

Central Bank Financial Strength, Transparency, and Policy Credibility

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Although rarely acknowledged explicitly, the financial strength of an independent and credible central bank must be commensurate with its policy tasks and the risks it faces. This paper explores the relationship between central bank financial strength and policy outcomes, stressing the importance of financial independence as a fundamental support to policy credibility. The attributes of an adequate central bank capital policy are discussed and implications drawn for the appropriate way in which central banks ought to be recapitalized. Reasons why this issue has not been clearly analyzed in the past—primarily owing to idiosyncratic and obscure central bank accounting—are also presented. [JEL E42, E58, E61]

We found no widely accepted, analytically based criteria to show whether a central bank needs capital as a cushion against losses or how the level of such an account should be determined.¹

I am aware that there are those who do not fully understand, from an economic perspective, why the central bank should be concerned about the soundness of its capital base.²

The credibility of economic policies has been an important focal point of analysis for many years, with the substance of the discourse enriched by the advent of the “rational expectations revolution” and associated modeling advances. Credibility is

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¹United States General Accounting Office (2002).

²From a speech by Mr. Toshihiko Fukui, Governor of the Bank of Japan, at the Spring Meeting of the Japan Society of Monetary Economics, Tokyo, June 1, 2003.

essential in influencing expectations and thus is of vital importance to policymakers, be they a central bank attempting to induce a fall in the inflation premium reflected in long-term bond yields, or a government seeking to encourage new investment by proposing to lower future taxes.

In analyzing policy credibility, writers have emphasized three factors—objective functions, institutional arrangements, and the economic feasibility or sustainability of the policy regime. The utility of *fiscal rules* or other institutional arrangements to constrain governments and thereby influence expectations has been extensively debated, as has the need for the associated fiscal policy to be consistent with public debt sustainability. That is, both considerations internal to the development of fiscal policy as well as its consistency with fiscal solvency have been thoroughly discussed. In contrast, while the advantages of rules and/or particular objective functions for central banks have been extensively debated—as has the importance of institutional independence for their credibility—comparatively little has been said about the implications of central bank policy for central bank financial sustainability.³ While it is common to discuss the ability of a sovereign government to maintain its current constellation of expenditure and revenue policies while meeting its debt-service obligations, the *financial ability* of a fiat money central bank to carry out its policy obligations has until recently virtually never been questioned.⁴ Why is this the case?

There is both a historical and a theoretical reason why central bank financial strength is a comparatively neglected issue. The historical reason relates to the fact that many fiat money central banks, including those of the Group of Seven (G-7) prior to the foundation of the European Central Bank (ECB), had been highly profitable for an extended period. The notion that they could find themselves in serious financial difficulties—for whatever reason—is a rather remote concept to most. The U.S. Federal Reserve System has made a profit every year since 1915 and, at times, a quite sizable one. For example, in 1990, Federal Reserve System profit exceeded income before taxes and extraordinary items for all U.S. banks combined.⁵

The theoretical argument behind neglecting the issue usually assumes a variation of the following syllogistic form:

1. *Commercial banks* require financial strength (capital) to absorb losses while meeting their financial obligations in full and on time and hence remain in operation.
2. *Central banks* have an unlimited costless ability to create the means to pay their financial obligations in full and on time in domestic fiat money.
3. *Central banks*, therefore, do not require financial strength (capital).

³The literature on the sustainability of exchange rate rules is a notable exception, although it has tended either to look narrowly at the foreign reserve component of the central bank balance sheet (as noted by Blejer and Schumacher, 1998) or more broadly at the fiscal position of the entire public sector. The latter approach was quite sensible in a world characterized by government determination of exchange rate policy, fiscal dominance, and central bank dependence. Increased central bank independence has led, *pari passu*, to growing interest in the stand alone status of central bank balance sheets.

⁴The European Union, in the process of creating the European Central Bank (ECB), raised the profile of this issue by clearly pointing to the importance of the “financial independence” of member central banks as a key element of ECB policy credibility. See also Sims (2003, p. 9).

⁵See Nelson and Owen (1997) for data on U.S. commercial banks.

The primary purpose of this paper is to argue why central bank financial strength *is* relevant for policy credibility. In so doing, proposition 2 of the above syllogism will be recast to emphasize the *policy* rather than *financial* cost of unlimited fiat money creation, and a conclusion opposite to that of proposition 3 will then be reached. That is:

2. Central banks cannot both attain a nominal policy objective and create an unlimited amount of fiat money.
3. Therefore, central banks require a degree of financial strength to credibly commit to a given nominal policy objective.

The method of the paper is to discuss both the historical/empirical and theoretical validity of the issue of central bank financial strength. First, various country vignettes illustrate cases where central bank finances had a decisive impact on policy outcomes or instrument choice, or at least were the object of controversy. Ize and Cargill, both in this issue of *Staff Papers*, provide more detailed discussions of certain cases. The paper then discusses a subsidiary reason (problems with transparent accounting) why central bank accounts have been comparatively ignored and then briefly examines various country approaches to the issues of central bank profit distribution and capital determination. The third section outlines the argument for a policy-dependent approach to assessing central bank financial strength. The fourth section highlights the connection between this approach and central bank financial independence and explains why a proper central bank recapitalization is much more valuable than a mere promise of general government support for central bank liabilities. That section uses a formal model to illustrate the point. The conclusion notes that central bank policy credibility is associated with financial independence and that such independence carries with it a contingent fiscal cost that should be properly recognized by society.

The view of central bank financial independence adopted here is similar to a financial market stop-loss rule. Central bank financial strength must be viewed in context—within a given policy framework—and assessed in a probabilistic forward-looking value at risk approach. The degree of credibility inherent in a given policy is associated with the probability of the set of states of the world where the central bank can efficiently attain its policy goals without outside financial assistance. Credibility cannot be completely present in states of the world where the central bank cannot withstand the financial consequences of adhering to its policy goals. To enhance credibility in such states, financial strength—and hence the bank's ability to absorb potential losses—must be increased. In determining the socially desirable level of financial strength, it is necessary first to assess the environment and its volatility given the policy regime and decide what degree of loss should require action on the part of the fiscal authorities; that is, at what point the stop-loss rule should go into effect, thereby triggering broader social consultations to determine whether the policy ought to be modified. Clearly, the more remote the possibility of such a scenario, the greater the credibility of the central bank (the wider the set of states of the world where it can achieve its objective) and the larger the potential loss the public sector might sustain in light of adherence to the agreed policy. This, in a real sense, is the price of central bank financial independence.

I. Central Bank Financial Strength as an Empirical Issue

Central bank financial strength can determine the success or failure of financial policy. A weak central bank will make losses, which, if they reach sufficient magnitude, will necessitate financing through current or future money creation, thereby undermining monetary and exchange rate policy. Among the most salient cases are Argentina, where central bank losses reached 23.5 percent of GDP in the second quarter of 1989,⁶ and the Bank of Jamaica, whose losses during fiscal years 1988/89 through 1991/92 averaged 53 percent of the respective beginning-period stock of reserve money. The need to finance such losses implied the abandonment of any conflicting policy objective. Less dramatic imbalances have interfered with the central bank's ability to achieve price stability or have led to changes in policy course when losses have become worrisome.⁷ Furthermore, a financially weak central bank may have difficulties serving as the government's fiscal agent⁸ or even lack the credibility to maintain an effective domestic payments system. In extreme cases, central banks have not had the resources to purchase new banknotes, and in one case the central bank was expelled from the national bank clearinghouse owing to a repeated failure to settle its obligations. More commonly, when the financial system observes signs of central bank financial collapse, financial disintermediation away from the formal payments system occurs. A past history of official financial repression tends to accelerate this process.

While the aforementioned are often suffered as chronic problems with institutions adapting to the situation, at times they are acute. In particular, banking crises elevate the importance of a central bank being able to credibly demonstrate its capacity to foster and maintain financial stability without resorting to financial repression. A lack of such credibility would delay the restructuring of distressed assets, deter strategic investors, and perpetuate high-risk premiums, thereby suppressing asset prices, fiscal revenue, and growth.

Even in cases where the central bank *is* strong, the market's belief that it may change policy course to avoid losses undermines policy credibility. In early 2002, for example, the market raised questions as to the likely duration of the Bank of Japan's willingness to use its *rinban* operations to influence the long end of the government bond yield curve, as an eventual rise in interest rates would subject it to losses that could exhaust its capital and reserves.⁹

Provided the losses do not exceed the sustainable level of seigniorage and provided that the central bank need not maintain price or exchange rate stability, such losses and a deterioration of the central bank's balance sheet can go on indefinitely. This issue has been particularly relevant as many central banks have directly or

⁶See World Bank (1993).

⁷See, for example, IMF (1995 and 1998).

⁸Several possible problems exist: the central bank may not have the foreign exchange assets to cover government external payments, a weak balance sheet may complicate intermediating government foreign borrowing, or the central bank may find itself in conflict with government regarding issuing debt if it itself has significant financing needs.

⁹JPMorgan, *Japan Markets Outlook and Strategy*, January 24, 2002. See also the discussion in Okina (1999) and Cargill (in this volume).

indirectly financed costly bank rescue operations. The resultant problems have led some to argue that the central bank's ability to undertake such operations should be restricted or transferred to the government—see Dornbusch (2001) and Jácóme (2001).¹⁰

Outright central bank losses are a relatively common phenomenon. Stella (2002) updates a table originally provided in Leone (1994) reviewing losses as a percentage of GDP in a sample of mostly Latin American countries. In some cases continuous losses have been realized over the course of more than two decades. In others, such as Peru and Bolivia, new central bank laws and central bank recapitalization in conjunction with economic reforms led to a sustained improvement in financial positions.

In Peru, following a recapitalization and a new central bank law in 1992 limiting the range of central bank activities, losses as a percentage of central bank liabilities to the private sector fell from close to 31 percent in 1991 to 2½ percent in 1994 as the central bank accounts came into virtual balance. Peru's financial sector exhibited strong growth in the liberalized environment, with broad money to GDP rising from 12 percent at the end of 1991 to 21½ percent in 1997. Bank supervision and the prudential framework were also strengthened. The central bank's operating balance turned positive in 1996 and has remained so in recent years at low, single-digit inflation rates.

In Uruguay, losses averaging 3 percent of GDP in the late 1980s were brought down to ½ percent of GDP by 1995 as the central bank transferred to the treasury outstanding external liabilities related to the mid-1980s purchase of loan portfolios from troubled commercial banks and gradually began to replace its own bills with treasury bills in the conduct of open market operations. By the end of 1993, the entire stock of central bank bills had been replaced and the cost of open market operations was being borne by the treasury.¹¹ Central bank losses reached a trough of 0.2 percent of GDP in 1999 before rising to 0.4 percent of GDP in 2003 in the wake of the recent financial crisis, which witnessed a dramatic decline in central bank net foreign assets.

In other cases, improving or stable institutions were dealt a severe blow by central bank intervention in banking crises, such as in Paraguay, where unprecedented losses amounting to almost 4 percent of GDP were sustained in 1995 and had not been totally eliminated five years later. Losses have recently begun to rise owing to the cost of sterilizing liquidity support provided to commercial banks. Concerns have also been raised at the central bank's repeated transfers to the fiscal budget despite incurring significant losses.¹²

¹⁰For further discussion of timing issues related to the fiscal impact of the central bank, see Stella (2002) and the references therein. Brazil has made significant progress on this issue by including the central bank in the definition of the central government for certain statistical measures. See IMF (2001d, paragraph 9).

¹¹See IMF (1996a). A similar process is also under way in Brazil. The Brazilian Law of Fiscal Responsibility required the central bank to cease issuing its own debt effective May 2002, at which time all monetary operations began using government securities.

¹²IMF (2003).

Central banks in Nicaragua and Venezuela also experienced large losses in response to banking crises, suggesting that the speed with which central banks can both spend and finance—through money creation—is an attractive quality during crisis periods, as is perhaps the ability to keep the cost of rescue operations nontransparent.¹³

In Nicaragua in 1995, following years of losses, the central bank suspended all financing of the state-owned banks and the government began to make significant debt-service payments on its central bank debt, with the result that the latter's operating position came into balance for the first time in a decade.¹⁴ However, the banking problems that emerged in 1998 led to a large provision of central bank paper to intervened commercial banks, thereby giving rise again to losses as well as to potential difficulties in rolling over the obligations. A partial response of the authorities had been to increase commercial bank reserve requirements, a tax on financial intermediation. The situation worsened as the cost of resolving four banks that failed during the year August 2000–August 2001 led the central bank to issue dollar-indexed bonds totaling 20 percent of GDP. Part of this debt has recently been restructured.¹⁵

In Venezuela, the cost of the major banking crisis in the middle of the 1990s was financed by the central bank and led to a sharp increase in losses. Losses in later years also resulted from the cost of sterilizing capital inflows and from attempts to counter the fiscal stance. In 1997, for example, the central bank aggressively issued its own obligations to sterilize capital inflows, but this impact was negated by a drawdown of treasury deposits at the bank owing to a loosening of the fiscal position. Following further sales of its own debt and an increase of reserve requirements by a total of 5 percentage points, monetary policy was eventually eased markedly in the last few months of the year owing to growing concerns about the quasi-fiscal losses arising from sterilization.¹⁶

Chile and Costa Rica are cases where central bank losses have persisted, impeding the central bank's ability to achieve low inflation in the latter but not the former. By the end of 2000, the Central Bank of Costa Rica had negative capital exceeding 6 percent of GDP.¹⁷ The central bank balance sheet has structural problems as evidenced by the fact that by the end of 2002, interest-bearing liabilities were almost double interest-bearing assets. The authorities took an important step forward in 2004 in their plan to recapitalize the central bank, which is estimated to require approximately 11 percent of GDP.¹⁸

In the case of Chile the issue of recapitalization has been discussed over the last few years with the general conclusion being that the losses have not had a material impact on central bank behavior.¹⁹ Nevertheless, the central bank has requested that the government initiate the formal procedure for a recapitalization.²⁰

¹³Only in 2001 did Mexico begin to publish an adjusted fiscal balance that seeks to incorporate the quasi-financial operations of the public financial institutions—most significantly, those associated with the banking crisis of the mid-1990s.

¹⁴See IMF (1996b).

¹⁵See IMF (2001b and 2004b).

¹⁶See IMF (1998).

¹⁷*Memoria Anual 2000*, Central Bank of Costa Rica (2001).

¹⁸See Central Bank of Costa Rica (2003), IMF (2004a), and Ize (in this volume).

Chile indeed would seem to be a significant outlier from the general rule that central bank financial weakness impacts the quality of policy. Chile consistently has had central bank losses close to 1 percent of GDP during the past decade. Yet this did not prevent an impressive inflation performance. Inflation fell from an annual rate of 26 percent in 1990 to single digits by the middle of the decade. The central bank successfully adopted an inflation-targeting strategy—inflation was less than 4 percent in 2000 despite central bank capital falling below zero in 1998 and remaining so throughout 2000, when it amounted to approximately –2 percent of GDP. The puzzle is not so much that accounting capital could have been negative but that the cash losses did not interfere with monetary policy as they have in many other cases.²¹

In understanding how negative capital, chronic losses, and outstanding inflation performance can be reconciled, it seems useful to term Chile a case of “benevolent fiscal dominance.” Fiscal dominance is conventionally thought of as a situation where loose fiscal policy requires the central bank to abandon a commitment to low inflation or a fixed exchange rate to generate seigniorage revenues or reduce the value of government debt.²² Benevolent fiscal dominance is a situation where tight fiscal policy contracts the monetary base or strengthens the exchange rate beyond the levels sought by the central bank in pursuit of price stability, thereby requiring an active policy of monetary injections, which in this case, is partially served by the liquidity expansion forthcoming from central bank losses. During the past decade and one half, Chile’s public sector fiscal accounts, including the cash losses of the central bank, have been approximately in balance with surpluses through 1996 and significant deficits recorded only since 1998. In the first half of the 1990s, the fiscal surpluses allowed not only the repayment of foreign debt but a reduction in the nonfinancial public sector’s net domestic borrowing that offset the net issuance of central bank debt. As a result, the central bank is the major issuer of public domestic debt (the nonfinancial public sector has virtually no domestic debt outstanding). Hence, it dominates the supply side of the market for public domestic securities and avoids any potential conflict with the government over the debt-service cost of raising interest rates. Furthermore, if one analyzes the bank’s balance sheet—ignoring the alarming negative net worth, one notes that net foreign reserves at end-2000 were almost five times the monetary base and 112 percent of the sum of the monetary base and central bank securities outstanding with residual maturity of one year or less. Thus, the bank has more than ample reserves to exchange for its maturing obligations, provided that the implications for the exchange rate are acceptable.²³ Chile also represents

¹⁹ See, for example, IMF (2000a, 2001a, and 2004c).

²⁰ *Memoria Anual 2000*, Central Bank of Chile (2001).

²¹ See Stella (1997).

²² See Sargent and Wallace (1981) and Ize (1987).

²³ The central bank suffers from a negative interest rate spread since it is forced to pay higher peso interest rates than it earns on its foreign assets. In 2000, however, owing to the depreciation of the peso, foreign exchange revaluation gains exceeded net losses from interest income. If one believes that economic agents are influenced by the accrued change in net worth rather than merely the cash losses, as suggested in Sargent and Wallace (1981) and Leone (1994), then there is even more reason to believe that the losses are not interfering with the credibility of monetary policy.

a case where a financially weak central bank makes losses not only owing to past quasi-fiscal operations but from the fiscal cost of monetary or exchange rate policies. A number of countries have suffered from the latter cost since the liberalization of capital flows in the past decade.

The Czech National Bank has used provisions to account for anticipated losses in connection with commercial bank rescue operations and for various items in connection with the transfer to government (at nominal cost) of claims resulting from the dissolution of the former State Bank of Czechoslovakia. The impact of accumulated losses on the fiscal accounts has been distributed over time through retained earnings. For example, despite a profit of CZK 2.5 billion (roughly US\$50 million) in 2000, the need to cover accumulated losses meant that no transfer to government was made. The remaining accumulated loss of CZK 15.9 billion is to be made up out of future profits.²⁴

A more spontaneous approach to handling bank resolution costs was evident in the Bank of Estonia's decision to support the rescue of the Land Bank of Estonia through an ". . . advance payment of future [profit] transfers, since the quick solution of the crisis was particularly important for maintaining financial stability. . . ." The Bank later recognized that ". . . it is clear that in case of one-off transfers of exceptional size such an approach [reflecting the profit transfer as a source of budget income comparable to the "usual" taxes] is unjustified and such income cannot be used to cover the deficit of the state budget."²⁵

G-7 central banks provide a very different picture. Despite discussions about whether to eliminate its surplus and reserves and congressional moves to require ad hoc transfers of surplus to the treasury, the consolidated accounts of the Federal Reserve System (each Reserve Bank maintains its own balance sheet) provide an example of a strong balance sheet with very low capital. Of its assets, 90 percent are holdings of U.S. Treasury securities and federal agency obligations, which are virtually free from default risk. The remainder is largely gold (valued at a constant accounting rate) and foreign assets.²⁶ On the liability side, Federal Reserve Notes outstanding amount to 91 percent of total liabilities (excluding capital and surplus). Reserves of depository institutions—which are noninterest bearing—account for a further 3 percent, implying that Federal Reserve liabilities generate virtually no cost. Profits during the past five years averaged US\$25.7 billion (selected years are shown in Table 1, below).

Canada is another example of a central bank with a very strong balance sheet yet minimal capital. The authorized capital of the Bank of Canada is Can\$5 million. The general reserve of the Bank was accumulated out of the Bank's net revenue until it reached the stipulated maximum of Can\$25 million in 1955. Out of total assets of Can\$47 billion, the Bank holds Can\$43 billion (92 percent) in securities

²⁴See Czech National Bank (2001).

²⁵Bank of Estonia (1999).

²⁶The Federal Reserve shows only part of the stock of U.S. international reserves on its balance sheet. Part is held on account of the Treasury Exchange Stabilization Fund.

**Table 1. United States: Consolidated Federal Reserve System
Selected Balance Sheet and Profit and Loss Accounts
(In billions of U.S. dollars)**

	Capital	Profit	Transfer to Treasury	Total Assets
1981	2.6	14.2	14.0	176.8
1986	3.7	18.0	17.8	267.4
1991	5.3	21.2	20.8	353.1
1996	9.1	21.0	20.1	481.5
2001	14.7	28.0	27.1	654.9
2004	23.5	21.4	18.1	810.9

Source: Board of Governors of the Federal Reserve System, *Annual Report*, various issues.

issued or guaranteed by Canada.²⁷ Of its liabilities, Can\$44 billion (95 percent) consist of notes in circulation. Under these circumstances, the Bank is virtually assured a profit. In this light, it is clearly immaterial whether the Bank's capital is Can\$30 million or zero.

Increased attention to central bank independence has raised the profile of these issues and in some cases resulted in conflict between banks and respective governments. The creation of the ECB offered an important blank slate to design a modern capital framework. The ECB was established with a capital of €5 billion. In addition, foreign exchange assets of €39.5 billion were transferred to the ECB by countries participating in Stage Three of the European Monetary Union (EMU) in early 1999. The motivation for the capital was to fund startup costs of the bank, as well as to generate continuing operating income. This was deemed particularly important as seigniorage from note issue was to begin only in 2002. Furthermore, the ECB has a large foreign exchange exposure, since 90 percent of its assets are in foreign exchange and gold, which has an offsetting counterpart in euros—liabilities to national governments owing to the transfer of foreign exchange. The ECB in fact made a loss in 1999 that was covered by a writedown of the claims of national governments.²⁸ This ability to write down claims in response to unrealized foreign exchange losses was explicitly granted for the first three years of Stage Three of EMU, to allow the ECB breathing space before the issuance of banknotes would generate seigniorage revenue and increase its reserves. The issue of allocating seigniorage revenues was resolved only at end-2001, and the issue of the optimal level of capital remains outstanding.

²⁷ See Bank of Canada (2005). Canada's foreign reserves are held in the Exchange Fund Account. Although managed by the Bank of Canada, they are not on the balance sheet.

²⁸ Although the ECB made more than €6 billion in unrealized foreign exchange gains resulting from the depreciation of the euro during 1999, its accounting policy calls for these gains to be excluded from the profit and loss account and set aside in a revaluation account. Ironically, the overall loss of €247 million came largely from unrealized writedowns on financial assets of about €600 million, which are required to be brought to the profit and loss account.

To conclude, there is wide variation in central bank financial strength. In some cases, the central bank is clearly in a state of the world where it cannot commit credibly to a low-inflation target. In others, financial strength is such that only in the remotest of possibilities would the bank's financial situation interfere with its choice of instruments or achievement of objectives. Intermediate cases usually imply less efficient but less directly costly monetary instruments or weaker policy objectives, plus greater vulnerability to a loss of monetary control in the face of shocks.

II. Central Bank Financial Transparency and Capital Determination

As noted above, central banks tend to have very different financial results, as well as different levels of accounting capital. One reason for this, which makes cross-country comparisons difficult, is wide variation in accounting practices, as well as limited transparency. Stella (2003) provides internationally comparable data on "other items net" as a proportion of central bank assets and demonstrates both a very wide range and high levels of this index, which he interprets as a transparency proxy.

Increasing interest in financial transparency accompanied a widespread adoption of rules-based macroeconomic policy frameworks in the early 1990s. The U.S. Budget Enforcement Act of 1990, the 1992 Maastricht Treaty (later to be followed by the Stability and Growth Pact's deficit and debt limits), and a movement toward transparency in New Zealand and Australia raised the profile of fiscal accounting, while pressure also increased to enhance the openness of monetary policy. In the European Community this was accompanied by a harmonization of national statistical systems in part to allow a common measurement of national fiscal deficits in general and state aid in particular.

Later in the decade, the sustained growth in private capital flows to emerging markets, the Asian and Russian crises, and the emergence of calls for a new international financial architecture accelerated an already evident trend toward greater transparency in the accounts of governments, central banks, and the financial sector. Conventional wisdom now stresses the importance of information revelation for the functioning of markets and for the reduction of risk premiums for sovereign borrowers. There is as well a strong conviction that the "... credibility of fiscal rules and objectives is strengthened if such measures are accompanied by enhanced fiscal transparency, as this openness complements a rules-based approach in three ways: by removing any tendency to be nontransparent to meet rules; by facilitating judgments of actual fiscal performance against rules, which makes transparency an essential requirement for rules to be effective; and by allowing justifiable flexibility in the application of rules."²⁹ As Kopits (2001) points out, "... the usefulness of fiscal rules hinges on transparency in institutional structure and functions, that is, in the relations within the public sector. . . ."

Central banks, however, in their financial or fiscal operations have historically been very opaque and a prime locus for nontransparent quasi-fiscal operations.³⁰

²⁹IMF (2001e, Chapter III). See also Kopits (2004).

³⁰See, for example, the discussions in Robinson and Stella (1987); Fry (1993); Fry, Goodhart, and Almeida (1996); and Mackenzie and Stella (1996).

Most worrying are central banks not subject to effective external audit, whose accounts lack integrity and/or are not disseminated. This opacity has arisen from a combination of the unique nature of the central bank (unlike other monopolistic fiscal enterprises, there is no close commercial analogue to the central bank), its ability to finance itself through money creation, and the fact that central bank accounting is idiosyncratic. This makes external oversight difficult—a situation not undesired at certain times by certain governments that, to borrow from the language of Fry, Goodhart, and Almeida (1996), are quite content to hide the fact that they are squeezing the goose that lays the golden eggs.

With these caveats in mind, it must be noted that a great deal of improvement in the basic accounting framework and in transparency has been achieved in the past decade.

- The IMF has developed standards and a code of good practices on transparency in fiscal and monetary and financial policies, using them to review the policies of dozens of member countries to date.
- Revisions to international accounting standards (IAS) applicable to financial institutions have been made. For example IAS 39 “Financial Instruments: Recognition and Measurement,” which broadens the application of fair value accounting, became effective January 1, 2001.
- The IMF has worked with member countries to improve their transparency as evidenced by technical assistance and seminars (see, for example, Sullivan (2005), which explicitly discusses the applicability of IFRS to central bank accounting). See also Curtis and Mander (2003).
- The IMF has actively promoted central bank transparency through its “safeguard assessment” program, introduced in 2000 to address concerns that some central banks utilizing the Fund’s resources lacked transparency and posed a risk as intermediators of Fund credit. The safeguard assessment examines the adequacy of five key areas pertaining to the central bank: external audit, internal audit, legal independence, financial reporting, and internal controls. An essential requirement is that countries publish annual central bank financial statements that are independently audited in accordance with internationally accepted standards.
- The Fund has completely revised its basic fiscal accounting framework with the introduction of the *2001 Manual on Government Finance Statistics* (IMF, 2001c) to bring it in line with the UN’s *System of National Accounts* and to address concerns raised over the years (the previous edition dated from 1986) that it had serious analytical inadequacies.³¹ In particular, the *2001 Manual* changed the basis of accounting from cash to accrual and established a fully integrated system of accounts, including stock data. The previous edition of the *Manual* limited stock data to debt liabilities.
- A greater emphasis has been placed on adjusting fiscal balances for the distorting impact of inflation, particularly important for the quasi-fiscal operations of financial institutions.³²

³¹ See Blejer and Cheasty (1993).

³² See de Rezende Rocha and Saldanha (1992).

Table 2. Main Findings of Safeguards Assessments¹

	Type of Assessment		Total Identified ²	Total Assessed ²	Identified as Percentage of Assessed (in percent)
	Transitional procedures	Full			
Central banks assessed	25	26			
1. Nonexistent or deficient external audits.	13	20	33	49	67
2. No, or delayed, publication of financial statements.	7	13	20	49	41
3. Poor controls over foreign reserves.	2	14	14	26	54
4. Inadequate accounting standards.	8	23	23	26	88
5. Deficient governance oversight.	5	20	20	26	77
6. Deficient internal audit.	1	23	23	26	88
7. Loopholes in governing legislation.	-	13	13	26	50
8. Inadequate accounting for IMF transactions.	2	9	9	26	35

Source: "Safeguards Assessments—Review of Experience and Next Steps," available via the Internet at: www.imf.org/external/np/tre/safegrds/2002/review.pdf.

¹Data as of February 8, 2002.

²Given the nature of transitional procedures, findings 3 through 8 (shaded) are not *prima facie* principal objectives of such assessments and, therefore, are excluded from the calculation of total identified cases.

- Some central banks have moved toward full cost recovery for services and more clearly identifying the cost of undertaking other activities, thereby enabling a closer examination of their cost efficiency.

Despite this significant progress, individual country improvements have been sporadic. IMF safeguard assessments have identified a number of problems that have been or are being addressed in the central banks assessed, but these constitute only a subset of member countries. In particular, 88 percent of assessed central banks were identified as having had inadequate accounting standards (see Table 2, left).

Apart from differences among countries in stages of reform, two controversial issues remain that are essential to the debate over central bank financial independence: profit distribution rules and the appropriate level of central bank capital.³³

Profit Distribution

Sullivan (2003) thoroughly discusses this issue from the perspectives of central bank financial disclosure, transparency, and accountability. Here we focus on how the macroeconomic, in particular the fiscal, accounts are impacted, as well as profit distribution as the mechanism by which central bank capital and ultimately financial strength is determined.³⁴

Interestingly enough, the very idea that profit distribution is an integral element of central bank independence and should take into consideration the ability of the bank to meet its policy commitments is controversial. On this question, the European Union has been a strong advocate through its convergence requirements for central banks wishing to participate in the monetary union. Among the required features of EU-member national legislation is the financial independence of the central bank, and among the specific requirements is that national central banks “in those countries where third parties and, particularly, the government and/or parliament are in a position, directly or indirectly, to exercise influence on the determination of an NCB’s [National Central Bank’s] budget, or the distribution of profit, the relevant statutory provisions should contain a safeguard clause to ensure that this does not impede the proper performance of the NCB’s European System of Central Banks [ESCB]-related tasks.”³⁵ Ireland and Finland amended their legislation to meet this requirement, while the European Commission (EC) recently stated that Swedish legislation is incompatible with the financial independence of the Riksbank and, in that respect, assessed it as not compatible with the EC Treaty and the ESCB Statute.³⁶ In October 2003, in response to a request for its opinion from the Finnish Ministry of Finance pertaining to a legislative proposal that would, *inter alia*, substantially reduce the central bank’s capital, oblige the

³³ See survey data in Kurtzig and Mander (2003).

³⁴ The IMF, in its surveillance work, has for certain countries long found it important to report the overall public sector deficit—including the cash losses of the central bank—in its assessment of the fiscal stance. The *2001 Manual on Government Finance Statistics* also covers these issues.

³⁵ European Monetary Institute (1998, p. 295).

³⁶ See Commission of the European Communities (2002).

transfer of 100 percent of profit to the state, and limit the central bank's right to create financial provisions, the ECB argued that such a proposal "... infringes the principle of financial independence ..." and "... is incompatible with the Treaty and its intentions."³⁷ The EU requirements are also having an impact on the relevant legislation of states recently admitted to the Union and on those hoping to become members of the EU later this decade.

Outside Europe, these issues continue to be discussed in various contexts. In 2001, the Central Bank of Venezuela paid unrealized foreign exchange gains to the government, which, in turn, had not fully recognized the cost of the bank rescue operations indirectly financed through the central bank.³⁸ At their June 2000 meeting, the Central Bank Accounting and Budget Committee, formed of representatives of various central banks in the Americas, could not arrive at a consensus that would have enabled it to approve standards for determining profits and on the appropriate level of central bank capital.³⁹ There have also been serious problems in a number of the newly independent central banks coming out of the formerly socialist countries. The 2000 IMF ROSC on Azerbaijan, for example, notes that the profit transferred by the central bank to the budget is not determined according to objective criteria but is negotiated at the time of budget preparation.⁴⁰

In the United States, the issue of profit transfers and capital has been actively discussed in recent years, although there is broad agreement that the magnitudes involved are not material to the Federal Reserve System's financial status. In 1993, the Omnibus Budget Reconciliation Act required the Federal Reserve to transfer from surplus US\$106 million and US\$107 million to the treasury in fiscal years 1997 and 1998, respectively. The General Accounting Office (GAO) acted transparently but questionably when it took the position in 1996 that those transfers of accumulated Federal Reserve surplus should be counted as fiscal receipts and reduce the budget deficit in the year received.⁴¹ Congress acted again in late 1999 by amending the Federal Reserve Act to require a transfer of Federal Reserve surplus to the secretary of the treasury of US\$3.752 billion during fiscal year 2000 and forbidding the Fed from recouping the loss in that fiscal year. Because the government's and the Federal Reserve's fiscal years are not synchronous, the Federal Reserve was nevertheless able to replenish most of its surplus through retained profits by the end of its own fiscal year.⁴²

In its 1996 report to the U.S. Congress, the GAO suggested that the Federal Reserve review the size of its capital or "surplus account." In 2002 the GAO reported back to Congress on the implementation of the recommendation and noted that while the Federal Reserve had undertaken a review of its policies pertaining to capital, no major changes in policy had taken place and that the "... level of

³⁷European Central Bank (2003 and 2004).

³⁸See Jácome (2001).

³⁹See CEMLA (2000).

⁴⁰See IMF (2000b), paragraph 8.

⁴¹See U.S. General Accounting Office (1996).

⁴²Goodfriend (1994), in addition to pointing out that the federal deficit properly measured would not be affected by such a transaction, presciently pointed out that the 1993 congressional decision "... could set a harmful precedent for further stripping the Fed of assets. ..."

Federal Reserve capital surplus account is not based on any quantitative assessment of potential financial risk associated with the Federal Reserve System's assets or liabilities" (U.S. GAO, 2002). Hence, the issue of an alternative rule for Federal Reserve capital remains open.

Countries with large foreign exchange exposure tend to have mechanisms to smooth the impact of exchange rate changes on their accounts. While Norway and Iceland bring realized and unrealized foreign exchange gains and losses to the profit and loss account—as did Finland prior to the EMU—they have established mechanisms to smooth the transfer of profit as does Sweden (guidelines for distribution of the annual result stipulate that the annual transfer to the treasury shall not be affected by fluctuations in the value of the Swedish krona). The mechanisms also effectively make capital and reserves a function of the net open foreign exchange position.

To take one example, in comparison with Canada and the United States, almost all of the Norges Bank assets are international reserves and other foreign assets—98.5 percent (end-2004). On the liability side, notes and coins in circulation account for only 17.5 percent with treasury and banks' deposits accounting for the bulk of domestic liabilities. As a result, the Bank usually has net domestic interest expenses and net foreign interest revenue. Changes in the market value of its security portfolio, as well as changes in exchange rates, lead to volatile financial results. For instance, the Bank made a loss of NKr 24 billion in 2002, and profits of NKr 21 billion and NKr 1 billion in 2003 and 2004 respectively (see Norges Bank, 2005).

The Norges Bank undertakes to minimize the significance of the fluctuations in its profits in two major ways. First, part of its foreign securities portfolio was structured to hedge the government's foreign currency debt (which was fully retired in 2004). Second, it targets reserves amounting to 5 percent of the Bank's holdings of domestic securities and 40 percent of its net foreign exchange reserves, excluding the government's petroleum fund. Annual profits that are in excess of what is needed to maintain the reserve are transferred to a holding account. The amount distributed to the treasury is the average amount transferred to the holding account during the preceding three years. In light of Norges Bank's losses in 2001 and 2002, the Norwegian parliament decided to transfer approximately 9 billion kroner to bolster the Bank's "Adjustment Fund" or capital account and no profit transfers were made in 2003 or 2004.

Capital

As is evident in the discussion of profit transfer policies, central banks' approaches to financial strength or capital differ, although the problem is generally made operational by discussing a target or target band for central bank *capital*.⁴³ Targets generally fall within one of four types, although some banks take a hybrid approach. The first is an absolute nominal level of capital. The second is a target ratio of capital to another central bank balance sheet item. The third category sets a ratio of

⁴³ See Ernhagen, Vesterlund, and Viotti (2002) for a discussion of this issue in the Swedish context.

capital to a macroeconomic variable (excluding central bank balance sheet items). The last bases the level of capital on the perceived risks to the “solvency” of the bank (which often is the underlying basis for the actual target chosen in the other three categories). Here “solvency” is sometimes interpreted as positive capital, sometimes as the more general concept of maintaining the ability of the central bank to undertake its policy goals.⁴⁴

In practice, the Bank of Canada is an example of a bank in the first category. The Bank has a nominal level of capital and pays all of its accrued profits to the government.

The Federal Reserve, Bank of Japan, the Bulgarian National Bank, and the central banks of Iceland and Estonia are all examples of banks falling into the second and third categories. The Bank of Japan and the Bulgarian National Bank target internal balance sheet indicators, while the Federal Reserve, Central Bank of Iceland, and Bank of Estonia target external indicators.

The Bank of Japan targets a capital adequacy ratio of 8–12 percent, defined as the capital base divided by the period average of banknotes issued. Specific reserves against possible loan losses are not included in calculating the capital ratio. The Bulgarian National Bank sets a nominal floor on foreign exchange assets in excess of what is necessary under the rules of the Bulgarian currency board. These assets constitute a pool from which the Bank is able to provide a lender of last resort facility.

Federal Reserve System member banks are required to make capital contributions to the System proportional to their own level of capital. The Federal Reserve then matches these contributions with retained earnings. The effect is to index the level of Federal Reserve capital to the aggregate capital of Federal Reserve member banks.

In September 1999 the Bank of Estonia, operating in a currency board framework, decided to alter its capital target.⁴⁵ Prior to that Board decision, the Bank had a three-tier objective. The first, statutory capital, was set in nominal terms. The second level, reserve capital, was set at a level equal to statutory capital. Once those two objectives had been achieved through accumulated retained earnings, the Bank had significant discretion as to how to distribute profit. Indeed, the Bank used such discretion to make “advance payments of future transfers” to resolve a banking crisis in 1997 (see section I above). In 1999 the Bank, with a view toward eventual membership in the European Monetary Union, changed its distribution policy to focus on preventing an excessive decline in surplus reserves of the currency board. While noting that some decline from the level then prevailing was warranted in view of declining risk in the financial environment, the Board decided to set a floor for foreign exchange reserves, net of currency board liabilities, equal to the greater of 2 percent of GDP or 5 percent of broad money, M2.

⁴⁴The notion that solvency is defined not as a balance sheet concept but as a capacity to meet policy goals is similar to the concept espoused in Fry, Goodhart, and Almeida (1996, p. 39): there, insolvency is “negative net worth at all steady state rates of inflation” so a central bank is insolvent if it is financially incapable of holding steady the rate of inflation.

⁴⁵See Bank of Estonia (1999).

The Central Bank of Iceland, since 2001, transfers two-thirds of its profit to the treasury unless capital and own reserves at the end of the fiscal year are less than 2.25 percent of the amount of lending and domestic securities assets of the credit system at the end of the preceding fiscal year. In that case the transfer is reduced to one-third of profit.⁴⁶

The European Central Bank presents a hybrid system. As noted above, the ECB chose a nominal level of capital with an option to require further transfers from member banks. The ECB motives were explicit in two respects. First, capital was viewed as an income source to fund the operations of the bank during startup and to absorb initial losses—which is a very conventional view of commercial banks' minimum absolute capital requirements. Second, independence, in general, and financial independence in particular, requires that capital adequacy be kept under review.

Less definitive approaches have been adopted in Latin America, as evidenced by the failure of accounting experts to agree on a position on this issue.⁴⁷ Ulrich (1998) made two proposals with reference to predollarization Ecuador. One, analogous to the Basel capital criterion, is that the central bank should hold capital and reserves equal to at least 9 percent of risk-weighted assets according to the provisions of the legislation applicable to private commercial banks. The second, based on a currency board analogy, is that capital plus net international reserves be at least as great as the monetary base.

New Zealand and Australia take the fourth approach, which is best summarized as protecting the strength of the balance sheet by explicit control on risks that are not strictly necessary for policy purposes and undertaking a review of the adequacy of the balance sheet before determining profit distribution. Essentially, when the balance sheet is deemed strong enough, the focus is on ensuring it remains that way but without reference to a specific benchmark. The Reserve Bank of New Zealand employs value at risk model limits, as well as stop-loss limits, in managing its foreign asset portfolio, but it does not attempt to manage the risk coming from its holding of domestic securities for monetary policy purposes, as (i) this might lead the operations department to act counter to monetary policy objectives, exactly what the market suggests the Bank of Japan might do; and (ii) because any capital gains or losses on its holdings of government securities would be mirrored by the government.

The Board of the Reserve Bank of Australia (RBA) reviewed in fiscal year 2000/01 the structure and adequacy of its capital and reserves and decided to consolidate disparate reserve accounts.⁴⁸ The amount to be transferred to the consolidated reserve fund is determined by the Australian government after consultation with the Board. A key element of the profit-transfer policy is that while all unrealized gains and losses are taken to the profit and loss account, unrealized gains are not made available for transfer to the government. They are held in a separate account until realized or offset by unrealized losses. Although the RBA does not

⁴⁶ See Sedlabanki Islands (2001).

⁴⁷ See CEMLA (2000).

⁴⁸ See Reserve Bank of Australia (2001).

have an explicit target for its reserve fund, it noted that at June 30, 2001, it stood at 10.6 percent of total assets, which the Board regarded as adequate. The Bank attempts to pay the determined profit early in the financial year following the year in which it was earned, but on occasion this has not been done, as in fiscal year 1998/99, when the government spread the dividend from that year over the two following years.

In assessing the various options, the focus on balance sheet capital is problematic in that it tends to frame the discussion in terms of capital being used to avoid insolvency, and hence “zero” becomes a very important number as it is for commercial banks. For a commercial bank, negative capital—or the fear that a bank is approaching negative capital—has clear implications. But for central banks zero has no special meaning for two reasons. The first is that central banks are not subject to insolvency procedures; the second is that central banks, in their conventional state, have a significant unrecorded asset: namely, the monopoly right to issue fiat money (currency boards and countries participating in a monetary union are an important exception here). This monopoly right, were it capitalized on the balance sheet in the form of franchise value or goodwill, could easily be in the range of 20 percent of GDP, depending on the steady-state level of the inflation tax and the discount rate. Taking a low-inflation country as an example—calculating the annuity value of the Fed’s 2000 profit of approximately US\$30 billion (roughly 0.3 percent of GDP), using a 2 percent discount rate yields a net worth of 15 percent of GDP, or approximately US\$1.5 trillion, compared with balance sheet capital of \$14 billion. Looked at differently, the average annual increase in U.S. reserve money during the past 10 years was US\$27 billion. This is equivalent to the monetization of a 6 percent coupon on net liabilities of US\$450 billion.

The point here is that the nominal level of central bank capital—in the absence of any knowledge of the policy regime—is a rather meaningless statistic. Only when provided with policy objectives, such as price or exchange rate stability, can a threshold for central bank net worth or strength be determined. That said, the financial strength of the central bank does not provide a *sufficient condition* for those policy objectives to be achieved. It merely provides a floor under which the central bank cannot achieve its objectives without reliance on the treasury. Hence, it is first necessary to determine the bank’s objectives, then to determine the minimum strength of the balance sheet to achieve those objectives, the exposure to risk that the bank is likely to experience, and finally a mechanism that ensures that enough reserves are available to absorb the risk.

This argument is a specific application of the more general methodology presented by Blejer and Schumacher (1998), in effect suggesting that central bank strength be determined by utilizing a value at risk approach in light of the cost and benefit matrix attached to its policy choice. As an example, a central bank that does not determine foreign exchange policy—such as the Bank of Canada—need hold no foreign exchange reserves.⁴⁹ Banks that do hold large foreign reserves, as

⁴⁹In Canada, the Ministry of Finance decides foreign exchange intervention, and the country’s foreign assets are not on the books of the Bank of Canada.

is the common practice in Scandinavia, would need to adopt hedging strategies or hold additional capital to prevent or accommodate large losses.

III. Credibility and Central Bank Financial Strength

With the advent of rational expectations as a common assumption in economic theory and the recognition that central bank policy is “. . . not a game against nature but against rational economic agents,”⁵⁰ policy credibility has become the focus of intense interest both in theory and practice. In his survey of central bank credibility, Blinder (2000) notes that central bankers and economists agree that credibility is important and that it is attained by building a reputation for doing what you say you will do. Effectively, this implies that there are three key issues. The first is adopting the right objective function, the second is enabling the attainment of the objective, and the third is being transparent. Insights into the issue have been gained by analyzing the preferences of policymakers, the degree of central bank legal independence, and the consistency and credibility of central bank objectives, as well as their consistency with fiscal policy.⁵¹

Germane to the discussion of this paper is the substantial attention paid to the relationship between central bank independence and inflation performance. Interestingly, the demonstrated link tends not to be found outside the developed economies.⁵² There are a variety of possible reasons, one of which is that there has been insufficient attention paid to actual financial independence in the measurement of the independence variable. Indeed, Jácome (2001) finds in a study of Latin American central banks that “legal” independence alone is actually *inversely* related to good inflation performance and only by including “economic” and “financial” independence variables does the expected correlation emerge.

The most straightforward argument in favor of central bank financial strength is simply that central bank financial weakness leads to central bank losses. Such losses are financed through financial repression, reserve money creation, or debt issuance—leading to expectations of future money growth. If the reserve money injection is consistent with the monetary program, exchange rate, or other central bank objective, then no immediate difficulty ensues. If, however, the monetary injection is not consistent with the central bank’s policy objectives, it will need to be offset with countervailing action.

Here the central bank has a choice. One avenue is to suppress the impact of the monetary injections by direct means involving repression of the financial system. However, in light of increasing recognition of the efficiency losses associated with such policies, the use of more market-friendly indirect instruments has gained wide acceptance.⁵³

⁵⁰Kydland and Prescott (1977).

⁵¹See Sargent and Wallace (1981), Rogoff (1985), Cukierman (1992), and, more recently, Faust and Svensson (2001) and Woodford (2001).

⁵²See Cukierman, Miller, and Neyapti (2001), and Jácome (2001).

⁵³See Giovannini and de Melo (1993), and Alexander, Baliño, and Enoch (1995).

Accomplishing the withdrawal of liquidity through market-friendly means requires the central bank to induce a voluntary action on the part of the public. The central bank will need to offer the market an asset bearing a market return in exchange for reserve money. This will lead to further operational expenses or loss of revenue. There are clearly limits to this policy, as eventually the central bank will exhaust its supply of valuable liquid assets.

The next step sometimes is to issue central bank own liabilities. The sustainability of central bank debt issuance is a function of the same factors that determine the sustainability of government debt in general.⁵⁴ These include expectations of the future income and expenditure stream of the central bank, the growth rate of demand for the securities being purchased from the central bank, the reputation of the issuer of the security, macroeconomic developments, the government's commitment to guarantee obligations of the central bank, budgetary developments, and so forth. Furthermore, chronic central bank losses and high inflation lead to institutional adaptations, such as the proliferation of indexed debt instruments, which reduce the scope for the use of the inflation tax.⁵⁵

Apart from the straightforward infeasibility of certain policy commitments when they violate the central bank's intertemporal budget constraint, a less severe degree of weakness decreases the central bank's credibility and worsens the policy cost/benefit trade-off. This would be the case where the current constellation of exogenous factors is consistent with the chosen policy but the central bank would not be able to withstand potential shocks to its balance sheet. Here what is relevant is not so much the consistency of the policy but its vulnerability and the possible volatilities of certain variables that would affect central bank strength and correspondingly its ability to fulfill its policy obligations.⁵⁶ The greater is central bank financial independence—by definition—the greater is its ability to withstand shocks without recourse to fiscal or quasi-fiscal resources. An additional issue is that central bank concern with its balance sheet, even though not vulnerable, could lead to a policy reversal (see Cargill, in this volume). Hence the importance of choosing the right measure of target strength.

Given that many governments either implicitly or explicitly stand by to support their central banks if need be, must they provide that financing up front? That is, is financial independence really important to credibility? We explore this question in the next section.

IV. Treasury Financing Versus Recapitalization

A country with a central bank suffering from large negative net worth faces a choice between strengthening the balance sheet or covering losses on a cash-flow basis from the treasury. The latter option is a frequent feature of central bank law.

⁵⁴See MacArthur's annex to Vaez-Zadeh (1991) for an explicit derivation of the transversality conditions, and Ize (in this volume) for a "net worth" approach.

⁵⁵For example, the Central Bank of Argentina made losses during most of the high-inflation period in the second half of the 1980s.

⁵⁶This is the emphasis of Blejer and Schumacher (1998).

For example, the 2002 organic law for the Central Bank of Guatemala has a clear provision covering cases where the Bank suffers losses that it cannot cover with own reserves. In this event, the Ministry of Public Finances should submit in the draft budget law a proposal to cover the losses through the provision of marketable interest-bearing debt to the central bank in the following fiscal year. This type of solution is what Edwards (2000), in his advice to the Bank, called an “automatic” recapitalization of the central bank and which he motivated from the importance of isolating this issue from the pure short-term political arena.

One difficulty with relying on transfers alone is that treasuries are rarely so flexible that they can be provided on a timely basis.⁵⁷ A budgetary allocation is normally required, and it generally is not possible to usurp the legal framework of an authorized budget law through an *ex ante* requirement that central bank losses be covered. Thus, in the case of Guatemala, although the economic form of the recapitalization is quite clearly spelled out, the legal requirement is for the government to *submit* legislation, not pass legislation. Thus, the likelihood of the legislation being passed is clearly subject to the will of the legislators at the moment the budget is approved and does not depend solely on the government even if well intentioned.⁵⁸

A second concern would be that were the treasury to have sufficient discretion to fund losses on a timely basis, this would also suggest it would have discretion to control the size and timing of the transfers, which in effect would place monetary policy in the hands of the treasury rather than the central bank. If institutional independence is desired for the central bank, it is difficult to see how this can be maintained when the central bank relies on the constant goodwill of the treasury to undertake policy implementation.

The third and perhaps most relevant concern is that states of the world where central bank finances are under stress are likely to coincide with times of fiscal distress, meaning that support is highly unlikely. In the game-theory literature, such a professed policy of central bank rescue would be considered to violate the criterion of “subgame perfection.” That is, if actually called on to play the professed strategy, the government would not find it optimal.

In assessing the difference between covering losses on a periodic basis and through a lump-sum recapitalization, one may consider the following situation, which abstracts from the three concerns expressed above that already would provide a bias against the credibility of treasury promises. Suppose, to achieve its price-stability goal, the central bank must receive either an annual transfer of government securities equal to X or a one-time transfer of the present discounted value of the stream of X s through time, Y . In the latter case, the central bank would issue the securities as needed to the market. The budgetary impact on the consolidated

⁵⁷Normal budget procedures would require a specific allocation for interest expenditure during the year and frequently place a limit on government debt outstanding.

⁵⁸Guatemalan law makes the state responsible for covering the losses, which may imply that should the approved budget not be adequate, another method must be found. The law also provides for a recapitalization of the Bank’s accumulated losses through the issuance of a long-term zero-coupon bond. See García Lara (2002) for a thorough discussion of the motivations for these and other provisions of the law.

public sector would be identical in both cases. In the annual transfer case, the central bank would immediately issue the government securities, hence the budget impact would be equivalent to the debt service on the transferred securities. In the second case, the nominal debt service on the government securities would be much larger, but the amounts in excess of the quantity issued to the *private sector* would remain in the public sector and the attendant income transferred back to the government at the end of the financial year.

The lump-sum recapitalization additionally provides a signal of the government's commitment to allow the central bank the financial possibility to implement appropriate policy. Conversely, the failure to provide the resources up front, given that the net financial impact on the public sector is nil, could only call into question the government's long-term commitment to the annual transfer policy. This in turn would lead to skepticism on the part of the public as to the central bank's policy capability. In cases where the government is particularly concerned about influencing the public's expectations about the medium-term policy framework, this uncertainty could be very costly.

The aforementioned discussion is placed in a formal model in the remainder of this section. The model draws from Barro and Gordon (1983a and b) and is analogous to Backus and Driffill (1985). The general outline is that the government wishes to undertake a financial reform, which is taken to be a reduction in the rate of inflation. The central bank is in a weak financial situation and is not capable of bringing the rate of inflation down to the desirable level without an infusion of government securities. More broadly, there is also the need for fiscal consolidation in the overall public sector accounts. Hence, we are not speaking of a recapitalization for purely transparency purposes.⁵⁹

The government has a choice between transferring the required securities in a lump-sum fashion at the beginning of the reform or transferring only the minimal amount of securities required each time period or budgetary year. To introduce the notion of credibility, it is assumed that the public does not know the true objective function of the government and therefore must form expectations of future government policy on the basis of incomplete information. For simplicity, it is assumed that the public does know the objective function of the central bank and that there are only two possible types of government: one that has the same objective function as the central bank and one that is weaker in the sense that under certain circumstances it would choose to accept higher inflation than the other government or relax the fiscal constraint, which in the model can be thought of similarly. That is, the choice variable is the rate of inflation, but the instrument is the quantity of government bonds to issue to the central bank each period, which has a government debt-service cost as well as a monetary implication. This motivation is but one of many for including surprise inflation in the reduced form for the government's objective func-

⁵⁹ A recapitalization of a loss-making central bank purely for transparency purposes would involve the provision of a zero coupon but nontradable government security to the central bank sufficient for it to generate a profit on an accrual basis. The conventional fiscal balance would then reflect the central bank losses, but the monetary authorities would continue to be forced to finance their expenditures through money creation.

tion. These are discussed extensively elsewhere in the literature, as is the appropriate form of the objective function. For our purposes we use the following:

$$V^i = b^i (\pi\{t\} - \pi^e\{t\}) - a/2(\pi\{t\})^2,$$

where π is defined as inflation, π^e is expected inflation, and i is the index for government type.

The solution for the government if this is a one-stage game is to set $\pi = b^i/a$. Rational expectations with complete information require $\pi^e = \pi$. We now discuss the situation with the possibility that there are two types of governments, either A or B .

Government type A is strongly committed to the reform. That is, it claims $b^a = 0$. This government will always choose $\pi = 0$, as would the central bank.

The other government, type B , has a parameter $b \gg 0$. In what follows, when the parameter b is mentioned it always refers to that of the type- B government; therefore it will no longer be superscripted. The payoff for the type B government, when it sets $\pi = 0$ and is expected to do so, is zero. The payoff for the B government when it chooses its optimal one-stage solution, $\pi = b/a$, when people anticipate $\pi = 0$, is:

$$- a/2(b/a)^2 + b(b/a - 0) = - b^2/2a + b^2/a = \left(\frac{1}{2}\right)b^2/a.$$

So the dominant strategy, if this were a single-stage game, would call for government A to play $\pi = 0$ and for government B to play $\pi = b/a$.

Individuals begin the game with a prior about the type of government that is in power. The formation of these priors is not modeled. The subjective probability that the government is of type A is denoted p^a .

The prior is updated according to Bayes rule as long as the government's type has not been completely revealed. (If type B is revealed, the model collapses to the perfect information case.) Bayes rule implies:

$$\begin{aligned} p^a(t) &= \frac{p(\pi\{t+1\} = 0 | A)p^a(t+1)}{p(\pi\{t+1\} = 0 | A)p^a(t+1) + p(\pi\{t+1\} = 0 | B)p^b(t+1)} \\ &= \frac{p^a(t+1)}{p^a(t+1) + [1 - p^a(t+1)]p^{0|b}(t+1)} \end{aligned}$$

where $p^{0|b}(t+1)$ is the probability that the government of type B would play $\pi = 0$ in $t+1$. Time is indexed by t , where $t = T$ is the first period and $t = 1$ the last. Thus, t represents the number of periods remaining in the game. Notice that if $p^{0|b}(t) = 1$, then $p^a(t) = p^a(t+1)$, that is, nothing is learned from experiencing zero inflation if both governments are believed to choose it with probability one. And, since any rate of inflation greater than zero is completely revealing, $p^a(t) = 0$ if at any time, s , prior to t , $\pi(s) > 0$. This "sharp" conclusion is the result of two

assumptions: that the government has perfect control over the rate of inflation and that there are only two, quite different, types of governments.

The Bayesian probability, at any time in the game, that the rate of inflation will be set equal to zero is $p^a(t) + p^{0|b}(t)p^b(t)$. This equals $p^a(t) + p^{0|b}(t) [1 - p^a(t)]$. Since any choice of inflation above zero will reveal the government of type B , if it decides to reveal itself it will choose the optimal level of inflation, b/a , at that time. Therefore, the probability that the rate of inflation will be equal to b/a is $1 - p^a(t) - p^{0|b}(t) [1 - p^a(t)]$. It then follows that the expected value of the rate of inflation in any period is:

$$\begin{aligned} & [p^a(t) + p^{0|b}(t)p^b(t)] \times 0 + [1 - p^a(t) - p^{0|b}(t) (1 - p^a(t))] \times b/a \\ & = b/a - b/a [p^a(t) + (1 - p^a(t)) p^{0|b}(t)]. \end{aligned}$$

This is how people form expectations of inflation along the equilibrium path.

The government of type A will set the rate of inflation equal to zero for each period. It is committed to the rule. The more complicated strategy is that of the government of type B . It is found by working recursively from the end of the game. Its strategy at time 1, the last play of the game, is clear. It will always set the level of inflation equal to b/a . The decision faced by government B in the next-to-last period, period 2, is the following. The payoff equation for that government in period 2 is:

$$-a/2[\pi(2)]^2 + b[\pi(2) - \pi^e(2)].$$

If the government sets $\pi = 0$ and retains its reputation, it gains $-b\pi^e(2)$. In period 1 it sets $\pi = b/a$ and gains $-a/2(b^2/a^2) + b[b/a - \pi^e(1)]$. The sum of the payoffs in the two periods equals $-b\pi^e(2) + b^2/2a - b\pi^e(1)$. This is the undiscounted payoff to setting the rate of inflation equal to zero in the next-to-last period and then setting it equal to b/a in the last period.

Alternatively, the government of type B could set the level of inflation in the next-to-last period equal to b/a and thus reveal it is of type B . It would then, of course, set $\pi = b/a$ in the last period as well. The payoff to this strategy in the next-to-last period would be:

$$-a/2(b^2/a^2) + b^2/a - b\pi^e(2) = b^2/2a - b\pi^e(2).$$

Then in the last period the payoff would be equal to $-a/2(b^2/a^2) = -b^2/2a$. The undiscounted sum of these two payoffs is $-b\pi^e(2)$. This policy represents breaking from the “rule” at the next-to-last period, losing credibility, and then accommodating people’s high inflationary expectations in the last period.

Comparing the relative payoffs it is clear that if $b/2a > \pi^e(1)$, then the optimal strategy is to set $\pi(2) = 0$. The government of type B will set $\pi(2) = 0$ if this leads people to believe, next period, that it is of type A with sufficient probability to make $\pi^e(1)$ lower than $b/2a$.

As noted above, inflationary expectations about time t are formed according to the following formula:

$$\pi^e(t) = b/a - b/a [p^a(t) + (1 - p^a(t)) p^{0b}(t)].$$

The government, if it is of type A , always sets $\pi = 0$. Solving recursively by induction for the optimal strategy of type B one finds that it also sets $\pi = 0$ at time t , if $p^a(t) > (\frac{1}{2})^{t-1}$. If $p^a(t) < (\frac{1}{2})^{t-1}$, it randomizes, setting $\pi = 0$ with probability:

$$p^{0b}(t) = \frac{[2^{t-1} - 1] p^a(t)}{1 - p^a(t)}.$$

The implication of this optimal strategy is that people will expect future inflation for some time regardless of government claims as long as they are not certain about the government's underlying, unobservable type. To clarify the way expectations adjust after a possible financial reform, a simple numerical example is provided on basis of the following assumptions.

Suppose $b/a = 20$ percent; T , the number of periods, is 10; and z , the prior on the probability that the government is of type A , is $1/20$. Recall that

$$\pi^e(t) = b/a - b/a [p^a(t) + (1 - p^a(t)) p^{0b}(t)].$$

The rate of inflation expected to hold in each period then, from the information available at time T , the first period, is calculated below:

10-6		=	0%
5	$19/20 \times [4/19] \times (20)$	=	4%
4	$19/20 \times [12/19] \times (20)$	=	12%
3	$19/20 \times [16/19] \times (20)$	=	16%
2	$19/20 \times [18/19] \times (20)$	=	18%
1	$19/20 \times (20)$	=	19%

The first number in each calculation is the belief, formed at time T , that the government is of type B ; the second is the cumulative probability that the government of type B will set the rate of inflation equal to 20 percent by the given period. The numbers trace out a term structure of inflationary expectations that takes on an S shape. Note also that expected inflation does not change until the fifth period. That is, since there is no new information about the government before this period—as it is known with certainty that a type B government would mimic type A at least through this period—expectations do not change.

Thus the option of recapitalizing the central bank, by providing it with government securities at the beginning of the game, can be seen as a form of precommitment technology enabling the establishment of policy credibility in the face of uncertainty about the underlying motivations of government. In such a case inflationary expectations would fall more rapidly as the public would know the central

bank has the independent financial resources to achieve its objective. The model is clearly simple, and many others have been analyzed that are more sophisticated, for example in Cukierman (1992). But the point was not to take into account the variety of policy uncertainties. In fact, the idea was to introduce only one kind of uncertainty and demonstrate that it is enough to lead to credibility problems. To the extent that other difficulties would cause even further uncertainties about future policy would serve only to strengthen the point that should the government really intend to undertake financial reform, it ought to provide the financial resources to the central bank to undertake this policy at the beginning and not merely commit to transfer amounts according to losses. Provided, of course, that the central bank has the correct incentives.

It should be clear that recapitalization is not *sufficient* for the central bank to achieve its objectives. Just as the revenues/costs of monetary policy have a fiscal implication, the government's fiscal policy has monetary and exchange implications. However, the failure to recapitalize the central bank, in cases where the public sector has chosen to have an independent monetary policy, creates unnecessary uncertainty and undermines credibility. In cases where credibility is important, that is, when the private sector's expectations about the medium term are important, the lack of credibility can be very costly.

V. Conclusions

If credibility is important for the success of monetary policy, the central bank must be financially strong. The practical implication of this premise is that financially strong central banks should ensure that their strength remains adequate to cope with their policy responsibilities and attendant risks. Their economic auditors should in turn utilize risk-based models to ascertain whether in most circumstances the central bank can survive adverse events without the need to abandon its objectives. Clearly, when the objective changes, the appropriate degree of central bank financial strength should be reevaluated.

A second implication of this approach is that credible central banks need to have a mechanism to ensure that when needed they can build reserves. Conversely, profit in excess of what would need to be maintained to keep the central bank financially strong ought to be delivered to the treasury. The accumulation of excess net worth is not justified, could require the government to borrow from private capital markets at excessively high interest rates, and could create a temptation to plunder the central bank's reserves for reasons of political expediency.

The situation with financially weak central banks is not so facile. In this case, government/society has three options. One is to relieve the central bank of some of its policy goals, for example, price stability or maintaining a fixed exchange rate. The second option is to achieve the goals through direct instruments and financial repression. The attractiveness of such a solution has been demonstrated to be low almost universally. The third solution is to strengthen the balance sheet, either now or at some time in the future.

The paper has argued that to be credible, the strengthening must be contemporaneous with the policy commitment. A mere promise on the part of government to solve this problem later is not credible. First, because those times or states of

the world when central banks need recapitalization tend to coincide with times of fiscal distress. Second, providing the equivalent expected present discounted value of the government promise in liquid securities to the central bank would clarify the state's commitment and provide assurance to market participants that the central bank is financially independent.

Recapitalization involves transferring real resources to the central bank so that it attains profitability and its balance sheet becomes capable of recovering from adverse shocks without resorting to the treasury. In determining how much capital a central bank should have, a number of factors are important. The correct amount will differ, depending on the economic environment in which the central bank operates, the historical legacy reflected in the balance sheet at a particular point in time, and the status of institutional relations with the government. Ize (in this volume) presents a simple model to determine recapitalization needs.

Fundamentally, however, the choice of the optimal degree of central bank financial strength, that is, financial independence, cannot be made by the central bank alone. Policy credibility is enhanced by a diminishing of the probability that the central bank would need to turn to the government for financial assistance. But providing those resources in advance of an actual need has a cost in expected-value terms. Only to the extent the central bank might actually need to draw on the resources would credibility be enhanced. Hence, society must decide on a trade-off, or a stop-loss rule, that determines the point at which it is ex ante optimal to require government to consider whether the cost of continuing with a given policy objective continues to be worth the price.

Determining the financial strength of a central bank requires careful analysis, not only of the balance sheet and economic environment but also of the accounting rules, profit transfer rule, and the bank's institutional status within the government. Appropriate accounting rules and profit-transfer rules will safeguard the soundness of the central bank, differentiate genuine central bank profit from disguised credit to the government, correctly reflect any central bank losses in the government accounts, and prudently provide for the future flow implications of changes in the current value of items on the central bank balance sheet. The appropriate level of central bank financial strength is that sufficient to ensure that in a proportion of future states of the world determined by society, the bank will be able to meet its policy goals and preserve its financial independence.

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