Evaluating the Cost of Government Credit Support: The OECD Context

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Governments throughout the OECD allocate a large share of societies’ capital and risk through their credit-related activities. Hence, accurate cost estimates for credit support programmes are a prerequisite for efficient resource allocation, transparency, effective management and public oversight. I find that OECD governments generally take their cost of capital to be their own borrowing rate, rather than using a weighted-average cost of capital that includes the cost of risk borne by taxpayers and the general public in their role as equity holders. That practice, which is institutionalised in government accounting and budgetary rules, results in cost estimates for credit support that are significantly downwardly biased relative to a fair-value metric that recognises the full cost of risk. The size and possible real consequences of those distortions are illustrated with analyses of the European Bank for Reconstruction and Development, the European Stability Mechanism and the Tennessee Valley Authority.

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1. INTRODUCTION

Governments throughout the OECD and around the world allocate a significant share of societies’ capital and risk through their credit-related activities. Those activities include explicit and implicit guarantees of too-big-to-fail private and international financial institutions and non-financial firms; direct and guaranteed lending; and credit-related insurance and guarantee programmes such as deposit insurance. In deciding whether to initiate or modify a credit programme, policymakers consider a broad array of political and economic factors. Costs play a prominent role in such deliberations – policies are often debated and ultimately justified or rejected on the basis of formal or informal cost–benefit analyses. Consequently, accurate cost estimates are a prerequisite for efficient resource allocation, informed and transparent government decision-making, and effective management and oversight of government programmes.

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This paper explores how OECD governments and government entities determine the official costs of their credit-related activities, evaluates those methods against the metric of a ‘fair-value’ approach, and illustrates the divergence between reported and fair-value cost estimates through an analysis of several major OECD government credit programmes. A fair-value approach measures programme costs at market prices, or at some approximation thereto when directly comparable market prices are unavailable.1

The underlying premise — that governments systematically understate the cost of their credit activities because they misidentify their cost of capital as being their own borrowing cost — rests on two robust principles from financial theory. The first dates back to Arrow and Debreu (1954) and remains the cornerstone of modern-day asset pricing: The cost of capital for any project, public or private, depends on the undiversifiable (also often referred to as market or aggregate) risk associated with it. Relative to a unit of consumption today, an investment that pays off when the economy is strong is worth less than an investment with the same average payout but that pays off when the economy is weak. The second principle follows from the related logic of the famous Modigliani–Miller (MM) theorem (Modigliani and Miller, 1958) as it applies to governments.2 The MM theorem established that as a first approximation, the cost of capital for a project (including financial projects) depends on the timing and undiversifiable risks of the associated cash flows, not on the mix of debt and equity used to finance it. Debt and equity holders collectively bear the entire undiversifiable risk of a project, and the cost of the total undiversifiable risk is the same no matter how it is divided across those claimants. The relevance to the government arises from the recognition that the undiversifiable risks inherent in most government credit activities are similar to those present in private credit transactions and that those risks are ultimately borne by taxpayers and the general public, who are the de facto equity-holders in government investments.3

The analysis reveals a large divergence between how OECD governments account for the costs of credit support and the corresponding fair-value costs: governments (and government-owned entities) systematically understate the costs of credit support, often by a considerable margin. Cost understatement has a number of potentially adverse consequences: it encourages over-reliance on credit support relative to other types of assistance, such as grants or in-kind transfers, for which costs are measured

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1 More precisely, the fair value of an asset is the price that would be received if it were sold in what is known as an orderly transaction — one that occurs under competitive market conditions between willing participants and that does not involve forced liquidation or a distressed sale. The distinction between fair value and market value is particularly useful for valuing government assets and liabilities, many of which do not have an exact private sector analogue; fair value accounting standards provide guidelines for how to handle such cases.

2 Cost estimates based on a weighted-average or market cost of capital are often described as fair value estimates, and henceforth the terms are used interchangeably.

3 That perspective was endorsed by the Financial Economists Roundtable (2012), a non-partisan group of senior financial economists, but remains controversial among US budget practitioners.
more fully. The impetus to use credit support in lieu of other types of assistance may be particularly strong during periods of fiscal consolidation when there is intense pressure to reduce measured spending. Cost understatement creates incentives for capital misallocations and overinvestment; and it under-reports the size of the public sector. Furthermore, it encourages a larger build-up of financial risk by governments than would otherwise occur. That in turn increases the likelihood of future funding shortfalls that could hinder governments’ capacity to respond to adverse shocks, and adds to the aggregate financial risk in the world economy.

The phenomenon of significant cost understatement and several valuation approaches that can be used to address it are illustrated through analyses of three OECD examples: (1) the European Bank for Reconstruction and Development (EBRD), a large international financial institution whose disclosures are typical of such organizations; (2) the Tennessee Value Authority (TVA), a wholly federally owned firm responsible for about one-sixth of the electrical generation and transmission in the United States; and (3) the European Financial Stability Facility (EFSF) and its successor, the European Stability Mechanism (ESM), a permanent crisis resolution mechanism established by the eurozone Member States as an intergovernmental organisation to ensure financial stability by providing financial assistance to ESM members experiencing or threatened by severe financing problems.

This analysis adds to a growing number of studies that address those issues as they pertain to the US federal government (Lucas, 2012a, surveys that literature). Similar analyses do not appear to have been performed for other OECD Member States, despite the growing prevalence of government credit support by those countries and the significant differences from the US in policies and institutions. The aim of this paper is to begin to fill that gap, and to draw attention to the importance of accurate cost measurement for credit support in the OECD context and the shortcomings of current practices. A caveat is that the conclusions drawn rely on examination of a small subset of the numerous government financial reports and budgetary documents where credit cost information may appear, as well as a reading of the relevant portions of the International Public Sector Accounting Standards (IPSAS) and related commentaries and conversations with OECD experts. A comprehensive analysis of OECD credit programmes and accounting practices was not attempted. Thus there may be important exceptions and variations that remain to be identified in future research.

As noted above, the fundamental conceptual reason for the systematic understate-ment of credit costs by OECD member states and government-owned entities is relatively straightforward: Governments generally equate their cost of capital with their borrowing rate, independent of the risk of the activity being financed. Relatedly, government entities use an accounting notion of profitability rather than an economic one. However, the practical impediments to a full recognition of credit costs are more numerous and complex. They include the panoply of legally binding directives and long-standing practices that allow the costs of many credit activities –
particularly credit guarantees and other contingent commitments – to be entirely unaccounted for in government budgets, or to be accounted for on a cash basis that largely obscures the lifetime cost of new obligations at the time they are made. The US federal government took the positive step of moving to an accrual basis of accounting for its direct loans and loan guarantees programmes, but its use of government interest rates for discounting results in downwardly biased cost estimates. Even if one were willing to take reported costs at face value, identifying the relevant programmes and uncovering the available cost information is difficult. Reporting practices are not standardized, and cost information may be spread across a combination of budgetary accounts, financial statements, and special reports issued by multiple reporting entities.

Despite the complexity and heterogeneity of current practices, it is possible to characterize the differences in the information disclosed by government entities and by publicly traded firms in a way that clarifies the relation between financial accounting, budgetary accounting and market prices. That taxonomy represents an original contribution of this paper, and it is useful for several reasons. For one, it suggests the importance of recognizing the fair-value costs of credit support in budgetary accounts. Government financial statements, even when they include a fair value balance sheet, do not reveal the full cost of credit support. The observation is important because whereas government financial accounting has become increasingly standardized and is largely consistent with financial accounting practices in the private sector as more countries have chosen to adopt IPSASB guidelines, international standard setters have offered much less guidance on budgetary accounting practices. Furthermore, many OECD government credit activities are conducted by entities such as international financial institutions, which evaluate their financial performance largely on the basis of data on their financial statements. The fair-value costs of their credit activities, which for a publicly traded firm would be reflected in stock price movements, are generally not estimated or recognized as relevant.

Adoption of a fair value approach to cost estimation by governments would involve a number of practical challenges. Those include the need to select appropriate methodologies for a variety of applications; the possibility that the resulting cost estimates would be less transparent and more open to manipulation than estimates based on simpler rules; and the costs of educating staff members on how to prepare and communicate fair value estimates to policymakers and the public. The case is made that those costs and risks would be largely mitigated if governments were to adopt the accounting standards and practices that have developed to guide and discipline the production of fair value estimates by private sector financial institutions.4

While accurate cost measurement is important for the many reasons noted, it is clearly not sufficient for policy evaluation – private benefits and any positive or

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4 For a discussion of the concerns that have been raised about requiring fair value accounting by the private sector and a defence of that practice, see Laux and Leuz (2009, 2010).
negative externalities also must be taken into account. Although those broader issues are outside of the scope of the analysis here, there is an extensive academic literature on the broader effects of government credit support. Government credit support can improve social welfare when it alleviates informational and contractual frictions in credit markets (e.g., Stiglitz and Weiss, 1981; Williamson, 1994). Credit market frictions and their consequences may be particularly severe during periods of financial upheavals. Relatedly, during downturns credit policy can be a powerful tool for delivering economic stimulus (Gale, 1991; Lucas, 2012b). Public financing of infrastructure projects may improve welfare when it is not feasible for the private sector to collect sufficient revenues from users. Potential adverse effects of credit support include the crowding out of more productive investment activities; effects on prices that reduce the benefits to the intended beneficiaries; incentives for greater risk taking by guaranteed entities; and a build-up of debt by unsophisticated borrowers.

The remainder of the paper is organized as follows: Section 2 gives an indication of the size and scope of OECD government credit activities. Section 3 reviews the conceptual case for applying a fair-value approach to cost estimation in government accounting, and explains how credit costs are accounted for in practice. It then clarifies the complementary roles of budgetary accounting and financial accounting, and compares the information provided therein with information available to investors in publicly traded firms that also have information about stock prices. Section 4 reports the fair-value costs to governments of the EBRD, the EFSF/ESM, and the TVA, and compares those estimates to the government-reported information on their costs. Those analyses demonstrate several of the approaches that can be used to estimate the fair-value of government credit support. Section 5 discusses some of the practical challenges in implementing a fair value approach and how they might be addressed. Section 6 concludes.

2. GOVERNMENT USES OF CREDIT SUPPORT

OECD governments provide credit support for many purposes, and by a variety of means. Governments provide explicit and implicit guarantees to too-big-to-fail private financial and non-financial institutions, and to international financial institutions. Direct government loans and loan guarantees programmes provide assistance for housing, education agriculture, small businesses, development, energy, trade, and to foreign and subnational governments. Certain government insurance programmes, such as those protecting bank deposits and private pension benefits, are effectively credit guarantee programmes. Government-owned firms that fund their investments through low-cost debt issuance provide credit support to the activities they engage in.

Cataloguing the size and scope of government credit support for OECD countries using a consistent approach across jurisdictions and programmes would be a worthwhile and challenging undertaking, but such an exercise has not been done and is not attempted here. Nevertheless, information is available that provides a sense of the
magnitudes involved, and suggests credit supported by OECD governments amounts to several tens of trillions of euros.

For the US, Lucas (forthcoming) provides an inventory of federal credit support programmes which underscores the very large size of those obligations when considered collectively. Exposures are measured by dollar amounts of outstanding guaranteed obligations. Prominent implicit guarantees are included but state and local government obligations are not. That analysis concludes that for 2013, credit backed by the US federal government topped $20 trillion. The major components include: traditional direct loans and loan guarantees, primarily for low-income housing and higher education ($2.3 trillion); backing for mortgages insured by Fannie Mae and Freddie Mac ($5.8 trillion); deposit insurance ($6.2 trillion); guarantees of private defined benefit pension plans by the Pension Benefit Guarantee Corporation (about $2.8 trillion); and implicit guarantees to the Federal Home Loan Banks and the Farm Credit System (about $1 trillion). In general, the fair-value cost of those obligations is much smaller. For example, the US Congressional Budget Office (CBO, 2012) reports that for the estimated $635 billion of new direct loans and loan guarantees issued in 2013, the fair-value cost would be $11 billion.5

The International Monetary Fund (IMF) presents estimates of outstanding government-guaranteed bonds and debt of government-related enterprises as a share of GDP for selected OECD countries in 2008 and 2012 (IMF, 2012). That graph is reproduced here as Figure 1. It shows the significant growth in those obligations over that period for almost all of the countries reported. In 2012, government-guaranteed bonds reached close to 7% of GDP for Denmark and Spain, and exceeded 3% of GDP for 8 of the 10 countries shown. The US tops the list at 51.5% of GDP for debt of government-related enterprises (because of Fannie Mae and Freddie Mac), while for 10 of the other 13 countries shown such debt represents more than 10% of GDP. Details are not reported on the uses of the funds, but the report notes that in some countries the largest shares go to financial institutions including development banks (e.g., Germany) and housing agencies (e.g., Canada and Japan). The IMF also notes that in some countries the amounts are likely to be underestimated given data constraints. The totals also are not comprehensive in that they do not include various contingent liabilities such as those of the European Stability Mechanism. National credit programmes, such as for student loans and deposit insurance, also appear to be excluded.

Survey information on national direct loan and loan guarantee programmes from 22 OECD countries shows a combined total stock outstanding of $2.5 trillion (Hawkesworth, 2010).6 Loan guarantees account for $2.3 trillion of the total. Sectors

5 That estimate excludes the cost of Fannie Mae and Freddie Mac, deposit and pension insurance, contributions to multilateral financial institutions, and implicit guarantees.

6 Includes Australia, Austria, Canada, Denmark, Finland, Germany, Greece, Hungary, Iceland, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Sweden, Switzerland, Turkey and the UK.
receiving assistance (and their percentage of the total) included the financial sector (76%); export (10%); other (8%); non-financial, non-agriculture (3%); and student loans (3%).

OECD members rely on international financial institutions, and particularly multi-lateral development banks, to provide credit and other financial support to projects in developing countries and regions. Such institutions are chartered by more than one country and hence are subject to international law. Individual countries provide

Figure 1. Outstanding government-guaranteed bonds and debt of government-related enterprises (percentage of GDP)
Source: Reproduced from International Monetary Fund, 2012 Fiscal Monitor.
capital by purchasing shares in the institutions. They also provide ‘callable capital’ which commits them to buy additional shares when sufficiently large losses are incurred. In 2012, those institutions collectively held assets totalling more than €1 trillion, as shown in Table 1.7

The data presented confirms the importance of credit support in OECD countries. It also suggests that credit assistance in most OECD countries is channelled through the financial sector, whereas in the US the assistance is more often targeted to specific purposes through government agencies.

### 3. ESTIMATING THE COST OF GOVERNMENT CREDIT PROGRAMMES

This section briefly lays out the economic rationale for evaluating the cost of government credit programmes on a fair-value basis, and contrasts that approach with the practices that OECD governments follow in measuring and reporting credit costs. Most importantly, the differences between the information disclosures by government entities and by publicly traded firms are characterized in a way that clarifies the relation between financial accounting, budgetary accounting, and market prices. That decomposition points to the nature of under-reporting under the most common accounting regimes, and suggests how accounting practices could be modified to incorporate more complete cost information.

#### 3.1. Rationale for fair-value reporting by governments

Unlike most ongoing government programmes that may be modified by future legislation or administrative policy changes (e.g., unemployment benefits may be changed year to year), the terms agreed to in a credit contract represent a firm legal commit-

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**Table 1. Assets of selected international financial institutions, 2012 (€ billions)**

<table>
<thead>
<tr>
<th>Institution</th>
<th>2012 (€ billions)</th>
</tr>
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<tbody>
<tr>
<td>African Development Bank</td>
<td>25</td>
</tr>
<tr>
<td>Asian Development Bank</td>
<td>95</td>
</tr>
<tr>
<td>European Bank for Reconstruction and Development</td>
<td>52</td>
</tr>
<tr>
<td>European Investment Bank</td>
<td>508</td>
</tr>
<tr>
<td>Inter-American Development Bank</td>
<td>71</td>
</tr>
<tr>
<td>World Bank Group</td>
<td></td>
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<tr>
<td>- International Bank for Reconstruction and Development</td>
<td>260</td>
</tr>
<tr>
<td>- International Development Association</td>
<td>123</td>
</tr>
<tr>
<td>- International Finance Corporation</td>
<td>58</td>
</tr>
<tr>
<td>- Multilateral Investment Guarantee Agency</td>
<td>1</td>
</tr>
</tbody>
</table>

*UA 1 = EUR 1.2*  
*USD 1 = EUR 0.77*

7 Assets reported in dollars are converted to Euros at an exchange rate of €77 per dollar. It is not clear whether the debt backing the assets of international financial institutions is included in the IMF calculations of guaranteed debt or debt of government guaranteed enterprises.
ment that binds the government over the life of the contract. Therefore the grant-equivalent measure of cost for a credit contract must represent its lifetime cost — the net present value of the associated cash flows from and to the government. Those cash flows are inherently uncertain, but they can be characterized by a probability distribution of possible outcomes. For a direct loan, when the present value of future cash inflows (from interest payments, fees, and repayments of principal) falls short of the principal loaned out, the difference represents a cost to the government and a subsidy to the recipient. Similarly for a credit guarantee, when the present value of future cash outflows under the contract exceeds the present value of fees and recoveries, then the cost to the government is positive and a subsidy is conferred.

Present value calculations are quite sensitive to the choice of discount rates, and the results can only be meaningfully interpreted if appropriate discount rates are chosen. The discount rates used in the private sector take into account time value — that a dollar received today is worth more than a dollar received in the future. Private sector discount rates also include a risk premium that compensates investors for the risks associated with a particular investment that cannot be easily avoided through diversification. Those priced risks include market risk, and in some cases prepayment risk and liquidity risk.8

In practice, there are three basic approaches that are used to incorporate the cost of risk into present value calculations: comparable market prices, risk-adjusted discount rates, and option- or derivatives-pricing methods. All derive from the same underlying principles, and therefore should provide similar answers if correctly implemented. However, the most reliable and tractable approach is likely to vary with the application. For example, for contingent claims such as credit guarantees, it is often most straightforward to incorporate an appropriate set of discount rates using a derivative-pricing approach. (Ways in which governments could credibly implement fair value methodologies are discussed below in Section 5).

Private sector discount rates depend primarily on the risks inherent in a particular investment, not on how it is financed: the value of a bank loan which is financed 90% by debt and 10% by equity is approximately the same as if it were financed with 50% debt and 50% equity.9 Risk is distributed differently between debt and equity holders in the two financing schemes, but the total risk to be shared is the same. Hence the total cost of the risk, reflected in the weighted average cost of capital for the bank loan,

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8 Market risk is the aggregate economic risk that remains even after investors have diversified their portfolios to the fullest extent possible. Loans and loan guarantees expose the government to market risk because future repayments of loans tend to be lower when the economy is performing poorly and losses are more costly for the government to absorb. Prepayment risk arises when borrowers have the option to prepay a loan before its final maturity date. A prepayment option also affects the probability and timing of defaults. Liquidity risk is the risk that market conditions may make it difficult to quickly find a buyer for an asset without large price concessions.

9 This abstracts from the effects of taxes, financial distress, and other financing frictions, but those various effects push in different directions and their net effects vary, leaving risk as the central consideration that is relevant to the issues discussed here.
is unaffected by how it is financed. This is the logic of the famous Modigliani and Miller (1958) theorem that remains a cornerstone of finance theory.

The risks inherent in government credit activities are similar to those in private credit transactions, but those risks are ultimately borne by taxpayers and the general public in place of private equity holders. Consider a risky government loan, funded by the issuance of government debt. If the borrower repays the loan in full then the proceeds can be used to pay back the debt holders, and if there is money left over it can be used to increase other government spending or to reduce taxes. However, if the borrower defaults then the debt will be repaid using new tax revenues or reductions in other government spending. Taxpayers and the public are effectively equity-holders (albeit with unlimited liability) in government investments and bear the associated risks.

As we will see, the direct practical consequence of treating taxpayer-supplied equity as free is that countries’ budgetary costs are downwardly biased, and the profits reported by government firms in their financial disclosures are upwardly biased. Those biases will be largest for credit activities that involve relatively large exposures to undiversifiable risk, such as government guarantees to financial institutions, and for government firms that achieve a very low borrowing cost because of public backing.

3.2. Current OECD practices in budgetary and financial reporting for credit

The problems of incomplete and inconsistent cost measurement are more acute for credit support than for most other types of government spending because credit provision involves uncertain cash flows that often extend out over many years. That complexity, combined with the fact that governments tend to produce credit services in-house rather than purchasing them from financial institutions, creates latitude in how the costs of credit are measured and reported. Consequently, myriad approaches and formulas are used by OECD governments and government entities for estimating and reporting credit costs.

Budgetary costs are of particular importance because it is in the budget process that policymakers make trade-offs between competing spending priorities. Whereas for government financial reporting there has been a move towards common standards across countries and with the private sector, there appears to have been little effort to harmonize budgetary accounting across countries. Nevertheless, for the purpose of understanding the most common budgetary practices and their main strengths and

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10 The International Public Accounting Standards Board endorses the use of accrual for budgetary accounting but does not require it: ‘The Cash Basis IPSAS encourages an entity to voluntarily disclose accrual based information, although its core financial statements will nonetheless be prepared under the cash basis of accounting. An entity in the process of moving from cash accounting to accrual accounting may wish to include particular accrual based disclosures during this process.’
weaknesses, the various accounting approaches can be broadly characterized as: (1) off-budget; (2) cash basis; and (3) accrual basis.

3.2.1. Off-budget. For an important subset of OECD countries, some or all credit-related costs are omitted from national budgets. Survey data (Hawkesworth, 2010) indicates that for loan guarantees, no budgetary expenditures are reported apart from administrative fees for Canada, UK, Slovak Republic, Australia and Turkey. For direct loans, no expenditures apart from administrative fees appear for Canada, UK, Spain, Germany, Austria, Slovak Republic, Portugal and Turkey.¹¹ The survey responses also indicate that during the global financial crisis, some countries ignored general procedures due to the extreme circumstances or made adjustments to their standard procedures.¹²

3.2.2. Cash basis accounting. Those credit activities that are considered budgetary are most often accounted for by OECD countries on a cash basis. Cash accounting entails reporting the cash flows associated with a direct loan or credit guarantee in the years that they are realized.

Cash-basis accounting for credit has significant and widely recognized weaknesses. It delays recognition of the full cost of credit support until many years after the commitments are made, when cost information is most decision-relevant to policymakers. It distorts comparisons between the subsidies associated with economically equivalent direct loans and loan guarantees. Newly guaranteed loans may actually appear to make money because typically the government receives fees upfront and only bears the costs of defaults years later, often outside of the time horizon covered by the budget. By contrast, direct loans show a large upfront cost when principal is disbursed, even for loans that are likely to be repaid in full. Loans with high expected default rates appear initially to be no more costly to make or guarantee than those extended to the safest borrowers. Furthermore, cash accounting does not recognize the effects of time or risk on the value of cash flows.

A possible response to the shortcomings of cash-basis accounting is to simply not report credit costs in national budgets. However, excluding credit from budgetary accounts creates other problems, including that total government expenditures are under-reported and that credit support becomes less transparent than other forms of spending. A more satisfactory alternative is to switch to an accrual basis of accounting for credit. When properly implemented, accrual accounting addresses all of the concerns noted above, although it has the disadvantages of somewhat complicating the preparation and interpretation of budgetary estimates.

¹¹ Some countries (e.g. Norway and Denmark) report that no expenditures appear, but seem to contradict that by indicating that subsidy costs and write-offs of bad loans are reported. Presumably this reflects differences across programmes.

¹² The respondents for Denmark and Netherlands said they ignored the rules; those for Hungary, Finland, Mexico, Germany, Turkey and the UK said they adjusted them.
3.2.3. **Accrual accounting.** Budgetary accruals measure the lifetime cost of new credit support in the year a commitment is made. Accruals are calculated by projecting the future cash flows associated with a loan or guarantee and discounting them to the present. Despite its conceptual advantages over cash accounting, the US is the only major OECD country that appears to have adopted accrual accounting for activities classified as credit programmes.\(^{13}\) That change, which took effect in 1996, represented a major improvement over the cash basis budgeting that preceded it. However, the implementation has some shortcomings – primarily the use of Treasury rates for discounting – that cause costs to be under-reported, and that create inconsistencies across the way functionally similar programmes are accounted for.\(^{14}\)

The picture is brighter for financial reporting. The International Public Sector Accounting Standards Board (IPSASB) has promulgated accounting standards for public entities that are similar to the International Financial Reporting Standards (IFRS) that apply to private sector entities, but that allow specific differences that accommodate features special to public enterprises. Many OECD countries and government institutions have adopted some or all of IPSASB guidelines. Importantly, because it incorporates IFRS rules that require financial institutions to report balance sheet information on a fair-value basis, the IPSASB standards implicitly accept the relevance of market prices to governments. As a result of adopting those standards, government institutions such as multilateral development banks disclose a significant amount of information on their credit exposures and the value of loans and other financial holdings. However, as explained next, financial statement disclosures do not reveal the full cost of the credit support provided, and they were not designed to do so.

3.3. **Extracting cost information: the role of budgetary accounting, financial reporting and market prices**

An important question is how much can be gleaned about credit support costs from budgetary reports and financial statements, and how that information differs from what is available for publicly traded firms. The answer is shown here to depend on the budgetary accounting rules for credit support. Only when budgetary accounting is

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13 The US budgetary system also includes a system of supporting accounts that are necessary to reconcile budgetary accruals for credit with the subsequently realized cash flows. As part of that reconciliation process, and to provide information about the accuracy of the initial cost projections, periodic cost re-estimates that reflect realized cash flows and updates of projected cash flows are also reported. However, those re-estimates do not affect the reported budget surplus or deficit.

14 The stipulation in the law that US Treasury rates be used for discounting causes those estimates to be a less-than-comprehensive measure of cost. For a few credit-related programmes, most notably the Troubled Asset Relief Programme enacted to respond to the 2007 financial crisis, the law requires budgeting to be on a fair value basis, which replaces discounting at Treasury rates with discounting at market-based rates. Other major US credit support is classified as insurance and is budgeted for on a cash basis. Legislation has been passed in the House of Representatives that requires fair value accounting for most credit-related programmes (H.R. 3581) but the bill has not been taken up by the Senate.
on a fair-value basis is the information provided equivalent to what is available for publicly traded firms.

It is useful to begin with a reminder of the different functions of government budgetary reports and financial statements. Budgets record a government’s annual expenditures and receipts, primarily on a cash basis. Budgets are used to set spending priorities, and budgetary totals feed into the calculation of a country’s official deficit.

Financial statements are designed to give a picture of the operations and overall financial health of a public or private sector enterprise. They also provide commentary on an enterprise’s risk exposures. Financial statements include a balance sheet, which shows assets and liabilities; an income statement, which recognizes various categories of revenues and expenses generally using accrual concepts; and a statement of cash flows, which tracks actual cash flows associated with different categories of receipts and payments.

Financial statements only provide partial information about the cost of capital: they treat interest payments on borrowed funds as an expense, but make no mention of the required return to equity capital. Instead, the difference between revenues and expenses is reported as earnings, which is an indication of the value accruing to equity holders. A government enterprise is generally referred to as ‘profitable’ if those earnings are positive, even if they are insufficient to provide a fair rate of return on equity. Put differently, ‘economic profits’ are only considered positive if returns exceed the weighted average cost of capital, whereas accounting profits are positive if returns exceed the cost of debt financing.

For a publicly traded firm, the fact that accounting profits exclude a return on equity is less consequential because of the availability of stock price information. Stock prices reveal whether the market views a firm’s earnings as providing a fair rate of return to equity; when earnings fall short stock prices decline, and conversely when earnings exceed the required return. For that reason, a firm announcing a positive accounting profit may nevertheless see its stock price drop.

For national governments, budgetary cost estimates are the closest substitute for the information in stock price changes. Ideally, the budgetary cost of a programme represents the value of public resources committed to it. For grants and transfers, cash accounting achieves that objective. For credit support, budgetary accounting only represents the value of public resources committed and stands in for the information in stock price changes for private firms – when it is carried out on a fair-value accrual basis. Because that is generally not the case, policymakers lack the cost information that is available to their private sector counterparts.

For a government firm or international financial institution, the information in its financial statements is more salient to its decision-making than the budgetary information about it that is reported by national governments. For those enterprises, even when financial reporting is on par with the best private sector practices and it includes a fair-value balance sheet, the full cost of credit activities is not likely to be recognized because of reliance on the accounting definition of profitability.
This line of reasoning suggests two main conclusions. First, if governments were to report the budgetary costs of credit support on a fair-value basis, then the combination of financial reporting and budget estimates would provide information that at least in principle is similar to the information available to investors and managers of publicly traded firms through financial reports and stock prices. The second is that for government firms and international financial institutions, even when financial reports conform to IFRS guidelines, the cost of capital is generally not measured or reported, and there is often a misplaced emphasis on accounting profitability that is likely to have real effects.

4. QUANTIFYING FAIR-VALUE COSTS

To demonstrate some of the approaches that can be used to evaluate the fair-value cost of government credit support, and to compare the resulting cost estimates with the cost information disclosed under current budgetary and financial accounting regimes, three examples are analysed: (1) the European Bank for Reconstruction and Development (EBRD); (2) the US Tennessee Valley Authority (TVA); and (3) the European Financial Stability Facility (EFSF) and the successor European Stability Mechanism (ESM).

Those examples were chosen with several considerations in mind. A substantial amount of credit assistance from OECD governments is channelled through international financial institutions such as the EBRD, as shown in Section 2. The EBRD’s structure, activities and financial disclosures are typical of those types of institutions, and the results are therefore suggestive of the costs for other development banks. With regard to TVA, although quite a bit has been written on the fair-value costs of US government credit programmes, much less attention has been paid to the cost of credit support delivered through non-financial government firms. TVA serves as an example of how large credit subsidies are conveyed through government firms in the US and elsewhere, and how those costs are obscured by current budgetary and financial reporting practices. The EFSF and ESM were chosen because of the size and importance of those facilities and because costs estimates do not appear to have been previously attempted. That analysis also illustrates the greater challenges involved in estimating the cost of open-ended contingent guarantee programmes.

4.1. European Bank for Reconstruction and Development

The EBRD is an international financial institution that was established in 1991 to provide financial support for projects that ‘foster innovation and build sustainable and
open market economies from central Europe to central Asia and in the southern and eastern Mediterranean’. It supports such projects with loans, equity investments and guarantees. It also holds a portfolio of safe assets for liquidity, and it uses derivatives to hedge against interest rate and currency risk. Assets totalled €51 billion in 2012, of which €18.8 billion were loan investments in its banking portfolio.

The capital structure of the EBRD is similar to that of other large international financial institutions. The bank relies on mandatory equity contributions and so-called ‘callable capital’ from its members to obtain low borrowing costs on the debt issued. Callable capital represents firm commitments from members to purchase additional shares up to an agreed-upon maximum, should capital infusions become necessary.

The EBRD is owned by 64 countries, the European Union and the European Investment Bank. A member’s equity stake consists of its paid-in capital plus cumulative returns, which may be negative. Table 2 shows the 2012 capital subscription (the sum of paid-in and callable capital) of the top 12 equity holders, which collectively accounted for about 70% of total subscriptions. The ratio of members’ paid-in capital, reserves and surpluses; to its outstanding loans, share investments and guarantees; is required to be above 50%. Under the callable capital arrangement, members are obligated to increase their equity stakes if required by the Bank’s Board of Governors. Effectively, equity holders provide the EBRD with a free call option. The callable capital creates a substantial cushion for its debt against default. Because of those protections, the EBRD is able to issue debt in international capital markets that has consistently carried an AAA rating.

Capital calls are infrequent, but they do occur. For example, the EBRD Board authorized a capital call in 2010 to comply with its statutory capital requirement. It increased paid-in shares immediately by €1 billion and increased authorized callable capital shares by €9 billion. There are provisions in the law for redeeming callable

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Table 2. Top capital contributors to the EBRD

<table>
<thead>
<tr>
<th>EBRD top capital contributors</th>
<th>Capital subscription (€ 000s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States of America</td>
<td>3,001,480</td>
</tr>
<tr>
<td>France</td>
<td>2,556,510</td>
</tr>
<tr>
<td>Germany</td>
<td>2,556,510</td>
</tr>
<tr>
<td>Italy</td>
<td>2,556,510</td>
</tr>
<tr>
<td>Japan</td>
<td>2,556,510</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2,556,510</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>1,200,580</td>
</tr>
<tr>
<td>Canada</td>
<td>1,020,490</td>
</tr>
<tr>
<td>Spain</td>
<td>1,020,490</td>
</tr>
<tr>
<td>European Investment Bank</td>
<td>900,440</td>
</tr>
<tr>
<td>European Union</td>
<td>900,440</td>
</tr>
</tbody>
</table>
shares in the future if the bank has sufficient capital, but it appears that equity purchases are essentially non-refundable cash expenditures by member countries.

4.1.1. Financial reporting. In reporting its financial results, the EBRD generally follows IPSASB guidelines. Consequently, the EBRD’s reporting is quite informative about the value of its assets and liabilities, which it reports at fair value as well as book value. Not surprisingly, the return on equity is considerably more volatile when reported on a fair-value basis, as shown in Table 3. The EBRD also enumerates its various risk exposures, and provides data that could inform a quantitative estimate of that exposure. For example, the Bank reports the distribution of investments by credit risk category, by country and by industry.

As is standard in government and private sector financial reporting, the only component of capital costs that is recognized in the EBRD’s income statement is its interest costs. Those interest costs are much below the full cost of capital for the bank, which includes a fair return on equity and the annualized cost of callable capital. Put differently, the EBRD is reported to be profitable on an accounting basis in any year where the return on equity is positive, whereas it is only profitable on an economic basis if the average return on equity and callable capital exceeds a fair rate of return.

4.1.2. Fair value versus reported cost of capital. A straightforward way to estimate the fair-value cost of capital for an enterprise such as the EBRD is to identify the cost of capital for private-sector firms in a similar line of business. The calculation of the weighted average cost of capital here relies on the Capital Asset Pricing Model (CAPM) and a typical asset beta for the banking industry. The EBRD’s activities are clearly similar to, but not identical to, those of private financial institutions. On the one hand, it is possible that the EBRD is exposed to more credit risk than a typical bank because it finances projects whose sponsors have had difficulty obtaining private sector funding. On the other hand, in some cases those risks may be mitigated by the superior enforcement mechanisms available to the EBRD as compared to local banks. To the extent that any additional risk is largely idiosyncratic (e.g., arising from

<table>
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</thead>
<tbody>
<tr>
<td>Return on members’ equity – IFRS basisa (%)</td>
<td>8</td>
<td>0</td>
<td>12</td>
<td>–2</td>
<td>–15</td>
</tr>
<tr>
<td>Return on members’ equity – realized basisb (%)</td>
<td>7</td>
<td>5</td>
<td>8</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

a The IFRS basis corresponds to fair value returns, and the realized basis is a book value measure. 


16 The approach applied in this section is commonly used by financial practitioners and is recommended by standard corporate finance textbooks.
economic shocks to small countries), it would not affect the asset beta or the cost of capital calculation.

The components of the weighted average cost of capital calculation for the EBRD in 2012 are summarized in Table 4. The asset beta is set to 0.3, based on global data on banks over the last 5 years provided by Professor Damoradan. The market risk premium (the difference between the short-term risk free rate and the required return on the stock market) is set to 6.5%, consistent with historical returns data and typical industry assumptions about this parameter. The 3-month government borrowing rate, which represents the risk-free rate, is set to 0.0003, consistent with the low interest rates in that year. Together, those assumptions imply the required return on assets is

\[
0.0003 + 0.3(0.065) = 1.98%.
\]

Multiplying the required return on assets by the value of bank assets implies a cost of capital for the year of (0.0198)(52 billion) = €1.03 billion.

The total annual financing cost implied by this calculation is about three times the cost of debt financing that appears in the EBRD’s income statement. In its 2012 Annual Financing Report, the EBRD shows borrowing costs inclusive of hedging expenses of 0.89% on its debt of €37.1 billion, which implies a borrowing cost of €331 million. The difference of €699 million (€1030 million – €331 million) is the unreported capital cost for 2012. The corresponding unreported capital cost for 2011 is €716 million.

4.1.3. The value of callable capital. The unrecognized capital costs reported in Table 4 include the annual required return on the EBRD’s callable capital. However, to understand the fair-value cost to a government of entering into a new or incremental callable capital arrangement that will remain in force indefinitely, it is useful to be able to estimate the value of that standalone commitment over a longer time horizon. The estimates presented here can be interpreted as fair-value accruals, and the derivatives pricing approach used to calculate them illustrates a flexible

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17 The asset beta is based on returns data on 568 banks globally, as reported by Damodaran, http://pages.stern.nyu.edu/~adamodar/
methodology that government analysts could adopt to budget for the cost of new callable capital commitments (in lieu of the current off-budget treatment that represents them as costless).18

The cost of callable capital for the EBRD is estimated using a derivatives-pricing approach that builds on Lucas and McDonald (2006, 2010), modified to replace bankruptcy events with periodic and stochastic draws on member capital. The cost has the interpretation of being the present value of future capital infusions associated with capital calls. The model builds on the basic insights in Merton (1974, 1977), and on the extensions of Crosbie and Bohn (2003) to a more complex capital structure. The basic idea is that adverse shocks may cause asset value, and hence equity value, to fall below a threshold that causes a capital call to restore target equity ratios and thereby protect debt holders from losses. The call option exposes governments to significant market risk, and its value reflects that it is most likely to be exercised when the economy is weak and the cost of capital is high. The model is dynamic, and incorporates that over time the EBRD will tend to adjust its leverage, but those adjustments are gradual and can only partially offset exogenous shocks to risky asset values. Appendix 1 describes the model and its parameterization in more detail.

The model is calibrated using EBRD financial data for 2012. Asset volatility, which is not directly observable, is a critical parameter affecting guarantee value. For publicly traded firms, asset volatility can be inferred from market data using a derivatives pricing approach, but for government firms that data is not available. For the EBRD, the annual standard deviation of asset values used in the guarantee cost calculation is 0.075, which is based on the standard deviation of the reported fair-value equity of 0.104 from Table 3, and an assumed standard deviation for debt values of 0.03, weighted by the 2012 proportions of debt and equity. Setting asset volatility to 0.075 may be conservative; Damodaran reports volatility of bank assets of 29%.

Another important but unobservable parameter is the liability-to-equity threshold for capital calls. The threshold rule is based on the EBRD’s stated requirement that equity be maintained at a level of at least 50% of risky assets. However, it is restated for this analysis in terms of a maximum liability-to-equity ratio that triggers a call.19 The distribution of the size of the equity infusions when capital is called depends on multiple parameters, but most importantly on asset volatility; the level that the liability-to-equity ratio is restored to when new capital is added; and how often the threshold condition is checked. In the base case, equity is restored to 45% of liabilities, which is typical for that ratio for the EBRD over the last 5 years. Risky asset values are shocked monthly, but the threshold condition is checked only quarterly. The

18 Using a derivatives pricing model is generally the most accurate way to value call options, and it is a frequently used approach in practice.
19 The model tracks the market value of risky assets, not their book value. Stating the capital call trigger in terms of a maximum market asset to equity ratio can create the perverse situation where an increase in the market value of risky assets triggers a capital call. That problem is avoided by using a book liability ratio to express the trigger and target ratios.
trigger is checked only quarterly to capture policy inertia and the fact that financial statements tend to be updated at that frequency.

Under the base case parameterization, the cost of total callable capital over a 20-year horizon is €7.2 billion.\(^{20}\) The call option is exercised in about 6% of years. As is to be expected, the cost of the option is considerably less than the amount of callable capital outstanding (which stands at €23.4 billion), but is nevertheless significant. The estimate is sensitive to the various modelling assumptions and in particular to the assumed volatility of assets. For example, if average asset volatility is lowered to 3.75% then the cost falls to €2.7 billion and the call is exercised in 1.4% of years; and if volatility is increased to 10% then the cost rises to €11.8 billion and the call is exercised in 9.7% of years. More generally, the calculation underscores why omitting the cost of contingent credit liabilities from budgetary totals can significantly understate government expenditures.

4.2. Tennessee Valley Authority

TVA, the largest wholesale supplier of electricity in the United States, is wholly owned by the federal government. Its assets, which include coal-fired, nuclear and hydroelectric generators and an extensive transmission system, have a reported book value of $47.3 billion in 2012.\(^{21}\)

TVA funds its assets primarily through long-term debt issues to investors and also from earnings. Under the 1959 TVA Self-Financing Act, TVA is one of the few federal agencies in the US that issues debt in its own name rather than through the US Treasury. Its debt is subject to a cap, currently of $30 billion. Despite a history of losses that have repeatedly threatened its solvency, its debt has maintained a rating of AAA and its borrowing costs have historically exceeded comparable maturity Treasury bonds by only about 40 basis points. As emphasized by Logue and MacAvoy (2003), the low borrowing cost reflects the implicit guarantee from the US government on its debt obligations.\(^{22}\) Similarly to other government firms, TVA does not recognize in its financial statements any cost of the implicit guarantee provided by taxpayers.\(^{23}\)

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\(^{20}\) The present value of costs is calculated over a horizon truncated at 20 years for several reasons. One is that policies are unlikely to remain unchanged over long horizons, reducing the relevance of costs predicted to be incurred in the more distant future under current policy. Furthermore, with a longer horizon parameter uncertainty becomes more of an issue, and small errors in assumptions about growth rates or discount rates are compounded.

\(^{21}\) TVA reports under GAAP, and is not required to report on the fair value of its operating assets.

\(^{22}\) See Logue and MacAvoy (2003) for a more complete description of the history and operations of TVA.

\(^{23}\) The implicit guarantee on its debt is one of several types of direct and indirect government subsidies TVA receives. The company does not pay corporate taxes on earnings, nor does it pay local or state property taxes. It does make payments equal to 5% of revenues in lieu of taxes to the counties and states which house the system, but on net it receives a tax subsidy. TVA is restricted to operating within its service area, where it has a legislatively enforced monopoly. Its pension fund, which was underfunded by $4.9 billion in 2012, is also thought to have an implicit government guarantee.
The estimated market value of the annual subsidy associated with the implicit debt guarantee is calculated using a weighted average cost of capital approach parallel to that used for the EBRD in Section 4.1.2. The required return that investors would demand on TVA's assets is based on the CAPM and the asset beta for electrical utilities. Following Logue and MacAvoy, the asset beta is taken to be 0.6. The market risk premium is fixed at 6.5%, a standard assumption for this parameter. The 3-month T-bill rate, which varies across years, represents the risk-free rate. For example, the required return on assets is estimated to be 3.93%: 0.0003 + 0.6(0.065) for 2012. Applying that to the book value of assets (and hence approximating the market value of assets by the reported book value), a fair return to TVA's investors debt and equity holders collectively would be (0.0393)(47,334 million) = $1.860 billion. TVA reports a borrowing cost of 5.08% on debt of 25,078, for a total capital cost of $1.273 billion. The difference between the fair return to all investors and the borrowing costs is the unreported capital cost: $587 million in 2012. Table 5 shows the result of that calculation for the years 2008 to 2012. Over that period, the understatement of capital costs totalled about $3 billion.

The understatement of capital costs in TVA's financial statements has been mitigated in recent years by the interaction of two factors: the long average maturity of about 17 years for TVA debt; and interest rates on average have declined over the last two decades. To abstract from those effects, Table 5 also shows what the understatement of capital costs would have been had TVA borrowed anew each year at the prevailing AAA bond rate.24 Under that counterfactual, the understatement of capital costs over the 2008 to 2012 period would have been $4.38 billion.

The understatement of capital costs is under current accounting conventions invisible to TVA's managers and to policymakers. TVA is accounted for by US budgetary

<table>
<thead>
<tr>
<th>Table 5. Unrecognized capital cost subsidies to TVA</th>
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<tbody>
<tr>
<td>-------</td>
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<tr>
<td>Interest expenses</td>
</tr>
<tr>
<td>Book assets</td>
</tr>
<tr>
<td>Total debt</td>
</tr>
<tr>
<td>Borrowing cost</td>
</tr>
<tr>
<td>Risk free rate (3 month t-bill)</td>
</tr>
<tr>
<td>20-year constant maturity</td>
</tr>
<tr>
<td>Treasury +50bps</td>
</tr>
<tr>
<td>Market risk premium</td>
</tr>
<tr>
<td>Asset beta</td>
</tr>
<tr>
<td>Required return on assets</td>
</tr>
<tr>
<td>Unrecognized capital subsidy at historical interest rates</td>
</tr>
<tr>
<td>Unrecognized capital subsidy at current interest rates</td>
</tr>
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Note: All dollar amounts are in millions.

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24 The AAA bond rate is based on the 20-year constant maturity Treasury rate plus 50 basis points.
agencies on a cash basis, which does not discriminate between revenues, expenses and capital expenditures, and which excludes capital charges except to the extent that interest payments reduce revenues. Specifically, the effect of TVA on the reported surplus is the difference between revenues (e.g., from electricity sales), and operating expenses plus capital expenditures. Statements in TVA’s 2013 Budget Proposal support the contention that TVA’s management does not perceive the implicit guarantee on TVA’s debt as a cost. It states that: ‘TVA has not received federal government appropriations since 1999. Additionally, TVA makes annual returns to the U.S. Treasury on the government’s original $1.4 billion appropriated investments in the power program. Through fiscal year FY 2014, TVA expects to have paid approximately $3.7 billion, principal and interest, to the U.S. Treasury.’

The understatement of TVA’s cost of capital in its accounting statements and the omission of a capital charge to recognize the cost of the risk to taxpayers in the federal budget almost certainly has real effects on regional electrical consumption and on TVA’s investment policies. Under the TVA Act of 1933, the company is required to deliver a reliable supply of power (and a variety of other public services such as flood control) at the lowest possible rates to consumers. Because rates are set with the goal of recovering costs, the definition of costs affects electrical rates and hence the demand for electricity. The subsidized borrowing rate in itself reduces perceived costs and hence utility rates, which increases demand relative to its unsubsidized level. To the extent that different power generating technologies embody different amounts of market risk, the focus on its borrowing rate as its cost of capital distorts choices between alternative types of generating capacity.

4.3. European Financial Stability Facility and European Stability Mechanism

The EFSF was created in May 2010 in response to the eurozone crisis. It was structured as a temporary rescue mechanism with the mandate of safeguarding financial stability in Europe by providing financial assistance to eurozone Member States. In October 2010, EFSF participants decided to create a permanent rescue mechanism, the ESM. The ESM has the same membership, mission and structure as the EFSF. Going forward, any new assistance will be funded and managed by the ESM. However, the EFSF will continue to administer and fund ongoing programmes for Greece, Portugal and Ireland. For the purposes of this analysis, they are effectively a consolidated enterprise (and referred to as EFSF/ESM).

The EFSF/ESM has authority to issue bonds or other debt instruments on the capital markets. Member capital and callable capital allow it to maintain a high credit rating (currently AA+) and hence to borrow at favourable interest rates.25 Paid-in

25 The bonds are also eligible for purchase by the ECB.
capital is invested in low-risk and liquid securities to serve as a buffer for losses. New debt is issued to make loans to member countries experiencing or threatened by severe financing problems and agreeing to the conditions set. The funds may also be used to purchase bonds in the primary or secondary bond markets, to fund precautionary assistance in the form of a credit line, and to finance recapitalizations of financial institutions through loans to governments.

Financial information on the EFSF/ESM is available from the ESM’s 2012 Annual Report and the websites of both organizations. To date, the bulk of assistance has gone to Greece, Portugal and Ireland. For those countries, Table 6 summarizes the disbursed amounts (which total €168 billion) and remaining amounts authorized (which total €18.9 billion) as of July 2013. The ESM has also provided financial assistance to Spain for the recapitalization of its financial sector, and is providing funding to Cyprus.

A measure of the maximum prospective exposure of ESM members under current agreements is remaining subscribed capital available to be called, which stands at €620 billion. (However, the rules allow for increasing that amount if certain conditions are met. To date, €80 billion has been paid in. The largest top five subscriptions account for 83% of the total in each category.

The prospective fair-value cost to EFSF/ESM members is measured here as the present value of expected future capital calls over a horizon of 20 years, as was done for the EBRD earlier. The calculations employ a derivatives-pricing approach, implemented with a modified version of the EBRD model. However, estimating cost for the EFSF/ESM is more challenging, and there is more uncertainty associated with the estimates.

### Table 6. EFSF amounts disbursed and available

<table>
<thead>
<tr>
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<th>Already disbursed</th>
<th>Remaining amount available</th>
<th>Max. total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>14.4</td>
<td>3.3</td>
<td>17.7</td>
</tr>
<tr>
<td>Portugal</td>
<td>21.1</td>
<td>4.9</td>
<td>26</td>
</tr>
<tr>
<td>Greece</td>
<td>133.04</td>
<td>10.66</td>
<td>144.6*</td>
</tr>
</tbody>
</table>

*Includes €0.95 billion of a facility whose availability period has ended.

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26 It takes unanimous agreement among members for certain major changes including making capital calls. However, there is an emergency voting procedure that brings the required share-weighted approval rate down to 85% if the EC or ECB think there is an event that would threaten the economic and financial stability of the eurozone.

27 The largest subscribers are: Germany €190 billion; France €142 billion; Italy €125 billion, Spain €83 billion; and Netherlands €40 billion.

28 Related analyses (CBO, 2010; Veronesi and Zingales, 2010), examine the cost of facilities created by the US government to respond to the 2007 financial crisis.
Capital calls by the EFSF/ESM are likely to be less frequent but larger when they occur than for a development bank, because they are associated with particularly negative shocks to eurozone economies and financial markets. Hence, the growth rate of the ESM’s future assets and liabilities is likely to be highly variable, with long periods of no growth or shrinkage as existing loans are paid off, followed by a rapid balance sheet expansion in the course of a year or two if a major crisis were to develop. The amount of new assistance forthcoming not only depends on financial market developments, but also on policy decisions of the EFSF/ESM in terms of what countries to assist and in what amounts. In most years there will be little new activity because episodes of the sort the EFSF/ESM is designed to protect against are rare. Crises are likely to occur when the European and world economies are weak and the cost of capital is relatively high, and clearly the activities entail considerable undiversifiable risk, but the fair value cost of risk during a crisis is hard to determine. Furthermore, the EFSF/ESM’s loans outstanding are much less diversified than that of a typical development bank, and may experience discontinuous losses in value when borrowers experience new difficulties. Unlike for smaller government firms, general equilibrium effects of the ESM’s actions also must be taken into account, at least informally. Importantly, the presence of the ESM may reduce the likelihood of future financial distress relative to the past. To the extent possible, the effects of the policy on the probabilities of future events and losses should be reflected in the choice of model parameters.

Despite those complicating factors, it is informative to model the prospective cost of the programme and to consider the implied costs over a range of parameterizations. A relatively simple approach is taken here that is intended to illustrate the range of possible costs rather than produce a definitive estimate. The model could be expanded to incorporate more information about the size of exposures of individual members, differences in the probabilities of requiring assistance, and a more explicit correlation structure between them, but that is left to future research.

To adapt the EBRD model for the EFSF/ESM, stochastic jump processes are incorporated that govern the probability and severity of upward jumps in the size of its balance sheet, and that allow downward jumps to existing risky asset values. Incorporating jump processes is one way to incorporate the idea that the tails of the relevant distributions are fatter than those of normal distributions. In the base case, the jump process is set to trigger a crisis in about 6% of years. That frequency was chosen based on the observation that large international crises such as the Great Depression or Great Recession occur at a lower rate, but that for countries and regions serious financial problems have historically arisen more frequently. Consistent with EFSF/ESM’s policies, balance sheet growth caused by the jumps is modelled as being financed with additional debt issuance. Capital calls are triggered in the model

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29 In this analysis no risk premium is attributed to jump risk, which imparts a conservative bias to the cost estimates.
when the ratio of liabilities-to-equity rises above a threshold level. That ratio may rise either because of balance sheet growth financed with debt issues, or because of a drop in the value of existing assets. Capital infusions are invested in safe assets, and enough capital is called to restore the target liability-to-equity ratio. The model and its parameterization are described more fully in Appendix 2.

The cost of undiversifiable risk is incorporated in the pricing of the callable capital through the assumption about the risk premium on risky assets. The expected return on risky assets is set at 2.7% over the risk-free rate, and 2% over the EFSF/ESM’s borrowing rate (which is also assumed to be higher than the short-term risk-free rate, consistent with observed yields). EFSF/ESM purchases of distressed sovereign claims are likely to occur when those assets have been trading in the market at spreads in excess of the assumed risk premium. However, consistent with the idea that fair values exclude any distress or abnormal liquidity premium, and taking into account that observed spreads contain compensation for expected losses as well as a risk premium, the spread is chosen to be in line with bonds on the border between investment and non-investment grade.

Under the base case parameterization, the fair value cost to member governments of providing callable capital over 20 years is €36 billion. However, that estimate is quite sensitive to changes in the assumed parameter values. Table 7 reports the cost estimates for a variety of parameterizations, with each row showing the effects on cost of changing one parameter at a time. All other parameters are held at their base case values, which are listed in Appendix Table A2. Altering one parameter at a time highlights which assumptions the model is most and least sensitive to. The assumed frequency and severity of a crisis has the largest effect on predicted cost, whereas the estimates are relatively insensitive to the parameters driving portfolio risk during non-crisis periods. That is to be expected; the target amount of equity capital to risky loans already acquired is high and the risk of needing equity beyond what has already been paid in to absorb losses is low. However, new crises tend to trigger the need for large capital infusions.

The sensitivity analysis suggests that the cost of current callable capital commitments is likely to be in the range of €20–80 billion for a plausible range of parameter values, and depending most critically on the assessed probability and severity of future crises. Some might argue that the current imbalances and stresses in the eurozone system make the likelihood of a crisis over the next few years higher than the 6% annual rate assumed in the base case. Increasing the assumed frequency to a 9% rate doubles the estimated cost of the callable capital relative to the base case, and put it

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30 Combinations of parameter variations are also not considered because information is not available to inform assumptions about their joint distribution.

31 No probabilities are associated with different values in the reported range because of the difficulty of assessing the probability of crisis states, of alternative ESM policy reaction functions, and so forth. The range of parameter values considered was chosen to cover a plausible range for each component, taking into account factors such as the historical frequency of financial crises.
near the high end of the range considered.\textsuperscript{32} By contrast, in its financial statements (which consolidate the finances of the EFSF and the ESM), the ESM shows a modest loss of $498 million, none of which is related to prospective costs. The budgetary treatment of paid-in and callable capital by member countries has not been verified, but it is probable that callable capital is off-budget and hence effectively is treated as having no cost. Of course the benefits of having a safety net in place may far outweigh the estimated cost, but that can only be determined when information about cost is made available.

The reported cost estimates are based on an average over many Monte Carlo simulations. Figure 2 shows the distribution of cost estimates across 5,000 Monte Carlo simulations. The modal outcome is that the EFSF/ESM makes no capital calls over a 20-year period. However, there is a long right tail, and outcomes of over $100 billion are observed in about 2\% of runs.

The lack of recognition of the cost of capital by the EFSF/ESM has a direct effect on the pricing of assistance to member countries. The EFSF/ESM’s philosophy about cost recovery is prominently stated in its Annual Report: ‘The ESM does not aim to generate profit on financial support granted to beneficiary member states.’ In keeping with that policy, and with the standard practice of government institutions of treating taxpayer equity capital as costless, the ESM charges interest rates on the risky loans that it makes that effectively pass through its own borrowing costs plus a small spread to cover administrative expenses. A 200 bps penalty rate is imposed on delinquent loans. Adding to the opacity of costs, the EFSF/ESM’s financial reporting is much less revealing than that of a typical multilateral development bank. The EFSF/ESM did

\begin{footnotesize}
\begin{longtable}{lcccc}
\hline
\textbf{Annual crisis probability} & 0 & 0.03 & 0.06 & 0.09 \\
\hline
\textbf{Annual call probability} & 0.0\% & 1.5\% & 3.2\% & 5.0\% \\
\hline
\textbf{Risky asset multiplier in crisis} & 1.25$\times$ & 1.5$\times$ & 1.75$\times$ & 2$\times$ \\
\textbf{Annual call probability} & 0.9\% & 3.2\% & 4.6\% & 5.2\% \\
\textbf{Asset jump frequency, annual, no crisis} & 0 & 0.05 & 0.1 & 0.2 \\
\textbf{Annual call probability} & 38 & 38 & 39 & 39 \\
\textbf{Risky asset volatility (non-jump component), annual} & 0.05 & 0.1 & 0.15 & 0.2 \\
\textbf{Annual call probability} & 34 & 36 & 38 & 42 \\
\textbf{Trigger liabilities-to-equity (relative to target ratio)} & 1.05$\times$ & 1.1$\times$ & 1.2$\times$ & 1.3$\times$ \\
\textbf{Annual call probability} & 2.8\% & 3.0\% & 3.2\% & 3.7\% \\
\hline
\textbf{Note: Each row varies only the listed parameter from its base case value.} \\
\end{longtable}
\end{footnotesize}
not adopt IPSASB guidelines, and notably, it omits a fair value balance sheet from its financial statements.

5. IMPLEMENTATION CHALLENGES

Even if a switch by governments to fair value accounting for credit support is advantageous in principle, whether it would be an improvement over the status quo would depend in part on the quality of the implementation. Practical challenges include the need to establish rules for selecting methodologies for a variety of applications; the possibility that fair value estimates would be less transparent and more manipulable than ones based on simpler rules; and the costs of educating government analysts on how to prepare and communicate fair value estimates to policymakers and the public. Political resistance to disclosing higher budgetary costs is likely to be an obstacle as well, although a constituency for greater government transparency also exists. These issues are briefly discussed in this section and deserve more attention in future studies.

It appears that many practical concerns could be addressed by the adoption of the accounting standards and practices that have developed to guide and discipline the production of fair value estimates by private sector financial institutions. Because fair value calculations play such a prominent role in the private sector (in mandated financial disclosures as well as in transactional analyses), valuation and accounting consultancies have developed considerable expertise in the available methodologies and in model-building, and something of a consensus has emerged about the best practices for a variety of applications. That foundation could be drawn on by governments to provide discipline and consistency to fair value cost estimates, as a source of private contractors to assist in model building and auditing, and as a resource for educating government employees. Another mitigating factor is that most government credit support is provided through large and ongoing programmes. Once models and approaches are established and vetted for a given programme, the incremental costs of producing fair value estimates should be similar to that of preparing accrual estimates using government rates for discounting.

Figure 2. Distribution EFSF/ESM cost, 5000 trials of 20 years base case parameters, € millions
For guarantee programmes such as the EFSF/ESM that involve the insurance of tail risk, there will always be differences of opinion on modelling assumptions and little data to resolve them. Certainly that has been the experience with the stress-testing that has been mandated for systemically risky banks. Nevertheless, in such cases the modelling exercise provides important information that is absent for guarantees under current practice that only quantifies \textit{ex post} costs.

Manipulation is a legitimate worry, but arguably a switch to fair value accounting would make it easier to detect than under the status quo of discounting at government interest rates. Government entities release little or no information about the cash flow forecasts that underlie their reported accrual estimates, and those cash flow forecasts are at least as easily manipulated as the choice of discount rates. The plausibility of fair value cost estimates tends to be easier to assess when data is available on the pricing of similar private sector transactions (e.g., for mortgages). By contrast, meaningful comparisons based on market pricing data are not possible when governments use their own borrowing rates for discounting.

It is difficult to predict whether the political consensus that is needed to implement such accounting changes will emerge. Two observations suggest that it might: one is the adoption of IFRS standards (which have increasingly embraced fair value concepts) by the International Public Sector Accounting Standards Board. Another is the steps taken in that direction by the US, including the adoption of fair value estimates in the budgetary process for select programmes, and the passage of a bill in the House of Representatives that mandates fair value accounting for credit programmes. Research leading to greater awareness of the bias toward cost understatement and its consequences could also change perceptions among policymakers about the advisability of change.

5.1. Would fuller recognition of capital costs improve incentives for public managers?

Whether the benefits of implementing a switch to a fair value accounting regime would outweigh the costs depends among other things on whether it would result in better decision-making by public sector managers and policymakers. Some evidence that it could be beneficial in that regard is found in the experiences of private sector firms that have adopted a measure of ‘economic value added’ or EVA.

A switch to evaluating the profitability of government firms net of its weighted average cost of capital (rather than net of borrowing cost) would be akin to the practice in the private sector of using an EVA approach to evaluating managerial performance. EVA was popularized in the 1990s as a way to better align managers’ incentives for investment choices with stockholder interests. Rogerson (1997) demonstrates the theoretical potential for improvement; he shows that in a variety of settings with asymmetric information between principals and managers, incentive contrasts based on EVA can elicit first best behaviour by managers.
Evidence on the effects of EVA adoption by private sector firms suggests that decision-making in the public sector might be improved by a fuller recognition of the cost of capital. For example, Daske et al. (2013) find that the seriousness with which firms rely on EVA principles varies, but that serious adopters exhibit superior performance. The incentives facing public and private sector managers clearly would remain different, particularly because government pay is more weakly tied to performance than in private firms. Nevertheless, one would expect that if managers received more accurate signals from accounting data about firm profitability, project choices at least on the margin would be improved.

6. CONCLUSIONS AND AREAS FOR FURTHER RESEARCH

Accounting data – budgetary cost estimates and financial statement entries – comprise the price system facing policymakers. This paper makes the case for the importance of providing the most accurate available price signals about the costs of credit support, and for using fair value cost estimates to do so, particularly for budgeting purposes. A look at the accounting policies of OECD governments reveals the wide gap between that recommendation and current practice: for many types of credit support little or no cost information is provided, and reported costs are systematically and often significantly understated.

Analyses of the EFSF/ESM, EBRD and TVA illustrate the magnitude of the disparities between fair value estimates and the costs currently reported by governments. These examples also demonstrate the feasibility of developing fair value estimates even for relatively complex credit support arrangements. However, the analyses presented here are not intended to be the final word on the costs of any of these programmes, and it is possible that other approaches or assumptions could improve the estimates. What is important is that while there is significant uncertainty around any of the point estimates, in contrast to official figures, there is no reason to suspect a systematic upward or downward bias in the estimates. Furthermore, the exercise of model-building is useful in identifying costs and risks that might be otherwise overlooked. Although adoption of fair value accounting for credit support by governments would involve additional costs and challenges, the infrastructure developed to support fair value reporting by private sector firms could be used as a source of expertise and to provide discipline to the process of cost estimation.

The most striking results are for the EFSF/ESM, where the cost of the outstanding amount of subscribed callable capital to member countries is estimated to be in the range of €20–80 billion (depending on one’s assessment of the likelihood and severity of future crises), but for which no cost is reported by the EFSF/ESM or by member countries in their budgets. The cost of subscribed callable capital for the EBRD is similarly absent from government reports, but it is estimated here to be about €7 billion on a fair value basis. A calculation of EBRD’s capital costs on an annual basis shows a fair value financing cost that is about three times the cost of debt financing that
appears in the EBRD’s income statement. For TVA, the cost of capital for 2012, inclusive of the implicit government guarantee of its debt, is estimated to be $587 million more than the borrowing costs that appear in its income statement.

The analysis suggests several fruitful directions for future research. A foundational project would be to compile a comprehensive inventory of credit support for all OECD countries and international financial institutions, along with the rules governing their budgetary and accounting treatments. Relatedly, subnational government credit support activities and account procedures, for example credit extension by local governments, could be systematically investigated. Compiling that information in one place and on a consistent basis would shed light on the total amounts of credit support and the exposures of different governments. It would also lay the groundwork for other researchers and policy analysts to undertake more detailed analyses of the costs and risks of government credit support, including the development of new valuation models for the many large and complex contingent claims on governments.

Discussion

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Governments throughout the OECD use tax revenues to provide credit support to private companies and households as well as semi-public entities ranging from public enterprises to multinational organizations. Examples are direct lending programmes to support the development of new technologies, loan guarantees for low-income housing or for education, tax credits to attract businesses to a particular municipality, credit-related insurance programmes (such as bank deposit insurance for households or insurance against crop failures for farmers), and finally explicit or implicit guarantees of financial support for businesses deemed to be of strategic interest or simply too big to fail (such as automobile manufacturers or banks).

There are arguments for as well as against the use of government credit support programmes. On the positive side, such programmes may help overcome informational and contractionsal frictions in credit markets. This argument is particularly appealing in times of a financial crisis, when credit markets may freeze up without government intervention. Credit support programmes may also provide a much-needed economic stimulus to the economy. On the negative side, the concern is

33 A first step would be to define the scope of what constitutes credit support, for instance, whether or not to count the implicit guarantees that are widely expected to be honoured but that do not have legal standing. Challenges would include defining categories of credit that cut across the classifications used by different governments, and representing the size of the obligations in a way that is most comparable across types of support.
that government credit support programmes may crowd out private credit, may create price distortions, may encourage excessive risk taking by enterprises subject to government guarantees, and may result in excessive public borrowing.

The decision to enact a new credit support programme is usually preceded by an informal analysis of costs and benefits. Accurate cost estimates of credit-related government activities are a prerequisite for the efficient use of tax revenues, but often costs that are difficult to quantify are simply omitted from the analysis. The paper by Deborah Lucas illustrates that governments tend to systematically underestimate the cost of credit-related activities. This happens mainly for two reasons. First, governments rely on accounting standards rather than economic reasoning in assessing the profitability of new credit programmes, which tends to overstate the programmes’ profitability. Second, to the extent that governments consider future cash flows from credit programmes at all, they identify the cost of capital with their own cost of borrowing rather than the higher market rate of interest, ignoring the fact that risk taking requires an additional compensation.

This practice has three undesirable consequences. One concern is the over-reliance on credit guarantees at the expense of direct transfers. Whereas a direct transfer is likely to provoke political resistance, as it makes the magnitude of the transfer readily apparent, credit guarantees often are politically less controversial because their true cost only becomes apparent much later, as the first defaults set in, and these costs are not always understood by the public *ex ante*. The second concern is the misallocation of capital across different economic activities. As credit programmes channel capital to certain economic activities, more profitable activities end up underfunded. The third concern is that there will be too much investment in the aggregate now compared with the future, reducing the ability of the government to respond to future adverse shocks.

The solution proposed by Deborah Lucas is a market price approach, also referred to as a ‘fair value approach’. The motivation for the market price approach is threefold. First, according to finance theory, to a first approximation the cost of credit does not depend on how it is financed, allowing us to ignore the breakdown between equity and debt. Second, the risks inherent in the cash flows associated with government credit programmes are similar to those faced by private creditors. This line of reasoning suggests that we can use tools familiar from financial management in the private sector to compute market-based rates of return for government credit programmes. This involves reporting the net present value of the cash flow from and to the government resulting from each credit-related activity. These cash flows are uncertain, but their uncertainty can be captured by a probability distribution of outcomes. Future flows may be assessed by simulation. In computing the net present value, these flows must be discounted at a rate that reflects the true cost of borrowing including the price for the government assuming the credit risk. A credit programme is *ex ante* profitable if its net present value is positive.

It is useful to contrast this proposal with the status quo of government budgetary accounting. One common practice has been to treat some or all costs of credit programmes as off-budget, which means that they are not reported at all or simply set
to zero. It is obvious that this practice involves an understatement of the costs and will overstate a programme’s profitability.

Another common practice has been to report costs on a cash basis. This means that cash flows are reported in the years when they are realized. This approach overstates the cost of direct loans on impact because it ignores future repayments, while understating the cost of loan guarantees on impact because defaults typically only occur later.

A third approach has been to record costs on an accrual basis. This approach involves recording the lifetime cost of new credit support programmes in the year the commitment is made. Reports on an accrual basis have only been issued in the United States and only since 1996. This approach is similar to the net present value approach proposed by Deborah Lucas except that in practice governments tend to use a below-market rate of interest in discounting future cash flows, reflecting the government’s own low cost of borrowing. This practice ignores the fact that the tax paper must be thought of as the *de facto* equity holder in any government credit venture. Because taxpayers ultimately assume the credit risk incurred by the government, they require additional compensation for this risk that is not reflected in the government cost of borrowing. Hence, Deborah Lucas stresses that net present values ought to be computed based on market rates of interest instead.

The paper illustrates the market-based approach using three empirical examples in the OECD countries. One example is the European Bank of Reconstruction and Development (EBRD). As is the case for all multinational development banks, member countries purchase shares in the EBRD. They also agree to provide additional capital in the future in case the EBRD has trouble meeting its financial obligations. This callable capital effectively serves as collateral when the EBRD borrows in international capital markets for the purpose of investing in selected development projects in Europe. These projects are expected to yield a rate of return in excess of the EBRD’s own borrowing rate.

The second example is the Tennessee Valley Authority (TVA) in the United States. The TVA is a wholesale electricity supplier that runs coal, nuclear and hydro-electric power plants. It is a federal agency and issues its own debt with the implicit backing of the US government.

The third example is the European Financial Stability Facility (EFSF) and the European Stability Mechanism (ESM). The EFSF is structured as a temporary rescue fund for European Union (EU) countries facing financial difficulties. To date it has been used to fund Greece, Ireland and Portugal. The ESM is a more recent permanent rescue fund that has been used to support Spain and Cyprus so far. The paper views them as essentially one entity that is financed by European member governments. These funds may be invested in safe assets in capital markets to provide a cushion for losses and to provide loans to EU countries in need, to recapitalize banks, to provide capital lines, or to buy government debt from troubled EU economies.
The mechanics of the proposed market price approach are best explained in the context of one of these multinational rescue funds. Changes in the value of the risky assets held by the fund are modeled as a diffusion (or jump diffusion) process. The key observation is that adverse shocks to the value of risky assets may cause a call for fresh capital to restore the target liability/equity ratio of the fund. The cost of credit to the member countries is viewed as the present value of future capital infusions associated with calls for fresh capital. Starting with the current asset and liability holdings, future capital calls may be simulated up to a fixed horizon, resulting in a discounted present value of capital expenditures for each simulation run. The paper reports the average present value obtained by simulation as the cost of maintaining the fund and compares this number to the official government cost estimates.

The model has three main equations that are detailed in the Appendix of the paper. In short, the value of risky assets, $A_t$, grows at a stochastic rate. The value of the safe and liquid assets, $B_t$, purchased by the fund grows at a constant rate. So does the value of debt liabilities, $L_t$. The fund’s equity value is defined as $E_t = A_t + B_t - L_t$. A ratio of $L_t / E_t$ that exceeds the target for that ratio by 20% or more triggers a call for fresh capital in the amount required to restore the ratio to its target. In simulating the model, a number of design parameters must be chosen. In some cases, this may be done on the basis of historical data. In others, a grid of ad hoc values is considered.

Deborah Lucas documents that this market price approach yields much higher cost estimates than officially reported in all three empirical examples. For the EBRD the cost underestimate amounts to €7 billion; for the TVA it is $0.587 billion; and for the EFSF/ESM it is between €20 billion and €80 billion, depending on the choice of the simulation design parameters. One can quibble with some of the parameters choices in this analysis, but there is no doubt that costs have been substantially under-reported in all three examples. The author deserves credit for having quantified the costs of the EFSF/ESM in particular, which have not been studied to date. In fact, these costs have been ignored entirely in official budgetary accounts.

I would like to take this opportunity to discuss a number of modelling challenges and possible extensions of the proposed methodology. One obvious concern is the difficulty of parameterizing the simulation model. In several cases, the appropriate choice of the design parameter is not obvious. This raises the question of how we can tell a good calibration of the model parameters from a bad one. One important concern is that the methodology is open to manipulation by policymakers who may choose parameter values to overstate or understake the profitability of a given credit programme. It therefore seems important to develop ‘best practice’ guidelines for policymakers to prevent such abuse of this methodology.

A second concern relates to the choice of the parameters of the simulation model. The paper rightly recognizes that the cost estimates may be sensitive to letting these parameters vary within a reasonable range, but it explores this question only for one parameter at a time. A natural extension would be to allow all design parameters to vary. The results from this much more extensive simulation study could be succinctly
summarized by means of a response surface analysis, where non-linear regressions are fit to all net present value data points obtained in the simulation (e.g., Davidson and MacKinnon, 1993, chapter 21.7).

A third concern is that only expected costs are reported rather than the distribution of costs obtained by simulation. The paper recognizes the importance of accounting for uncertainty, at least conditional on the model structure. One way of handling this question would be by also reporting risk measures such as the weighted expected shortfall for the present value statistic. Such tools have been used in a variety of contexts including the problem of quantifying risks associated with inflation forecasts (e.g., Kilian and Manganelli, 2007). Their application in the present context would seem natural and straightforward. In fact, the present value exercise in this paper is in many ways reminiscent of the forecast scenarios constructed in Baumeister and Kilian (2012), the risks of which may be quantified using easy-to-interpret formal risk measures such as tail probabilities and tail conditional expectations.

A fourth concern relates to the arrival of new information after the net present value estimate of a new credit project has been reported, as proposed in this paper, in the government budget. A common situation is that, after a project has already been launched, the government discovers on the basis of new information that the project’s costs going forward will be substantially higher than originally expected. Would these additional expected costs be ignored or are there provisions for incorporating them in the government’s budget?

A final concern relates to the model structure itself. In the paper, the value of assets and liabilities evolves according to simple exogenous time series processes. This specification is tractable and indeed elegant, but what makes us think that this specification is realistic enough for the purpose at hand? It would seem desirable to embed the proposed methodology in future research within a larger macroeconomic model that allows for feedback between the economy and credit markets. This extension seems particularly important for the credit programmes associated with the recent financial crisis.

To conclude, this paper has important policy implications. For example, credit support programmes are at the heart of recent policies for dealing with the financial crisis and the Euro crisis. Even granting that one could refine the proposed methodology, the central idea of the paper appears sound. Deborah Lucas makes a convincing case that the cost of government credit programmes tends to be substantially underestimated. It is in the interest of the tax payer for these cost estimates to be improved and to be made public.

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There exist a myriad of rules and regulations in the accounting profession when it comes to reporting the fair value of assets and liabilities that will be realized in the future. At the same time economists use many models to quantify risk and uncertainty
about future events. A good example might be bank stress-testing or the subject of Deborah Lucas’s paper: the evaluation of the cost of government credit support for various policies. Given the importance of this topic, it is perhaps surprising that there is not more interdisciplinary work between accounting and economics that can help bridge the gap between the tools and conventions used by each profession. One way to think about this paper is as a way to reduce the gap between accountants and economists and recognize that more interaction is needed to better inform policy makers and the public about the true value of assets and liabilities, in this case stemming from government credit support.

I will motivate the importance of getting valuations right using a recent example from Cyprus. The three major commercial banks in Cyprus had, until March 2013, branches in Greece. As part of the negotiations between Cyprus and international lenders, it was agreed in the summer of 2012 that a three-year stress test to quantify the capital needs of the Cypriot banking system would be undertaken by PIMCO with June 2012 as the starting point. Greek banks had undergone the same stress test by Blackrock the year before. In March 2013 when the negotiations were concluded, and partly because the final solution involved the bail-in of uninsured depositors, the Cypriot bank branches in Greece were sold to the Bank of Piraeus. At the quarterly balance sheet announcement at the end of March 2013 the Bank of Piraeus reported a €3.5 billion ‘negative good will’ taking the book value of equity from negative €2.3 billion at end-December 2012 to positive €1.3 billion at end-March 2013. Policymakers labelled this as ‘accounting profit’. An alternative explanation is regulatory arbitrage that arises from differences in the valuation methodologies applied to stress-tests.

The Cyprus example illustrates the importance of both getting valuations right but also of having a consistent and uniform methodology to value assets. The paper by Deborah Lucas emphasizes the importance of this topic that might range from an asset-liability management perspective in public pensions (Lucas and Zeldes, 2009) or from bank recapitalization exercises (the Single Supervisory Mechanism at the level of the European Central Bank). For these and many other policy and business applications an essential need arises to have as correct as possible a method to compute the fair value of contingent liabilities.

It is perhaps important to start with the basic question policymakers are interested in: ‘What is the cost of capital for governments?’ Traditionally, the answer to this question tends to be ‘the borrowing rate on government debt’, an answer that still reflects conventional wisdom among policymakers. Is that the correct answer though? Deborah Lucas convincingly argues that the cost of capital for governments should reflect a risk premium for the macro risks the government undertakes with its expenditures and/or commitments. Essentially, there is no economic reason why the commitments of the public sector should be treated differently from those of the private sector. If the private sector recognizes the time value of money plus a risk premium when discounting uncertain pay-offs, then there is no reason for the
government not to behave in the same way. Taxpayers, as residual claimants to
government projects, are analogous to equity holders in a private corporation.

Current OECD practices, as described in the paper, illustrate that the quantitative
magnitude of this issue can be substantial. Many items in government budgets remain
off-budget and are only discovered when crisis hits. If government credit guarantees
do make it to the budgetary process, many times they are recorded on a cash basis,
making them also amenable to exploitation from short-horizon politicians (the
element of Greece in 2010 comes to mind) or delaying/distorting actual cost recogni-
tion. In accrual accounting approaches one needs a discount rate since the lifetime
cost of a commitment must be calculated. Accrual accounting thus does seem to domi-
nate cash accounting in providing a truer picture of the actual guarantee. Yet, despite
this advantage of accrual over cash accounting, the US seems to be an exception
rather than the rule in the OECD. Moreover, even in the US the government only
uses the ‘risk free’ discount rate, as proxied by US Treasury rates.

Once we agree that the current status quo needs to be improved, the harder ques-
tion arises: ‘Which path to take?’ Deborah Lucas proposes an approach based on the
market mechanism, therefore coining this as a ‘fair value approach’. One can think of
the market-based approach as intended to provide the discipline to public bodies that
the stock market provides for publicly traded firms. The paper illustrates the market-
based approach using three empirical examples from OECD countries. The examples
share similar characteristics. They tend to come from valuations or guarantees ema-
nating from organizations with a top credit rating, where there is an implicit or expli-
cit guarantee in place which means that capital calls might be made if necessary, and
the devil of valuation is in the details. An option model is constructed to value the gov-
ernment commitments in these different examples that involve the EBRD (European
Bank for Reconstruction and Development), the TVA (Tennessee Valley Authority)
and the EFSF (European Financial Stability Facility). The approach illustrates how
the results differ substantially from what is currently being reported and also shows
that different assumptions yield quantitatively different conclusions.

I find the proposal convincing and the calculations instructive about the actual cost
of government guarantees. Nevertheless, a number of questions arise that need to be
addressed to convince both the accounting and economics profession to adopt this
approach. In the case of the Cyprus example outlined above, for instance, regulatory
arbitrage arose from adopting different methodologies in stress-test scenarios. The
natural question arises as to how the methodology can become operational if it varies
on a case-by-case basis. One answer might be to develop a unifying theory that can
provide guidance on different valuations. Nevertheless, it might be difficult to guaran-
tee unanimity among professional economists on the methodology in valuing all
possible guarantees a government or an international organization may issue. Or, less
stringent, unanimity on all the quantitative assumptions that necessarily will be inputs
in any contingent asset/liability model.
I view the uncertainty surrounding valuation methods, or inputs in different quantitative models, not just a problem about valuation. Perhaps more importantly, sceptics might wonder how these valuation methods can be used if they generate different numbers. In that case, how can the accounting profession be convinced to change long-established practices that seem to be based on the principle of ‘uniform rules over discretion?’

I will use an example that is a bit extreme but serves to illustrate the type of uncertainty that might arise in computing a fair value for a specific guarantee and how this may be used to block adopting this approach for official use. A US federal guarantee of a state programme might be valued differently from a similar guarantee issued by a eurozone country. A US guarantee might be less costly given the independent/autonomous monetary policy that might impose fewer constraints on the government than in a currency union like the eurozone. Granted this is an extreme example, but it illustrates the difficulty in reaching an objective agreement between economists, and then, even more difficult, convincing the accounting profession to follow.

Admittedly the previous example is extreme but one may imagine that in most practical examples of interest, valuations might differ on a case-by-case basis because a unifying theory across all possible cases cannot be developed. In that instance, what should the advice be to governments or regulatory bodies? If a plethora of models exist, how could one convince a sceptic that something completely simple, with no assumptions, despite its obvious weaknesses can be dominated by something more complex? Here, the speech by Andrew Haldane (2012) becomes policy-relevant. Complexity also imposes costs, and these costs need to be recognized before complicating existing rules.

On the other hand, the fact that the world is complex, and is subject to different interpretations, does not mean that regulators and policymakers should continue following practices that are agreed to be lacking in the eyes of professional economists. What is needed, however, is further guidance on codifying an approach going forward that can have wider applicability. Without a unified approach, uncertainty valuation is amenable to political exploitation, especially in countries with weaker political institutions. At the same time, without a unified approach, it seems hard to be able to convince the accounting profession to adopt these rules.

Further work is therefore needed to determine exactly how this uncertainty can be codified in as simple a way as possible. One possibility might be to have a new type of professional certification that combines both an economics and an accounting background. An econo-accountant might be a new breed that can provide an independent valuation that unifies the established interdisciplinary views of the economics and accounting profession. Less drastic, perhaps the approach followed with inflation forecasting ‘fan charts’ provided quarterly by inflation-targeting central banks, could be an alternative way of depicting the uncertainty surrounding valuation. There will probably be less disagreement in depicting this uncertainty like
that and this might be an intermediate step that can be taken to convince sceptics to change current norms.

To conclude, I recognize that this is a more complex world and the Haldane critique might hold, but the complexity cost must be traded off against continuing to follow a wrong (and in the long run costly for the taxpayer) approach. More research in this important topic is therefore important, both from the operational point of view, but also, relatedly, from the point of view of convincing both accountants and policymakers in thinking of different ways of implementing such approaches. Deborah Lucas shows how the approach can be implemented, and I suspect further research in this direction can prove influential in how policymakers make decisions in this new world. At a minimum, policymakers should begin valuing government commitments with different models, even before explicit regulation is imposed, to have a better understanding of the costs that might lie ahead.

Panel discussion

Jeromin Zettelmeyer first requested the author to report actual returns in addition to required returns on assets for the TVA and EBRD. Second, he noted that one way to evaluate the cost of callable capital is to empirically look at episodes in which multinational banks have made these calls. However, he explained that these episodes are virtually non-existent, partly because the multinational can directly ask for a capital increase without officially exercising the former option. Zettelmeyer recommended using the incidence of such requested capital increases as a proxy for the callability of capital (given sufficient equivalence between actual and necessary environments). He noted that these cases could in turn be compared to the results of the author’s simulation-based exercise. Andrew Ellul asked how one would calculate the cost of borrowing/capital during non-normal times such as the TARP period in the US. He wondered whether the author’s Monte Carlo simulation is in any way capturing such discrete jumps. Finally, Hans-Werner Sinn advised Lucas to link the study to the earlier traditional cost-benefit analysis literature.

Deborah Lucas clarified that fair value accounting practices have already been imposed in the private sector. She noted that obtaining fair value estimates for the various parts of TARP has not been a problem in practice, with many bodies having independently reached similar figures. She argued that, at zero, the costs of the risks are currently being systematically understated and that at least her paper provides tangible estimates which can be evaluated. Lucas also informed the panel that the paper is indeed based on the idea of opportunity cost. On a final note, Lucas mentioned that she refers to the historical literature on government valuation in a separate paper.
APPENDIX 1 MODELLING THE COST OF CALLABLE CAPITAL FOR THE EBRD

The cost of callable capital for the EBRD is estimating using a derivatives pricing model, implemented using Monte Carlo simulation. This appendix describes the logic and main equations behind the model, and lists the base case parameters. The code, which is in VBA, is available upon request.

A risk-neutral version of the model is used for valuation, and a corresponding set of equations with actual expected returns and therefore actual probabilities is used to calculate the physical probability of a capital call. (Only the equations for the risk-neutral representation are shown here.) The EBRD’s assets are divided into safe and risky ones. The time evolution of the risky assets follows a log-normal process:

\[ A_{t+h} = A_t \exp \left[ (r_f - \delta A_t^2)h + \sigma_A \epsilon \sqrt{h} \right] \]  \hspace{1cm} (A1)

where \( h \) is the time step, which is set to one month, \( t \) subscripts represent time, \( r_f \) is the risk-free rate, \( \sigma_A \) is the volatility of risky assets, and \( \epsilon \) is a draw from a standard normal distribution. The volatility parameter is subscripted by time because the model accommodates time-varying volatility.\(^{34}\) The corresponding actual evolution of risky assets follows the same process, but with their expected return (as described earlier) in place of \( r_f \).

The risk-neutral evolution of the safe assets held for liquidity is deterministic:

\[ B_{t+h} = B_t \exp \left[ r_f h \right] \]  \hspace{1cm} (A2)

The corresponding actual process is also deterministic but assumes a 50 bps higher return on the assets. The existence of a positive spread on assets that are treated as being risk-free can be interpreted as a liquidity premium; it is included in order to make the assumed rates of return on the bank’s liquid asset portfolio more realistic. Notice that no dividends are paid to equity holders; returns on assets are assumed to be reinvested in the bank, as appears to be historical practice. Therefore in the model, actual bank assets grow on average over time at the expected rate of return on investments. An assumption of faster or slower growth would affect the cost estimates.

To capture the rebalancing between risky and liquid asset that occurs over time as loans mature or liquid securities are sold and replaced by new investments, the model incorporates a periodic partial adjustment towards the target asset mix. The adjustment rate is assumed to be asymmetric, with desired increases in risky asset holdings occurring more rapidly than desired decreases in risky asset holdings. As for callable capital, adjustments occur quarterly. Upward adjustments of the risky asset-to-equity ratio move 50% of the way to the target for that ratio over the course of a year,

\[^{34}\text{Volatility is assumed to be constant in the reported results. However, Lucas and McDonald (2006) show that if managers substitute towards riskier assets when equity is low, the estimated cost of a government guarantee may be significantly higher than under the assumption of constant volatility.}\]
whereas downward adjustments move only 3% to the target. The target ratio is close to the actual ratios reported for 2011 and 2012. The adjustment rates are chosen to capture the idea that it is fairly easy to sell liquid assets and reinvest them in riskier ones, but there may not be enough desirable risky projects available to immediately restore the target asset mix. The rate of downward adjustment is assumed to be much slower because of the difficulty of liquidating risky and opaque bank loans. Allowing for adjustment to the asset mix maintains a more stable and realistic ratio of risky assets-to-equity than if no adjustments were allowed. A faster speed of downward adjustment would lower the estimated cost of callable capital, whereas a faster speed of upward adjustment would increase the cost. However, the cost estimates are similar to what is reported in the base case for modest changes to the assumed adjustment speeds.

Debt liabilities, $L_t$, are assumed to increase deterministically at a rate equal to the interest rate paid on them (with the same 50 bps difference between the risk-neutral and actual processes as for liquid assets):

$$L_{t+h} = L_t \exp[r_f h]$$

(A3)

Because the rate paid on the debt is the same as the rate earned on liquid assets held, an increase in liquid asset holdings has an equivalent effect on cost as an equal-value decrease in debt. The specification implies that interest paid out is financed by additional debt issues, so that debt outstanding grows over time. Equity is then calculated as the difference between assets and liabilities:

$$E_t = A_t + B_t - L_t$$

(A4)

Capital is called when the ratio of liabilities-to-equity, $L_t/E_t$, exceeds the trigger, which is based on interpreting the statutory requirement that equity be maintained at a level of at least 50% of (book) banking assets as corresponding most closely in the

Table A1. Parameters for EBRD callable capital model

<table>
<thead>
<tr>
<th>Name</th>
<th>Base case value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Monte Carlo runs</td>
<td>10,000</td>
</tr>
<tr>
<td>Time horizon</td>
<td>20 years</td>
</tr>
<tr>
<td>Risk-free rate, $r_f$ (annual)</td>
<td>0.003</td>
</tr>
<tr>
<td>Return on liquid assets and liabilities, $r_B$ (annual)</td>
<td>0.0078</td>
</tr>
<tr>
<td>Expected return on risky assets, $E(r_A)$ (annual)</td>
<td>0.0198</td>
</tr>
<tr>
<td>Initial liquid assets, $B_0$ (€ millions)</td>
<td>26,528</td>
</tr>
<tr>
<td>Initial risky assets, $A_0$ (€ millions)</td>
<td>25,487</td>
</tr>
<tr>
<td>Initial liabilities, $L_0$ (€ millions)</td>
<td>37,106</td>
</tr>
<tr>
<td>Volatility risky assets, $\sigma_A$</td>
<td>0.15</td>
</tr>
<tr>
<td>Liability-to-equity target</td>
<td>2.91/1</td>
</tr>
<tr>
<td>Liability-to-equity trigger</td>
<td>2.24/1</td>
</tr>
<tr>
<td>Target risky asset-to-equity ratio for rebalancing asset mix</td>
<td>1/0.65</td>
</tr>
<tr>
<td>Adjustment rate of $A_t/E_t$ to target when $A_t/E_t &gt;$ target</td>
<td>0.03</td>
</tr>
<tr>
<td>Adjustment rate of $A_t/E_t$ to target when $A_t/E_t &lt;$ target</td>
<td>0.5</td>
</tr>
</tbody>
</table>
model to a relation between liabilities and equity. The condition for whether the trigger is tripped is checked quarterly, reflecting that monitoring and the production of new information about asset values is fairly infrequent. When capital is called, it is in an amount that restores the target liability-to-equity ratio. The new capital is assumed to be initially invested entirely in risk-free liquid assets.

The logic of the Monte Carlo simulation is as follows: at the beginning of each Monte Carlo run, variables are initialized to the values of risky and riskless assets and liabilities in 2012. Each month going forward over a 20-year period, a draw of a standard normal random variable, scaled by $\sigma_{A,t}$, determines the evolution of risky assets according to Equation A1. Safe assets, liabilities and equity evolve according to A2, A3 and A4 respectively. Every quarter, $L_t/E_t$ is compared to the trigger value for a capital call. If the trigger is tripped, equity is called in an amount that restores $L_t/E_t$ to its target ratio. Also every quarter, the ratio $A_t/E_t$ is compared to its target value, and the mix of risky and risk-free assets are adjusted towards the target for that ratio according to the adjustment rule described above. Along each Monte Carlo path, the amount and timing of each capital call is recorded, and the payments are discounted to time 0 using the risk-free rate in the risk-neutral representation of the model. The reported fair value cost of the guarantee is the average cost over the 10,000 Monte Carlo runs. The physical call probabilities are based on the results of applying the same shocks to the evolution of actual risky assets and averaging over the Monte Carlo runs. Table A1 lists the main parameter values used in the base case calculations.

**APPENDIX 2 MODELLING THE COST OF CALLABLE CAPITAL FOR THE EFSF/ESM**

Estimates of the cost of callable capital are derived using a variant of the model for the EBRD. Apart from a recalibration and rule changes that reflect policy differences, the main technical change is the incorporation of two jump processes. The first process represents the occurrence of a crisis (i.e., an event that triggers the purchase of additional assets) in the eurozone, and the second allows for a discrete downward jump in the value of existing balance sheet loans. The probability of a downward jump in the value of existing assets is assumed to increase during a crisis. Those jumps effectively create a fatter lower tail for asset values than if they were normally distributed. The occurrence of a crisis causes the purchase of additional risky assets, and an equal increase in debt liabilities. Existing loans amortize over time, but there is no rebalancing between risky and risk-free assets.

Under a risk-neutral representation in discrete time, risky assets (generally taking the form of risky sovereign debt) on balance sheet evolve according to:

$$A_{t+h} = (1 + I_{f,t} \omega_t) A_t \exp \left[ \left( r_f - \rho A_t - 0.5 \sigma_{A,t}^2 \right) h + \sigma_{A,t} \epsilon \sqrt{h} \right] - A_t \varphi + I_{C,t} \Delta A_t \quad (A5)$$
where $h$ is the time step (taken to be one month in the simulations), $t$ subscripts represent time, $r_f$ is the risk-free rate, $\sigma_{A,t}$ is the possibly time-dependent normally distributed component of the volatility of asset value, $\epsilon$ is a draw from a standard normal distribution, $\omega$ is the non-stochastic jump size, $I_{J,t}$ is an indicator that a jump in existing assets has occurred (the probability of which jumps up during a crisis), $p_{Jh}$ is the probability of a jump over an interval of length $h$, $x$ is the constant fraction of balance sheet assets repaid each period, $IC,t$ is an indicator that a crisis occurs, and $D$ is the increase in risky assets during a crisis, based on the amount currently on ESM’s balance sheet inflated at a 2% annual growth rate. The actual evolution of risky assets is identical except that $r_f$ is replaced by the expected return on assets $r_A$.

New equity from capital calls is invested in liquid assets. The risk-neutral evolution of liquid assets is:

$$B_{t+h} = B_t \exp[r Dh]$$  \hspace{1cm} (A6)

The rate earned, $r_{D}$, is the same rate paid by ESFS/ESM on their debt. Notice that no dividends are paid to equity holders; asset returns are assumed to be reinvested in the bank. Debt liabilities, $L$, increase deterministically at a rate equal to the interest rate paid on them, and decline by the amounts repaid each period as risky assets are retired. They also increase by the amount of new assets purchased during a crisis:

$$L_{t+h} = L_t \exp[r Dh] - A_t x + IC,t \Delta A_t$$  \hspace{1cm} (A7)

Equity is then calculated as the difference between assets and liabilities:

$$E_t = A_t + B_t - L_t$$  \hspace{1cm} (A8)

Table A2. Parameters for EFSF/ESM callable capital model

<table>
<thead>
<tr>
<th>Name</th>
<th>Base case value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Monte Carlo runs</td>
<td>20,000</td>
</tr>
<tr>
<td>Time horizon</td>
<td>20 years</td>
</tr>
<tr>
<td>Risk-free rate, $r_f$ (annual)</td>
<td>0.003</td>
</tr>
<tr>
<td>Return on ESM debt and liquid assets, $r_B$ (annual)</td>
<td>0.01</td>
</tr>
<tr>
<td>Fair value expected return on risky assets (annual)</td>
<td>0.03</td>
</tr>
<tr>
<td>Initial liquid assets, $B_0$ (€ millions)</td>
<td>80,000</td>
</tr>
<tr>
<td>Initial risky assets, $A_0$ (€ millions)</td>
<td>39,461</td>
</tr>
<tr>
<td>Initial liabilities, $L_0$ (€ millions)</td>
<td>39,461</td>
</tr>
<tr>
<td>Annual rate of asset repayment, $x$</td>
<td>0.027</td>
</tr>
<tr>
<td>Volatility risky assets, $\sigma_{A,t}$ non-jump component</td>
<td>0.15</td>
</tr>
<tr>
<td>Probability crisis</td>
<td>0.06</td>
</tr>
<tr>
<td>Risky asset multiplier if crisis, $\Delta$</td>
<td>$1.5 \times$</td>
</tr>
<tr>
<td>Probability jump down in risky assets, $p_{J_t}$, non-crisis, annual</td>
<td>10%</td>
</tr>
<tr>
<td>Probability jump down in risky assets, $p_{J_t}$, crisis, annual</td>
<td>25%</td>
</tr>
<tr>
<td>Jump size as a percentage of risky assets in crisis, $\omega$</td>
<td>$-20%$</td>
</tr>
<tr>
<td>Liability-to-equity target</td>
<td>$39,461/80$</td>
</tr>
<tr>
<td>Liability-to-equity trigger</td>
<td>$1.2 \times$ target</td>
</tr>
</tbody>
</table>

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Capital is called when the ratio of liabilities-to-equity, $L_t/E_t$, exceeds the trigger, which is assumed in the base case to be 20% higher than the target for this ratio. The target is taken to be the current ratio of liabilities to equity. The condition for whether the trigger is tripped is checked quarterly. When capital is called, it is in an amount that restores the target liability-to-equity ratio. The new capital is assumed to be initially invested entirely in liquid assets.

The logic of the Monte Carlo simulation is as follows: at the beginning of each Monte Carlo run, variables are initialized to the values of risky and riskless assets and liabilities. Each month going forward over a 20-year period, a draw of a standard normal random variable, scaled by $\sigma_A$, determines the normal component of the evolution of risky assets according to Equation A5. Two draws from a uniform distribution each month determine whether there is a crisis and an increase in risky asset holdings, and whether there is a jump down in the value of existing risky assets. Safe assets, liabilities and equity evolve according to A6, A7, and A8 respectively. Every quarter, $L_t/E_t$ is compared to the trigger value for a capital call. If the trigger is tripped, equity is called in an amount that restores $L_t/E_t$ to its target ratio. Along each Monte Carlo path, the amount and timing of each capital call is recorded, and the payments are discounted to time 0 using the risk-free rate in the risk-neutral representation of the model. The reported fair value cost of the guarantee is the average cost over the 20,000 Monte Carlo runs. The physical call probabilities are based on the results of applying the same shocks to the evolution of actual risky assets and averaging over the Monte Carlo runs. Table A2 lists the main parameter values used in the base case calculations.

REFERENCES

— — 2012a. ‘Credit policy as fiscal policy’, MIT manuscript.