

Part A Preliminaries: understanding central bank finances

1. Basics and concepts

a. Role and ownership

To understand central bank finances, it is first necessary to understand the role of central banks.

For over a century, central banks have been institutions of public policy, not commercial entities. Indeed, the vast majority of today's central banks were created from the outset as public policy institutions. For the small number that were set up originally as privately owned profit-seeking commercial companies, the growing conflicts of interest that accompanied their increasingly important role as the financial sector's informal police force and fire brigade led to their progressive withdrawal from commercial activities. Profit faded as an objective, to be replaced by financial system and currency stabilisation. Except for a few activities related to the provision of financial infrastructure, this withdrawal was largely complete by the beginning of the 20th century.⁴

Most central banks were publicly owned from the start. And many of the central banks that started out privately owned were nationalised during the 20th century.⁵ For the handful of central banks which continue to have private shareholders, the rights of ordinary shareholders to select management and determine strategy are severely circumscribed, and allow no role in the formulation of public policy. Dividends to private shareholders are predetermined or limited in law, making these central banks wholly or mostly independent of the profit motive, and removing a potential conflict of interest between private financial advantage and public welfare.⁶ Residual financial surpluses are transferred to the government in all such cases, creating instead a potential conflict between central bank policy and public finance objectives. If holes appear in the finances of the central bank, they are filled by transfers from the government – if at all. Accordingly, governments are the *beneficial owners* of all central banks (a term we will use throughout).⁷

A defining feature of central (as opposed to commercial) banks is that their customers are effectively captive. Most counterparties of the central bank do not

⁴ At the beginning of the 20th century, there were only 18 central banks in existence. By the end of the 20th century, that number had grown to 173.

⁵ Central banks established in the first third of the 20th century were, however, often constituted with private shareholdings, notwithstanding their public policy functions. From the 1930s on, many privately owned central banks were nationalised (the Reserve Bank of New Zealand in 1935, the National Bank of Denmark in 1936, the Bank of England in 1946, for example). The US Federal Reserve System is perhaps the best known example of a central bank established in the 20th century that continues to have private shareholders. The central banks of Belgium, Greece, Italy, Japan, South Africa, Switzerland and Turkey also have private shareholders.

⁶ For example, annual dividends are limited to 5% of the face value of shares at the Bank of Japan, 10¢ per share at the South African Reserve Bank, 6% of face value at the Swiss National Bank, and 6% at the US Federal Reserve.

⁷ As shares in most central banks are not for sale, the central bank's current net asset position is not needed by capital markets as an input for valuing their equity shares. This removes one of the standard arguments for regular financial reporting on the basis of current market values of assets and liabilities. Protection from insolvency proceedings and the ability legally to operate with negative equity (discussed shortly) removes another. The implications for accounting and financial reporting policy choices are discussed in Part C.

voluntarily engage with it on negotiated terms, after comparing alternatives. This is because the central bank's "monetary" liabilities – banknotes and banks' call deposit accounts at the central bank (referred to collectively as base money below) – are *the* means of payment within the central bank's jurisdiction, legally and by social convention.⁸ A central bank is the monopoly supplier of base money in its jurisdiction and can create such money at will, instantaneously, and at virtually no cost. And its customers are required to accept it. Accordingly, a central bank does not face the liquidity constraint faced by commercial banks and other entities, including the government.

b. Form and structure

As it happens, most monetary authorities have been set up as banks: hence "central banks".⁹ Accordingly, most monetary authorities have an explicit balance sheet and an associated profit and loss account. They have customers from whom they borrow and customers to whom they lend. They charge interest on loans, receive interest on other investments funded by their borrowings, and usually pay out less in interest on such liabilities than they generate from their assets. And much of commercial banking's clothing has been adopted by central banks, with increasingly similar titles for senior staff (eg chief financial officers are replacing chief accountants, chief risk officers are becoming more widespread), and there is a growing emulation of commercial banking's risk management and asset and liability management frameworks.

As a result, it is hardly surprising that casual observers find it difficult to understand where the parallels between central banking and commercial banking start and where they end. The relationship between the central bank's financial position and its ability to perform its tasks is one such source of potential confusion. Is a healthy balance sheet needed for policy success? Can policies run out of steam because they are not profitable?

The economics profession has struggled to understand how and why the financial position of the central bank might matter for its ability to conduct its policies successfully. For a commercial bank, it seems straightforward that an unprofitable bank will eventually be unable to pay its bills and thus be bankrupted – such a bank could hardly continue to function unchecked. However, the relevance of a central bank's finances for its ability to perform its policy tasks is less obvious.

For one thing, although set up as banks, central banks are not usually subject to standard bankruptcy proceedings, and do not normally face minimum capital requirements.¹⁰ Even though they are structured as banks, central banks are not normally set up under company law, or subject to legislation on the licencing and

⁸ There are exceptions, such as when residents use foreign currency in parallel to or instead of the domestic currency as a means of payment. In Latin America, for example, official or unofficial dollarisation was widespread in the 1990s and early 2000s.

⁹ A monetary authority need not be a bank. Some are currency boards, which may or may not issue banknotes. Prior to the relatively recent (for most countries) innovation of central banking, national treasuries often conducted many of the functions of modern central banks. Even today, most national treasuries borrow and lend without themselves having the need for a formal balance sheet or banking structure. A banking structure may be convenient for a monetary authority, but as will become clear, it is also a source of confusion.

¹⁰ There may be rare exceptions that we are not aware of. Until as recently as 2011, the National Bank of Belgium was indeed subject to company law provisions that require automatic dissolution once 50% of capital has been depleted.

prudential regulation of financial institutions. Company law typically allows creditors to petition courts to declare a debtor bankrupt and appoint a receiver or liquidator to take control of the assets. And in cases where company law is applicable, the central bank is almost always explicitly protected from bankruptcy or related proceedings through exemptions granting the highest body of the institution or the state the exclusive right to liquidate the institution.¹¹ Thus a central bank can have balance sheet liabilities that exceed balance sheet assets – that is, it can be “balance sheet insolvent”,¹² according to the accounting conventions used – and yet remain immune to creditor proceedings, or regulatory intervention based on breaching minimum capital ratios, which could otherwise stop it from continuing operations.

Terminology, as used in this discussion:

By *balance sheet solvency* we mean reported assets exceed reported liabilities, thus providing *positive net worth in accounting terms*. Positive net worth in accounting terms means that there is positive *shareholder equity*. (Because central banks rarely have traded shares, there is usually no market value analogue to balance sheet equity.)

Comprehensive net worth is the present value of probable future income, minus the present value of probable future expenditures. It is a forward-looking version of net worth, allowing for assets and liabilities that are not registered on the balance sheet. The *comprehensive balance sheet* is the balance sheet augmented to include such assets and liabilities. (Note: this bears a relationship to but is not the same as an accountant’s notion of comprehensive net income. The accounting concept is not forward-looking).

c. Financial resources and financial strength

A further preliminary matter is to define more carefully what is meant by “financial resources” and “financial strength”. In our terminology *financial resources* are those financial elements that can absorb or buffer losses and/or provide a base for income generation. They may currently be present and available, or callable.

The right to call for fresh resources is to be distinguished from a generic reliance on the owner’s deep pockets. While in principle the beneficial owner of the central bank – the government – has both deep pockets (through the power to tax) and an unlimited liability for the good functioning of the institutions of society, in practice central bank and public finances may be under pressure at the same time. Politicians who are also under pressure may be driven by incentives that are at odds with the long-term public policy objectives given to the central bank. Moreover, reliance on a government backstop may imply forgoing functional independence. He who pays the piper can usually call the tune (whether openly or unobserved). It matters, therefore, whether viability is assessed in terms of *standalone* financial resources, or of the combined financial resources of the central bank and its sponsor/owner. This paper is concerned with the former.

Financial strength includes financial resources but goes further to consider risk transfer or insurance arrangements and, importantly, institutional design features

¹¹ For example, such exemption clauses can be found in central bank law in Austria, Greece, South Africa, Switzerland and Turkey.

¹² Some insolvency specialists draw a distinction between “balance sheet insolvency” and “equitable insolvency” (see Lastra (2009) for a discussion of the distinction in a commercial banking context, and Buitter (2008) for a discussion in the central banking context). Equitable insolvency bears some relationship to illiquidity, whereas balance sheet insolvency has the same meaning as used here (see the box above). At the same time, equitable solvency *throughout the future* bears a close relationship to comprehensive net worth.

that help maintain financial resources over time. For example, surplus distribution arrangements that give priority to achieving and maintaining a given level of financial resources provide financial strength, whereas distribution arrangements that give priority to continuing transfers to the government do not.

The most fundamental source of financial strength is assured profitability through time – ie *positive comprehensive net worth* – coupled with mechanisms that make temporary fluctuations in accounting net worth (including into negative territory) essentially irrelevant. Comprehensive net worth is not commonly measured and reported. We do not attempt to measure it, but we allude to the concept when discussing *structural net income* – the discounted present value of which constitutes comprehensive net worth.

Some brief elaboration on how these terms relate to *capital* may be helpful, since discussions of central bank finances often focus on capital and its adequacy. Starting at the narrowest end of the range of components of financial strength:

- *Capital* refers to the money committed unconditionally by the owners of the central bank, either at the central bank's foundation or subsequently by way of a new injection of funds (eg in a recapitalisation). For most central banks, "capital" is foundation capital, and is a historically determined number that is small relative to reserves built from retained earnings. Foundation capital rarely acts as a buffer – it is rarely written down. The Bank of Mexico, for example, continues to report MXP 8,284 million of capital even in years when total equity is negative.
- Capital is only one component of *equity*, which also includes more active buffers such as reserves (built through retained earnings that are not distributed to shareholders as dividends), retained earnings (ie profits pending distribution or transfer to reserve), revaluation accounts (a special buffer tied to changes in the value of assets and liabilities in the books of the central bank), and general provisions against risks that are yet to be realised.
- Our definition of *financial resources* goes beyond equity to include callable resources. In a few cases (eg the Bank of Korea), central banks have the right to call for fresh capital from their owners, and that call is enforceable.
- And our definition of *financial strength* goes further again, to allow for risk transfer mechanisms that work in favour of keeping the central bank's financial resources intact. These risk transfer mechanisms may include the structure of the rules governing the distributions of dividends.

Our definition of financial strength is therefore multifaceted. As will become clearer, long-run profitability while simultaneously fulfilling policy and operational objectives is the underlying core – although it is rarely visible in regular financial statements. Because visible financial buffers – ie those that appear in the published financial statements – matter both for market and political reactions (important for the ability to meet objectives) and for profitability, accounting equity is also relevant. As we are concerned about standalone financial strength, the ingredients of structural profitability and visible financial buffers must be under the independent control of the central bank in order to qualify for this definition.

Some private sector economists have recently made some calculations that illustrate the potential quantitative importance of these distinctions. The table below summarises their calculations for three central banks.¹³

Illustrations of the quantitative significance of different concepts				Table 1
	Eurosystem (€ billions)	Bank of England (£ billions)	Federal Reserve (\$ billions)	
Comprehensive net worth at price stability	5,068	237	4,172	
Shareholder equity (end-2010)	411	4.8	134	
Total assets (end-2010)	2,002	247	2,428	

Comprehensive net worth here consists of the sum of the present value of future seigniorage income, conventional shareholder equity, and the stock of banknotes outstanding.

Sources: Buiter and Rahbari (2012), and central bank financial statements.

2. The relevance of own finances, as viewed from the economics literature

The literature identifies three reasons to think that a central bank's financial state may be of little relevance to its ability to discharge its policy obligations: (1) base money can be created as needed; (2) base money monopoly seemingly assures long-run profitability, since these liabilities carry no servicing cost;¹⁴ and (3) government ownership provides a backstop. All three have been subject to challenge.

a. Theory

Bindseil et al (2004) argue that for as long as people are willing to hold central bank liabilities at no interest and base money grows at least as fast as operating expenses, adverse events will just be bumps along a road of assured long-term financial strength. From this perspective, the comprehensive net worth of the central bank is greater than the net assets registered on the published balance sheet. This is because published balance sheets do not include intangible assets such as the franchise value of the (monopoly) right to issue base money (Fry (1992), Stella (1997), Ize (2005), Buiter (2008)).¹⁵ Fry (1992) shows that comprehensive net worth

¹³ The numbers presented for comprehensive net worth in Table 1 are extracted from a matrix of values calculated by Buiter and Rahbari using different assumptions. For illustrative purposes and without implied judgment we have selected the values corresponding to country-specific estimates of the interest rate semi-elasticity, but identical estimates and assumptions for the output elasticity of currency demand (0.8), trend real growth rates (1.5% per annum), inflation (2% per annum), and discount rates (4%).

¹⁴ We ignore printing and other currency management costs, as well as the costs of maintaining computer systems to support deposit accounts at the central bank, as they are typically trivial in the scheme of things.

¹⁵ This assumes that the central bank does not have contingent or other off-balance sheet liabilities with a net present value larger than the unregistered franchise value of its monopoly over base money issuance.

could reach over one third of annual GNP even in (stylised but realistic) cases where prices are stable.¹⁶

However, the ability to create base money and exchange it for the resources needed to run the central bank, or for the assets used in the implementation of policy, may not be the financial cold fusion device that it first appears to be. There are limits. BIS (1996), Friedman (2000), Goodhart (2000) and Santomero and Seater (1996) amongst many others discuss the prospect of central banks' currency note issue eventually being crowded out by e-monies. Also, central banks may effectively lose their monopoly right to issue currency notes through dollarisation (Papi (2011)). More generally, the return (in terms of higher central bank revenues) coming from monetary expansions is thought to follow a seigniorage Laffer curve, declining after some peak as inflation continues to rise (Cagan (1956), Anand and van Wijnbergen (1989), Easterly, Mauro and Schmidt-Hebbel (1995) and Buiters (1986)).

The limits that result from changes in the behaviour of base money holders as the value of base money erodes are not, however, the ones most likely immediately to bind. The inflation rates required of policymakers by the macroeconomic objectives written in their governing laws are typically well below those at which central bank revenue would peak as inflation rises.¹⁷ At first glance, this might be taken to imply: end of story – the revenue consequences of inflation higher than that consistent with policy objectives are irrelevant. But from another angle, this simply reveals that the issue is a potential conflict or trade-off between policy and financial objectives.

Stella and Lönnberg (2008) coin the term “policy insolvency” or “policy bankruptcy” for cases where the only way to assure long-run profitability – absent transfers from the government – is to increase base money at a rate inconsistent with the policy objective.¹⁸ Buiters (2007) derives analytically the conditions under which such a Laffer curve would render an inflation target “not independently financeable” by the central bank – by which he means not consistent with the central bank's long-term profitability and hence positive comprehensive net worth.¹⁹ Stella and Lönnberg's policy insolvency can be thought of as being a state in which the chosen inflation target is not independently financeable by the central bank.

Yet how often do central banks find themselves in a situation where long-run profitability is so tenuous that their comprehensive net worth could be negative, such that they may face policy bankruptcy because the inflation target is not independently financeable? This is an empirical question. The second line of argument – that monopoly over base money issuance assures long-run profitability – suggests that such circumstances would be rare indeed. If so, we need not concern ourselves with the financial state of the central bank getting in the way of

¹⁶ The relevance of the qualifier is as follows: the higher inflation is, the higher nominal interest rates are and therefore the wider the central bank's net interest margin is (assuming a non-trivial proportion of base money liabilities bearing no interest, and earning market-related yields).

¹⁷ Easterly, Mauro and Schmidt-Hebbel's (1995) work suggests inflation rates of around 250% for the sample of 11 high inflation (>100% per annum) developing country cases during the period 1960–1990.

¹⁸ Fry (1992) had suggested that insolvency for a central bank is defined by a situation in which accelerating inflation is required in order for it to continue to service its liabilities.

¹⁹ Buiters also derives the conditions under which an inflation target is not “jointly financeable” by the central bank and treasury working together. In such a case, the inflation target is infeasible, since the government cannot even bail out the central bank to make the target financeable.

its policy goals. Such is the view often taken by economists whose view of central banking was formed in the context of a large developed financial market such as the United States. (Being an empirical question, the available evidence will be discussed in the next section).

The third strand of argument for being unconcerned about a central bank's finances involves the owner's deep pockets. Negative comprehensive central bank net worth on a standalone basis might not matter if the government's power of taxation provides a backstop, and that backstop can be deployed without getting in the way of policy.²⁰ Most macroeconomists implicitly assume that this is the case, by considering monetary policy and public sector finances within a unified institutional structure that conflates the monetary and fiscal authorities (see, for example, standard macroeconomics textbooks such as Romer (2011) and Walsh (2010)). Even so, standard macro commonly treats inflation as a source of tax revenue, and a potentially efficient source at that.²¹ The possibility of a conflict between policy objectives of price stability and efficient financing of government spending arises. In more extreme circumstances, a fiscal authority with a wilful disregard for monetary policy might force inflationary financing to play a larger role than is consistent with price stability (Sargent and Wallace, 1981). The possibility of such fiscal dominance in the future may also play a role in normal times. If inflation is used as a revenue-raising device in normal times, signals are provided about the government's policy preferences in the management of its inter-temporal budget constraint. The greater the perceived chance that the inflation tax will be used when public finances are constrained, the more likely it is that a shortfall in the central bank's contribution to government revenues will result in higher inflation rates rather than higher tax rates.²²

Such public finance considerations provide reasons for doubting that central bankers could always rely on the availability of transfers from tax revenues to plug holes in the comprehensive balance sheet, at least without impeding their pursuit of price stability. Furthermore, because the bigger concern of policy designers has

²⁰ Buiter (2008) indeed argues that the taxpayer, through the treasury, is the *ultimate and only* guarantor of central bank solvency. National fiscal authorities must therefore let it be known that they are underwriting the central bank's net worth. He does not address (in this 2008 paper) the implication of this crucial role of the fiscal authorities for central bank policy effectiveness, in circumstances where central bank independence has been instituted to support achievement of public policy objectives (for example, by making credible a price stability objective, or a promise not to forbear on enforcing regulation).

²¹ Phelps (1973), Poterba and Rotemberg (1990) and Chari and Kehoe (1999). If inflation were widely considered in practice to be one of many tax sources, certain cyclical properties would be observed. They generally are not, according to Roubini and Sachs (1989), and Edwards and Tabellini (1991), although Delhy Nalivos and Vuletin (2012) suggest that this may be a result of not controlling different degrees of central bank independence (independent central banks would not adjust the tax – ie inflation – rate countercyclically or fill gaps left by weakness in other tax revenues).

²² Under the fiscal theory of the price level, prices are indeterminate until the fiscal authorities choose a policy path, making the price level a joint function of fiscal and monetary policy (see Leeper (1991), Sims (1994), Woodford (1995), and Kotcherlakota and Phelan (1999)). Sims (2003, 2008) suggests that the ability to ignore the central bank's separate identity depends on the understanding that the taxes ultimately backstop the central bank's net worth. Where that backstop is not available – Sims suggests that the ECB may be in such a position – the central bank may need to worry more about preserving its net worth. Zhu (2003), on the other hand, creates an independent role for the central bank's finances within the Benhabib et al (2002) fiscal theory model by assuming that the central bank cares about its own net worth. In a liquidity trap, that concern for its own finances stops the central bank undertaking sufficiently aggressive policy, resulting in macroeconomic instability (local indeterminacy and bifurcation).

been to prevent overuse of the inflation tax,²³ institutional separation of the central bank and the treasury has been favoured, with the central bank being endowed with a price stability objective that dominates any financial considerations relating to inflation tax revenue forgone.²⁴ In this context, the assumption of a unified public sector is no longer valid. Since institutional separation to limit the role of political preferences in policy could be undermined if politicians remain ultimate paymasters, reliance even on future transfers from tax revenues to support the central bank's comprehensive net worth would conflict with the institutional design objectives. For Ize (2005), to maintain inflation credibility, a central bank needs its comprehensive net worth (its future real profits) to be non-negative, even if *current* profits and/or *current* accounting equity are negative. Buiters (2008) arrives at the same conclusion.

There is thus a body of literature that rejects the idea that a central bank's financial state is *by nature* irrelevant to its ability to discharge its policy obligations, on all three grounds that might have led to that conclusion. In relation to all three grounds, this body of literature cites examples or empirical evidence to the contrary, suggesting that the policy irrelevance of a central bank's finances is not a given. (1) Base money can be created as needed, but potentially at the expense of price stability. (2) A monopoly over the issuance of base money does not guarantee long-run profitability, except again at the potential expense of policy objectives (and even then there are limits). And (3), government beneficial ownership provides a financial backstop that may contain a poison pill, by damaging policy performance through changing decision-maker incentives. To assess how common and therefore practically relevant are these counter-examples and limitations, we now consider the empirical evidence.

b. Empirical evidence

The most significant empirical matter is whether central banks by nature always enjoy a stable and voluminous source of earnings. Martínez-Resano (2004, p8) describes this idea as "naïve". Schobert (2008) reports 43 cases of loss-making of at least one year, out of 108 central banks during 1984 to 2005. And Stella and Lönnberg (2008) present a table showing 15 Central and South American cases that between 1987 and 2005 had losses for five or more years running, with eight of those cases involving loss runs for a double-digit number of years.

Fry (1992) notes that published profits are typically much lower than calculated seigniorage revenues, with the difference usually being explained by holdings of substandard (non-market) assets and expensive liabilities. In a pared-down framework, Ize (2005) focused on the carrying cost of net foreign currency reserves and the relationship between the growth of central bank operating costs and currency issuance. With this stylised representation of the long-run profitability

²³ Overuse here implies misperceptions of the cost of inflation or misaligned decision-makers' incentives that allow higher than optimal inflation.

²⁴ There are two main strands of the literature arguing for institutional separation/independence. The first is rooted in models where an inflation bias is sourced in the interplay between inflation and short-term output trade-offs, and the resulting impact on *expectations of* policymaker behaviour (Barro and Gordon (1983); Persson and Tabellini (1993); Walsh (1995); and Albanesi et al (2003)). The second focuses on the influence of political competition on macroeconomic policy as a source of economic cycles or fluctuations (starting with Alesina (1987) and in subsequent work with various co-authors; and Drazen (2000)). Although these sources of inflation bias are conceptually independent of inflation tax considerations, by also motivating institutional separation, they likewise undermine the proposition that the central bank could rely on government bailouts to assure financial strength without potentially getting in the way of achieving policy objectives.

problem, he concluded that the average low-income country's – and several middle-income countries' – central bank is unlikely to have sufficient "structural" profits²⁵ to allow it to operate without either an equity base large enough to fill the income gap, or inflation above levels consistent with price stability. In other work, Ize (2006) found that in a sample of 87 central banks in 2003, about one third had negative structural profits, typically as a result of both negative net interest margins and relatively high operating costs. Net interest margins for the two thirds of the sample with positive structural profits were on average *positive* (to the tune of nearly 10% of currency on issue), whereas they were more than *negative* for the other third (to the tune of over 3%). The lack of structural profitability for the weak group was exacerbated by its comparatively high operating costs (40% higher than for the other group, on average, as a proportion of currency issuance).

Clearly, it cannot be the case that central banks are profitable *by nature*. There are too many counterexamples. Indeed, one of the points to be made in this paper is that central banking is highly diverse in its finances (as well as in other characteristics). Even in normal times, long-run profitability is tenuous for many central banks.

What accounts for these apparent violations of the proposition that monopoly control over base money issuance is a guarantor of profitability? Fry (1992) puts the blame squarely on quasi-fiscal activities taken on by central banks or forced on them.²⁶ Others point the finger more at exchange rate-related issues. Schobert (2008), for example, reports that of the 8% of annual financial statements surveyed (of 108 central banks, between 1984 and 2005) where losses were reported, the great majority had sterilisation costs or exchange rate losses as the biggest expenditure items.²⁷ Cukierman (2011) suggests that monetary regime changes and structural changes to the financial sector are both conducive to loss-making by the central bank, especially in countries with narrow financial markets. We will also suggest that part of the reason is grounded in the nature of financial systems in less advanced economies, and is thus structural (Section 1 in Part C).

Still, if not irrelevant *by nature*, and financial weakness is not in practice rare, it might be the case that a central bank's financial state is in practice *usually irrelevant*

²⁵ Roughly, profits generated from assets backing the currency issuance, net of interest expenses associated with interest-bearing liabilities and operating costs. See also Ize (2005).

²⁶ Quasi-fiscal actions may be thought of as redistributive policy actions that could have otherwise been undertaken by the fiscal authorities on budget, via some combination of taxes and subsidies.

²⁷ The Fry and Schobert views are not necessarily at odds. Mackenzie and Stella (1996), among others, argue that exchange rate related actions are often quasi-fiscal in character, in that they are redistributive (eg favouring exporters), and could in principle have been done instead on budget via explicit taxes, subsidies or expenditures. The dividing line between fiscal and monetary policy activities is not at all clear, given that many monetary actions have both distributional and fiscal consequences (in part, through the central banks' own finances). For Goodfriend (2011), credit policies – defined as actions that change the composition of the central bank's balance sheet but which, by not affecting bank reserves or the interest paid thereon, do not change the federal funds rate – fall clearly over the line. Monetary policy and interest-on-reserves policy (the other two categories that he discusses) have fiscal effects but are more obviously monetary in nature, he notes. Even so, at the zero lower bound, Goodfriend argues that risks to profits and hence fiscal income may become large and require the ex ante support of the fiscal authorities if the central bank's financial independence is to be preserved. Shirakawa (2010) is clearer still: "Unconventional policy measures taken by a central bank involve quasi-fiscal elements, such as potential taxpayers' burden incurred by a loss from such operations, and intervention in resource allocation at a micro level. ... Since [] such measures need to be decided and implemented by government in democratic society, a central bank falls into a difficult position, when decisions by government are just postponed."

to its purposes. Ize (2006) provides prima facie evidence that it is not irrelevant in general to central banks' policy purposes. In the division of his sample of 87 central banks into those with positive and those with negative structural profits, he found average inflation in the former group to be about one third of the average rate in the latter in 2003 (3.5% versus 9.5%). Stella (2003) used the same approach (weak versus strong finances, although based on central bank losses, for a different sample, and for three years – 1992, 1996 and 2002) and produced similar results. Stella (2011) used a wider sample, a different set of years (1992, 1997 and 2004) and a different definition of financial strength ("capital" and "other net items" in the IMF's International Financial Statistics) to obtain much the same picture: central banks with weak finances tend to have higher inflation outcomes (twice as high²⁸).

There are also several case studies to consider. According to Friedman and Schwartz (1963), the Fed's concern for its own net worth was a factor in preventing an aggressive expansionary response to the emerging Great Depression. Winding the clock forward, Ueda (2004) discusses the cases of Venezuela in the 1980s and 1990s, and Jamaica over a similar period, as examples where financial weakness had forced abandonment of inflation control.²⁹ Japan has itself been cited as an example of monetary policy being constrained by financial weakness – or rather, the threat thereof. Van Rixtel (2009) among others quotes several key Bank of Japan policymakers as expressing concern about aggressive quantitative easing potentially leading to a loss of independence through a weakening of the Bank's finances.³⁰

In other references to specific cases, Dalton and Dziobek (2005) discuss several instances (Brazil, Chile, the Czech Republic, Hungary, Korea, Thailand) where losses were caused by prior policy mistakes, although in many of these cases central bank reforms subsequently prevented these losses compounding policy problems. Schobert (2005) highlights several cases in Eastern Europe and Turkey, where underperforming assets acquired for quasi-fiscal reasons were significant enough on the balance sheet to impair earnings and at times impede policy. Stella (2008) considers the examples of Costa Rica, Hungary, Nicaragua, Peru, Uruguay, and Venezuela. Prior to the introduction of a new central bank law, the Central Reserve Bank of Peru, for instance, experienced several years of mainly quasi-fiscal losses that exceeded 5% of GDP in 1987, with the losses being primarily financed by money creation. Inflation exploded, reaching 7,000% in 1990. Cases in Asia have also been cited at various times, including that of the Philippines where, to re-establish policy capacity, the old central bank was liquidated in 1993 and a new one instituted with a clean balance sheet and new governance arrangements. Stella (2011) also discusses the cases of Hungary in the mid-1990s, Peru and Uruguay in the late 1980s and early 1990s, Nicaragua in the early 1990s, identifying a

²⁸ Statistically different at the 99% confidence level, after excluding hyperinflation outliers.

²⁹ Vaez-Zadeh (1991) also discussed the experience of Jamaica, where in his reading of the history the central bank was forced to turn to financial repression (economically inefficient penalties on banks accessing central bank facilities) because the interest costs of raising its own liabilities rates were compounding existing losses.

³⁰ See Box 1 of van Rixtel (2008); see also Cargill (2005) and Benecká et al (2012). Sims (2003) had argued that a central bank concerned about its independence could refrain from stimulative monetary policy because of the implications for its own financial risks, but had associated that issue with the ECB rather than the Bank of Japan. He suggested instead that the fiscal authorities in Japan might have weakened their stimulus on account of worries about rising real liabilities at the central bank. It is important to note that today's Bank of Japan officials deny such an impact on policy. While recognising the existence of a conflict between the interests of policy and the Bank of Japan's own finances, Governor Shirakawa has made it clear that the policy interest dominates (Shirakawa (2010)).

correspondence between financial weakness at the central bank and poor macroeconomic policy outcomes.³¹

However, important recent case studies of the central banks of Chile (see especially Restrepo et al (2009)) and the Czech Republic (Cincibuch et al (2008) and Frait and Holub (2011)) provide evidence that financial weakness *per se* does not hamper policy performance in practice. A casual survey of central banks that have recently performed well in policy terms despite financial weakness would also include the central banks of Israel and Mexico. These four cases get more attention in Part C of this paper.

A simple association between periods of financial weakness or stress and policy outcomes is insufficient. At a minimum, it would be desirable to control for the presence of other factors that may contribute to determining policy outcomes. One obvious possibility is that bad national economic policy arrangements cause *both* poor macroeconomic outcomes and losses at the central bank. We are aware of only three studies that use econometric methods to attempt to control for such possibilities:

Klüh and Stella (2008) document a decline in the financial strength of the median central bank in the 10 years to 2005, with return on average assets falling from around 1.7% to around 0.75% (across a sample of 130 central banks). In panel regressions with 15 Latin American countries between 1987 and 2005, they find a statistically significant role for central bank financial strength in explaining the erosion of purchasing power, with some evidence of non-linearity, whereby only a substantial impairment of finances has a material effect on macroeconomic outcomes. Benecká et al (2012) subject these findings to several additional robustness checks, including extending the sample beyond Latin America and using different empirical techniques. They conclude that the Klüh and Stella results are sometimes confirmed, but are generally weak and not robust.

Adler et al (2012) take a different approach, asking not about the influence of central bank finances on macroeconomic policy outcomes, but instead on monetary policy settings, using optimised policy reaction functions as the baseline.³² The idea is to side-step the question of additional determinants of macroeconomic policy outcomes beyond those under the control of the central bank. They find statistically significant effects of central bank financial weakness on deviations of interest rates from “optimal” settings, although most robustly and significantly when policy deviations are large. But these results hold only for less well developed economies. It is possible that the quality of policy institutions makes a difference.

c. Summary

To summarise the messages from the literature: theory suggests that central banks can get into financial trouble despite the clear financial advantages that come with their monopoly right to create base money, protection from bankruptcy proceedings and the backing of an owner with exceedingly deep pockets. Such trouble is characterised by negative comprehensive net worth – that is, insufficient

³¹ For clarity, here we are not using Stella’s (2008) definition of financial weakness, which is a financial situation that prevents the achievement of policy goals. In this context, such a definition would be circular.

³² The policy reaction functions are instrument rules in the spirit of Taylor rules, but allow for interest rate smoothing and a response to the exchange rate. The sample is limited to countries with a degree of exchange rate flexibility.

profitability over the entire (discounted) future to offset deficits. Only two escape routes appear available to a central bank that might be at risk of finding itself in such a situation, and neither is attractive. The first is to alter policy course: ease up on inflation control, or eschew desirable though financially risky policy actions. And even this escape route is not without limits, as the revenue gains from higher inflation ultimately fall, and a poorly-functioning financial market may eventually drive intermediation offshore. The second escape route – fresh real resources transferred from the taxpayer – may conflict with the policymaking incentive structures purposefully constructed by central bank independence, since taxpayer resources are intermediated through the political process. And public finances may not be in good enough shape for governments to forgo the chance to dip into inflation taxes.

The limited empirical evidence available is not conclusive as to the impact of weak finances on a central bank's prospects for policy success. While the theoretical financial barriers identified in the literature are not commonly felt, they do exist, especially in less developed economy contexts. What is less apparent from the literature is whether the (theoretical) possibility that a central bank might ultimately need fiscal backing could affect attitudes and expectations of economic agents now. In that context, we do not have formal evidence on the extent to which current conventional accounting indicators of financial strength or weakness are regarded by economic agents as noisy signals of approaching deep limits to policy (even if, in reality, they might often be downright misleading signals, as will be discussed later).³³ These unknowns may be becoming more important. The data tentatively suggested a trend weakening in the financial state of central banks even before the latest financial crisis struck in 2007. As we discuss in this paper, the crisis has substantially altered the financial exposures of several developed economy central banks, making their finances look more similar to those of their confrères in less developed economies.

³³ Vaez-Zadeh (1991) suggested that the mere emergence of losses at the central bank might have adverse macroeconomic consequences.