of the future stream of income generated by the guarantee. This affects the initial conditions for derivatives-based estimates. The analysis also reveals that the spread-based approach is upwardly biased when no correction is made for the lower-predicted default rate for guaranteed firms that optimally default less often to preserve the value of future guarantees.

To provide estimates that take into account these considerations and that also incorporate potentially important complications such as jumps in underlying asset value, time-varying asset volatility, and a more complicated default policy, Lucas and McDonald calibrate and simulate a computational version of the model. They find that an insurance premium of 20 to 30 basis points on Fannie and Freddie debt would have been fair compensation for the default risk assumed by the government under the benign economic conditions of 2005. However, an asset value decline of 10 percent causes the fair premium to more than double, highlighting the sensitivity of guarantee values to changes in equity value in highly levered financial institutions, and also demonstrating the usefulness of these types of models in setting risk-based insurance premiums.

The Federal Government can support credit to target groups either through direct lending or by guaranteeing against default risk loans made by private financial institutions. Whereas most federal credit programs rely on either direct lending or on loan guarantees exclusively, the federal student loan program is unique in maintaining two large and competing programs to support higher education, one of each type—the Federal Family Educational Loan Program (guaranteed program) and the Federal Direct Loan Program (direct program). This structure provides the opportunity to compare the cost to the government of these different financing and delivery

mechanisms for very similar underlying loan products. Since both programs are accounted for in the federal budget, the costs as estimated under current budgeting rules also can be compared to market value-based estimates. In chapter 7, “Guaranteed versus Direct Lending: The Case of Student Loans,” Deborah Lucas and Damien Moore develop a quantitative valuation model for student loans under the rules of each program and use it to explore these issues.

After adjusting for the market cost of capital, asymmetric treatment of administrative costs, and other inconsistencies in how the programs are budgeted for, the authors find that the guaranteed program appears to be fundamentally more expensive than the direct program, with an 11 percentage point higher subsidy rate (i.e., costing \$0.11 more in present value per dollar of loans originated). The differential can be attributed primarily to administrative costs associated with the structure of the guaranteed program and to the fact that guaranteed lenders are paid more than is required to induce them to lend at statutory terms. The direct program also appears to have a real cost advantage. As well as lower administrative costs, the direct program has the apparent advantage of raising funds via the Treasury rather than through private financial institutions.

In light of its cost disadvantage, a natural question is whether the guaranteed program provides offsetting benefits. In general, which method is a more efficient way to provide credit assistance depends on a variety of factors including the relative cost of capital, administrative efficiency, and the incentives to screen and monitor borrowers. Lucas and Moore point out that because student loans have categorical entitlement and an almost full credit guarantee, the value added by private intermediation is less obvious than for some other programs.

The discrepancy between budget estimates and market value estimates of subsidy rates on student loans is found to be large. Including a credit risk premium in subsidy rate estimates increases the subsidy rate by more than 15 percentage points. As a consequence, the budget cost of student loans significantly understates the cost to taxpayers. The authors also suggest that the cost understatement can distort policy choices in a way that has real effects—for instance, favoring an increase in the student loan program over other forms of assistance to students like direct grants, which have been shown to be more effective for encouraging low-income students to obtain a higher education.

The last two chapters in this volume show how the principles of financial economics can be fruitfully extended to analyze federal financial exposures that go beyond the realm of traditional financial activities. In chapter 8, “Market Valuation of Accrued Social Security Benefits,” John Geanakoplos and Stephen Zeldes apply the principles of market valuation to Social Security obligations. The calculations are relevant: to assessing the size of unfunded federal liabilities, to the debate over whether and how they should

be accounted for in the financial statements of the US government, to helping workers plan for retirement, for plans to privatize benefits based on the fair value of current accruals, and for considering asset allocation in the trust fund. Interestingly, this is a case where taking market risk into account has the effect of lowering the estimated cost of federal obligations relative to traditional cost estimates.

Most existing analyses project Social Security obligations forward, taking into account demographic and wage trends. They implicitly treat the projected obligations as riskless by discounting them at a riskless rate. In fact, promised benefits are correlated with long-run wages through the benefits formula, which bases lifetime annuity payments on a worker's average real wage over his or her thirty-five highest-earning years. This means that when the economy has done well, promised benefits are higher, and conversely when economic growth is low. Hence, there is systematic risk associated with Social Security obligations.

The valuation approach taken by Geanakoplos and Zeldes is to treat Social Security claims as derivatives of the stock market. Although the empirical correlation between wages and stock returns is low over short horizons, in the long-run, evidence suggests that the two are positively correlated. A risk-neutral Monte Carlo model, calibrated with historical data on stock returns, labor earnings, the risk-free rate, demographic data, and the rules governing Social Security obligations, yields an estimated market value for claims held by workers of different current ages. Aggregating across birth cohorts yields an estimate of aggregate liabilities. Adjusting for market risk has a significant effect on estimates of the present value of accrued benefits, particularly for benefits accrued for workers not yet retired. For workers under age sixty, the present value of costs, measured as the present value of accrued benefits less the current value in the trust fund, falls from \$8.57 trillion to \$6.05 trillion when the discount rate is risk adjusted. For retirees, the effect of market risk is minimal, since promised benefits are not affected by future shocks to the aggregate economy. Overall, taking market risk into account decreases the present value of benefits to 81 percent of the estimated value calculated using a riskless discount rate.

Failure at the federal level to account for the value of environmental assets and liabilities and to actively manage the associated risks has potentially dire consequences. In chapter 9, "Environment and Energy: Catastrophic Liabilities," Geoffrey Heal and Howard Kunreuther review the extent to which the government faces liabilities arising from its management of environmental risks and also survey estimates of the size of natural capital as an asset. They then look in detail at the Price-Anderson Nuclear Industries Indemnity Act (P-A Act) in order to assess the nature of this federal liability and to suggest ways in which it could be more effectively managed.

Valuing environmental assets and liabilities has been an active area of environmental research in the last decade, but it is a complicated undertaking

that is made especially difficult by the absence of markets for many of these resources. An example given of undervaluation due to underpriced positive externalities is the New York City watershed, which provides uncompensated value in the form of clean water and the avoidance of filtration costs. Another is the cost of the gradual destruction of barrier islands in the Gulf of Mexico that partially protect New Orleans from costly storm surges. Similarly to financial transactions, the authors note that government accounting standards tend to be less stringent than those imposed in the private sector, potentially encouraging natural resource depletion. For example, mineral depletion under US generally accepted accounting principles (GAAP) must be recorded as a reduction in assets on corporate balance sheets. Under the United Nations System of National Accounts, however, depletion is not treated as a charge against national income. Data from the World Bank gives some sense of the aggregate importance of environmental assets. It shows natural capital as accounting for 26 percent of total public and private capital for low-income countries but only 2 percent for high-income Organization for Economic Cooperation and Development (OECD) countries. Even the 2 percent is a large absolute number, since many forms of natural capital are omitted, and the total size of the capital stock is large.

Nuclear power plants have a highly skewed risk profile, with a high probability of emitting no pollutants, and a very small chance of a catastrophic meltdown, as in the case of the Chernobyl reactor. The disposal of nuclear waste also entails the potential for catastrophes. Whether these risks have become more or less severe over time is hard to measure. The frequency of accidents in the United States has decreased markedly from the 1960s and 1970s, but reactors are located close to population centers that have grown larger over time, and the potential size of losses is enormous. For instance, it is estimated that the cost of a major meltdown of the Indian Point reactor located near New York City could top \$1 trillion. The historical justification for the P-A Act, which was renewed in 2005, is that such exposures make it impossible for the nuclear industry to obtain private insurance. The authors review the conditions normally thought to be necessary for private insurability and conclude that the risks are in fact unique, massive, and not well understood, probably making it impossible to have a nuclear industry that relies on completely private insurance. They go on to look into the details of the P-A Act to see whether it is likely to meet goals such as mitigating moral hazard in how plants are operated and where they are sited. The conclusion is that problems such as regulatory capture by the Nuclear Regulatory Commission (NRC) and inadequate incentives for investing in safety suggest that the rules could be improved and that improvements in other catastrophe insurance programs provide some models that could be adopted in the nuclear context.

These chapters were first presented and discussed at an eponymous conference sponsored by the Zell Center for Risk Research at Kellogg and held

at the Kellogg School of Management at Northwestern University in February 2007. The conference brought together scholars and policymakers from academia, research institutions, and the government. This volume includes two of the presentations made by policymakers that crystallize the central issues: a keynote address by Peter Fisher, former under secretary of Treasury and now a managing director at Blackrock, on the importance of bringing financial literacy to Washington; and a talk by Donald Marron, former acting director of the Congressional Budget Office, on how cost estimates are used in Congressional decision making and how risk might be usefully incorporated. It is my hope that the chapters and discussions in this volume will provide further impetus for work in this area that ultimately leads to better informed decision making in the public sector.