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The views expressed are those of the authors and not necessarily the views of the BIS.

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Central bank capital and trust in money: lessons from history for the digital age¹

Sarah Bell, Jon Frost, Boris Hofmann, Damiano Sandri and Hyun Song Shin²

June 2024

Abstract

Historically, central banks have at times operated successfully with negative equity. This indicates that a negative equity position of the central bank can be fully consistent with preserving trust in money. In addition, there is no evidence of any systematic relationship between the equity position of central banks and their ability to meet their monetary policy objectives. However, the case of the Bank of Amsterdam in the late 1700s, and the emerging market crises of the 1980s and 1990s, provide cautionary tales on the importance of fiscal backing in upholding trust in money. The pivotal economic determinant behind the trust in money is the portfolio decisions of private holders of central bank money. In particular, there are potential “tipping points” when they abandon existing forms of money in favor of alternatives.

Keywords: money, trust, central banking, central bank solvency, fiscal sustainability.

JEL codes: E42, E58, O32.

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1. Introduction

Central banks are unlike private financial entities in that they are public institutions that pursue public policy objectives. Their aim is not the pursuit of profits. Any profits or losses are the result of policy actions in pursuit of their policy mandate. In particular, because central banks are issuers of fiat money, their liabilities are unlike the debt liabilities of private sector entities that are subject to repayment or redemption. Therefore, the standard tests of solvency – of having positive equity – do not apply in the same way to central banks. They can operate with negative equity, and many have done so in recent decades. The key question addressed in this paper is whether (and how much) central bank capital matters in preserving the trust in money. This question has gained more attention recently as central banks have raised policy rates to combat inflation, resulting in valuation losses on their longer-duration assets and a higher cost of remuneration on reserve balances.

The short answer (to be developed further below) is that a strong capital position is neither necessary nor sufficient for preserving trust in money. A strong capital position of the central bank in the conventional accounting sense is not an absolute prerequisite for preserving trust in money. This is evidenced by central banks that have operated effectively with negative equity. Still, these central banks have all benefited from support by fiscal authorities with sustainable debt levels. Conversely, there have been instances where trust in money eroded due to concerns about fiscal sustainability, despite central banks having positive capital. This suggests that the sustainability of public finances plays a critical role.

Instead of the central bank's capital position, our paper highlights the importance of a related set of issues as key for the preservation of trust in money. The pivotal economic mechanism that we highlight is the portfolio decision of private holders of central bank money. When private holders have access to alternative forms of money and other financial claims, fiat money needs to command unquestioned trust on the part of the private holders. While network effects will preserve support from private financial entities, erosion of trust could shift the economy closer to potential "tipping points" when holders abandon domestic money in favor of alternatives, whether they are metal coins in the 1700s or other reserve fiat currencies or crypto stablecoins in the modern era. It is in this context of the portfolio choice of private holders of central bank money that the capital position of the central bank enters into the analysis. This is because a weak or negative equity position of the central bank will have a bearing on how the tipping point of the switch to an alternative currency is determined. The outward symptom of such a tipping point would be the sudden collapse of the exchange rate during a currency crisis. The collapse of the currency can be seen as the point where there is a sudden loss of trust in money.

Before addressing these fundamental issues, we begin with an overview of the empirical evidence behind central bank capital and policy effectiveness. As we show below, there is little evidence from the major advanced and emerging market economies (EMEs) of any systematic relationship between the size of the equity buffer of a central bank and subsequent inflation. This finding holds even when comparing central banks with positive equity with those with negative equity. The key is the unquestioned trust in money secured by a credible central bank (Carstens (2024)).

While there is no one-for-one relationship between the equity level of the central bank and strength of the trust in money, it is illuminating to examine historical cases where the fiat money system came under sufficient stresses that trust in money broke down. We examine one such case – the demise of the Bank of Amsterdam in the late 1700s, arguably an early proto-central bank that issued fiat currency as book entries used for the settlement of wholesale payments.

The example of the Bank of Amsterdam as discussed by Bolt et al (2024) highlights how the portfolio choice of private holders of central bank money is the key economic determinant of the trust in money. The capital position of the central bank enters into the analysis especially when the central bank lacks credible fiscal support. In this case, a weak or negative equity position of the central bank influences the tipping point for the switch to an alternative currency. We return with a more detailed discussion of these issues below.

This paper adds to a growing literature on the role of central bank capital (see eg Stella (1997, 2002), Bindseil et al (2004), Cúrdia and Woodford (2011), Archer and Moser-Boehm (2013), del Negro and Sims (2015), Hall and Reis (2015), Reis (2015), Nordström and Vredin (2022), Wessels and Broeders (2022)). It also addresses the role of fiscal-monetary interactions for monetary stability (Sims (1994), Buiters (2020), Cochrane (2023)).

The paper is organized as follows. Section 2 opens with an overview of the evolution of central bank equity in recent decades and examines the empirical association between central bank capital and monetary stability. Section 3 gives a cautionary tale from monetary history, describing the downfall of the Bank of Amsterdam. Section 4 discusses how the mechanisms outlined in the loss of trust in money can play out in emerging market currency crises. Section 5 concludes by discussing some lessons for the digital age.

2. Central bank capital and economic outcomes

We begin with an overview of the evolution of central banks' equity in recent decades and its association with inflation and other macroeconomic outcomes. To measure central banks' equity, we rely on data from the International Monetary Fund (IMF) International Financial Statistics. Specifically, we use "Shares and Other Equity" of the central bank, as provided in line 17a.³ We normalize equity by the size of central bank assets. The equity-to-asset ratio provides an indication of the central bank's ability to absorb losses that may materialize from a decline in asset values.

Figure 1.A shows the median level of central bank equity in per cent of assets across an unbalanced panel of 47 countries since the 1950s. The country selection is based on data availability.⁴ The level of central bank equity has varied considerably

³ See <https://data.imf.org/?sk=4c514d48-b6ba-49ed-8ab9-52b0c1a0179b>.

⁴ The country sample comprises Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Croatia, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Latvia, Lithuania, Luxembourg, Malaysia, Mexico, the

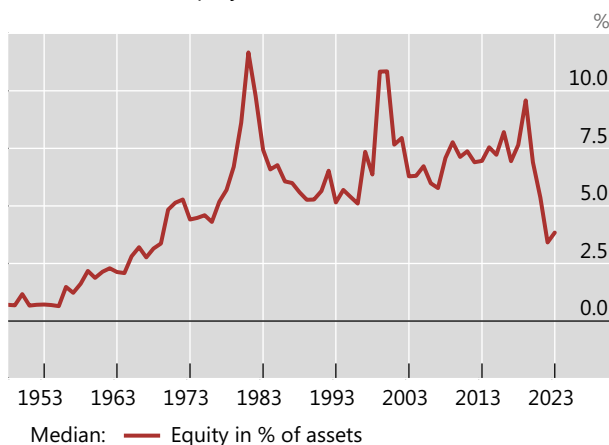
over time. Starting from about 1% in the early 1950s, central bank equity followed an upward trend until 1980, reaching over 10% of assets. Equity levels then hovered around 5–10% until the post-pandemic inflation surge.

Over the past two years, the median equity ratio has fallen substantially. Figure 1.B shows that the decline has been common across most countries, with equity levels in 2023 generally lower than those in 2021. This mainly reflects the impact of the post-pandemic monetary policy tightening that was required to curb inflationary pressures. Rising interest rates have reduced profits or even led to losses, especially for those central banks that engaged in large asset purchase programs after the Great Financial Crisis (GFC) and during the Covid-19 pandemic. These purchases were funded mainly through interest-bearing commercial bank reserves. When central banks increased interest rates to curb inflation, net interest income declined because a large portion of their liabilities were linked to policy rates. Asset valuations also came under pressure with rising bond yields. This put further strain on the profitability of central banks that recognize market value in calculating net profits. Reflecting these dynamics, a number of central banks have reported losses. In many of these cases, losses are sizeable and may result in negative equity (Bell et al (2023)).⁵

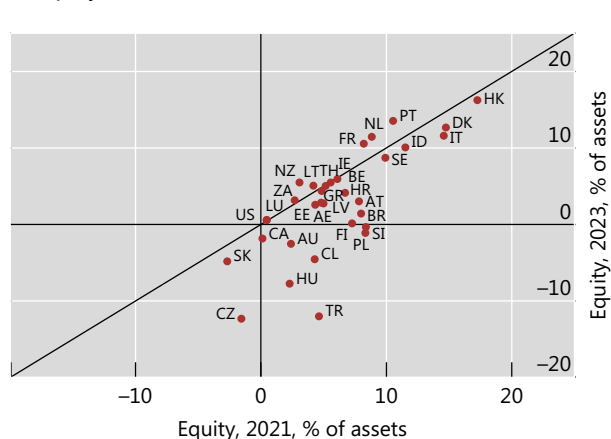
Evolution of central bank equity

Figure 1

A. Central bank equity since 1950



B. Equity ratios in 2021 vs 2023



Sources: IMF; national data; BIS.

The balance sheet of a typical central bank comprises foreign and domestic currency securities on the asset side. These are funded largely by banknotes in circulation and commercial bank reserves on the liability side (Figure 2.A). Specific variations in balance sheets depend on the responsibilities of a given central bank. For example, foreign assets may be held for a variety of purposes, including foreign exchange (FX) intervention, the need to meet foreign currency debt obligations and the need to cover trade balances. FX reserves are also a prerequisite for a central

Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Portugal, Slovakia, Slovenia, South Africa, South Korea, Spain, Sweden, Switzerland, Thailand, Turkey, the United Arab Emirates, and the United States.

⁵ See Cecchetti and Hilscher (2024) for an analysis of recent central bank losses in the wake of large-scale asset purchases.

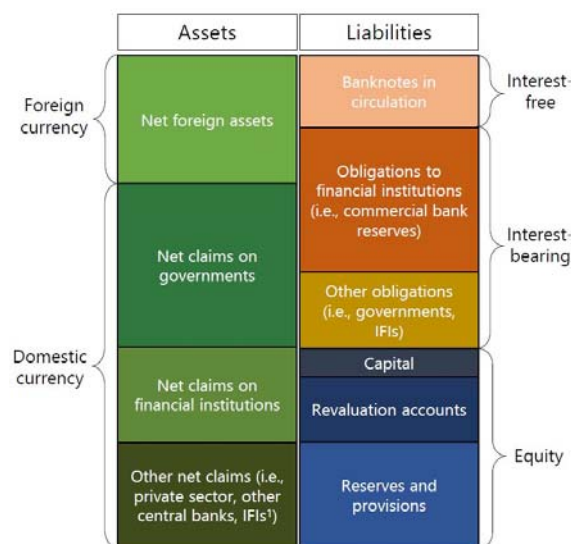
bank's ability to intervene to offset domestic currency depreciation. In some countries, the central bank acts as the banker for the government. Other central banks hold assets or liabilities to support operations that provide or reduce commercial bank reserves (Rule (2015)).

The financial strength of a central bank is determined by a combination of interacting factors, chiefly the structure of the balance sheet, the policies that determine recognition of income, and the rules that determine whether and how much income is retained or distributed (Figure 2.B). Traditionally a central bank's primary source of income is seigniorage, the net income earned on assets funded through currency issuance (a non-interest-bearing liability). For many central banks, and especially those in EMEs and small open economies, exchange rate translation gains and losses normally dominate profit and loss (P&L) movements. Conversely, for other central banks, variations in P&L primarily reflect changes in net interest income or asset valuation adjustments. Different accounting approaches, eg fair value, historic cost or an asymmetric approach,⁶ affect the size and volatility of net income from asset valuations in the short term, although the results wash out over the long term. From there, income recognition and distribution rules determine the size of buffers held against losses. These rules vary considerably across central banks (Bell et al (2023)).

Central bank finances: balance sheet and the drivers of equity

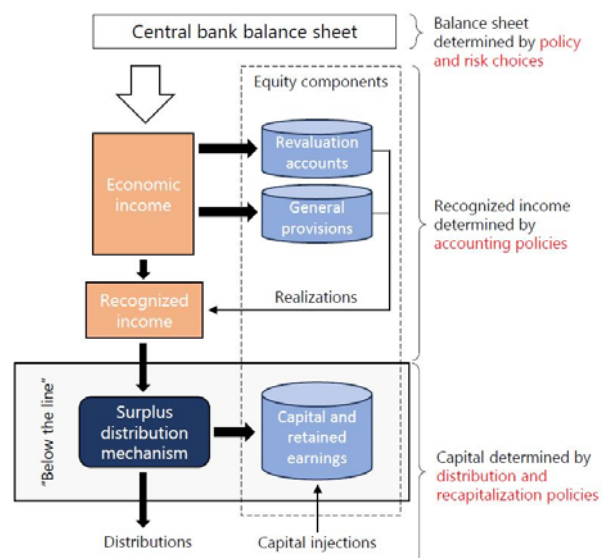
Figure 2

A. Central bank balance sheet



¹ International Financial Institutions

B. Drivers of central bank equity



Sources: Authors, based on Archer and Moser-Boehm (2013).

⁶ The Eurosystem's asymmetric approach for central banks recognizes unrealized gains in asset values accounted for at fair value in revaluation accounts, but it recognizes losses directly in the profit and loss, after the revaluation account for this specific asset is fully depleted.

As public institutions with policy mandates, central banks typically transfer their excess profits to the fiscal authority. In principle, a central bank at one end of the spectrum must remit all excess profits. At the other end of the spectrum, a central bank may be allowed to retain all of its earnings. In practice, most central banks fall in the middle of these two extremes. Many hold equity positions, ie capital plus retained earnings and other buffers in the form of provisions and reserves.

Approaches to distributing excess profits can be either rule-based or discretionary. They can be driven by targets for capital or components thereof and can have additional provisions that apply under specific circumstances. Approaches can be summarized in four types (Archer and Moser-Boehm 2013):

1. those that allow for general risk provisions (in addition to any revaluation buffers);
2. those that provide for smoothing mechanisms;
3. those that include equity protection mechanisms contingent on targets, eg with a rule that losses have to be compensated before distribution starts again or reaches a target equity level; or
4. those that place a cap on annual distributions .

Poorly designed surplus distribution arrangements, eg those that monetize unrealized gains by distributing them to the fiscal authority, can exacerbate decapitalization, impede rebuilding of equity and even risk interfering with policy objectives if the government takes advantage of the opportunity of recapitalization to influence policy (Ueda 2003). By contrast, those that are based on realized profits and losses and that have mechanisms for automatic recapitalization (with full fiscal backing) neutralize the impact of financial outcomes. A fully automated and credible rule for recapitalization of the central bank in case of losses can be regarded as a substitute for positive equity (Bindseil et al (2004)).⁷

Unlike commercial banks, central banks do not seek profits; they cannot be insolvent in the conventional sense, as they can, in principle, issue more currency to meet their domestic currency obligations; and they face no regulatory capital minima precisely because of their unique purpose. Accordingly, they are backed (indirectly) by taxpayers. Even without explicit fiscal backing, insolvency of a central bank would be possible only if the reduction in equity were to exceed the net present value of future seigniorage income.

Did fluctuations in equity levels in the past correlate with changes in inflation rates? And, more specifically, did declines in equity levels foreshadow stronger inflationary pressures? To examine the relationship between central bank equity and subsequent inflation, we estimate the following panel regressions:

$$\pi_{i,t+h} = \alpha_i + \beta e_{i,t} + \gamma_t + \varepsilon_{i,t+h} \quad (1)$$

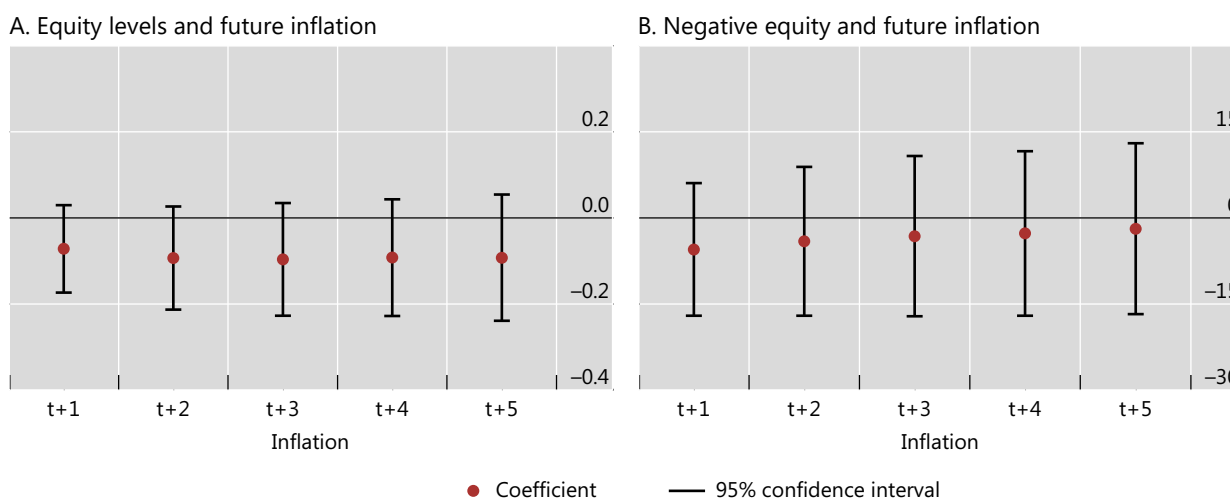
⁷ See Long and Fisher (2024) for a survey of central bank profit distribution and recapitalization arrangements across jurisdictions.

The dependent variable $\pi_{i,t+h}$ is the annual inflation rate $h \geq 1$ years in the future for country i . The regressor $e_{i,t}$ is the central bank's equity in per cent of assets. The regression includes country fixed effects α_i to control for time-invariant country characteristics that may affect inflation as well as time fixed effects γ_t to capture inflationary pressures arising from global shocks (eg commodity prices). As illustrated in Figure 3.A, we do not find evidence of a statistically significant relationship between equity levels and subsequent inflation outturns. These results are obtained after capping inflation rates at 200% to ensure that the regression estimates are not distorted by a few hyperinflation episodes. However, the point estimates remain statistically insignificant even without capping the inflation rates or when controlling for lagged inflation in the regression specification.

No association between central bank equity and future inflation

In percentage points

Figure 3



Panel A shows the relationship between central bank equity in percent of assets and future inflation, from one to five years ahead. Panel B shows the relationship between a negative central bank equity dummy and future inflation, from one to five years ahead. The regression sample includes 47 countries from 1950 to 2023. Data are at annual frequency.

Sources: IMF; national data; BIS.

A possible conjecture is that equity levels may not matter for inflation when they are positive, but they could jeopardize price stability when they are negative.⁸ To test for this hypothesis, we estimate an alternative version of equation (1) where $e_{i,t}$ is a dummy that takes the value of 1 to identify periods of negative central bank equity. As shown in Figure 3.B, we still do not detect a statistically significant association with future inflation.

Additional evidence that negative central bank equity does not inherently compromise inflation stability is provided by the experience of several central banks that successfully operated with negative equity for extended periods. Chile, Czechia and Israel are well-known examples of such cases. As Figure 4 illustrates, central banks

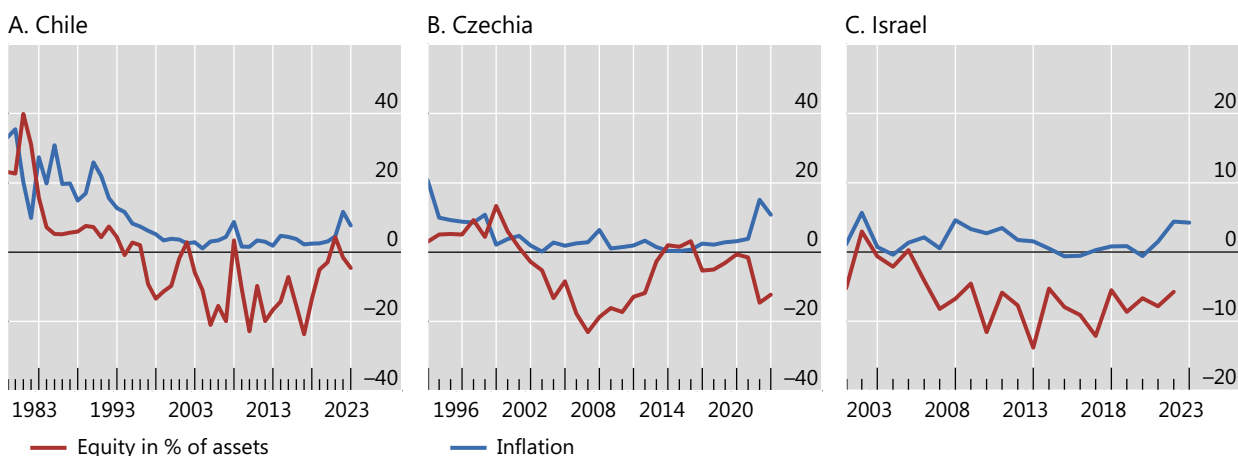
⁸ In this vein, Goncharov et al (2023) find that central banks are more likely to report slightly positive than slightly negative profits, particularly when political pressure is greater.

in these countries have faced persistent phases of negative equity, at times exceeding 20% of assets, and equity was still negative as of the latest available observation. Yet inflation rates have remained far lower than in past decades and are falling again as of the latest available observation, as central banks pursued credible inflation targeting mandates in a context of relatively sound fiscal positions.

Examples of large and persistent negative central bank equity levels

In per cent

Figure 4



Sources: IMF; national data; BIS.

3. A cautionary tale from history: the Bank of Amsterdam

These recent experiences underscore that, when solid institutional foundations are in place, negative or low central bank equity does not interfere with the ability of central banks to fulfil their mandate. Yet, this does not imply that there are no limits. If we go back somewhat further in history, we find a striking example of the limits of trust in fiat money.

Indeed, the Bank of Amsterdam provides a particularly vivid cautionary tale on the role of central bank capital – and what happens when it is depleted against the background of weak public finances. The Bank was founded in 1609 as a public deposit bank owned by the municipality of Amsterdam (see Bolt et al (2024), Shin and Schnabel (2004)). Its initial mandate was to “*check... the confusion of coin, and to be of use to all persons who are in need of any kind of coin in business.*” From the outset, it accepted silver and gold coins in deposit, assessing their quality and validity, and provided payment services. The Bank of Amsterdam subsequently operated for over 200 years and increasingly took on the role of a proto-central bank. It issued a fiat currency – the Bank guilder – that was used in international trade and wholesale payments and is sometimes considered the first global reserve currency (Quinn and Roberds (2016)). The relatively simple structure of the Bank allows us to see the underlying economics more clearly.

At its core, the Bank of Amsterdam functioned as a wholesale payment system. Merchants held deposits at the Bank, denominated in Bank guilders. Bank guilders traded at a premium (agio) to metal coins, which was usually around 5%. The agio indicated how much clients were willing to pay for the convenience and security of holding Bank guilders over (nominally equivalent) guilder coins and thus represented an indicator of trust in the fiat currency. When merchants wanted to make a payment, the Bank transferred funds between merchants' accounts using simple entries in a paper ledger. In addition to this system for wholesale payments, individuals could make retail payments by going to so-called cashiers, who issued receipts that could be used as money in daily transactions.

The Bank was able to grow and become successful due to the trust in its stability, sound finances and backing by the municipality of Amsterdam. Bank guilders were backed by holdings of silver and gold coins, and implicitly by Amsterdam city authorities. On numerous instances during its history, the Bank was able to continue functioning even through difficult circumstances. For instance, in 1672 (the "year of disaster," when the Netherlands was invaded and a severe economic crisis ensued), depositors demanded their funds from the Bank. Voltaire (1751) recounted the decision by the city authorities to open the vaults to public view. This demonstrated not only that the metal coins were still there, but also that they had been in the vault ever since the fire at the city hall decades earlier – the visitors could see coins with burn marks. Episodes like these built trust that Adam Smith (1776) would later refer to, in describing the Bank as follows:

"At Amsterdam, however, no point of faith is better established than that for every guilder, circulated as bank money, there is a correspondent guilder in gold or silver to be found in the treasure of the bank. The city is guarantee that it should be so. The bank is under the direction of the four reigning burgomasters who are changed every year. Each new set of burgomasters visits the treasure, compares it with the books, receives it upon oath, and delivers it over, with the same awful solemnity, to the set which succeeds; and in that sober and religious country oaths are not yet disregarded."

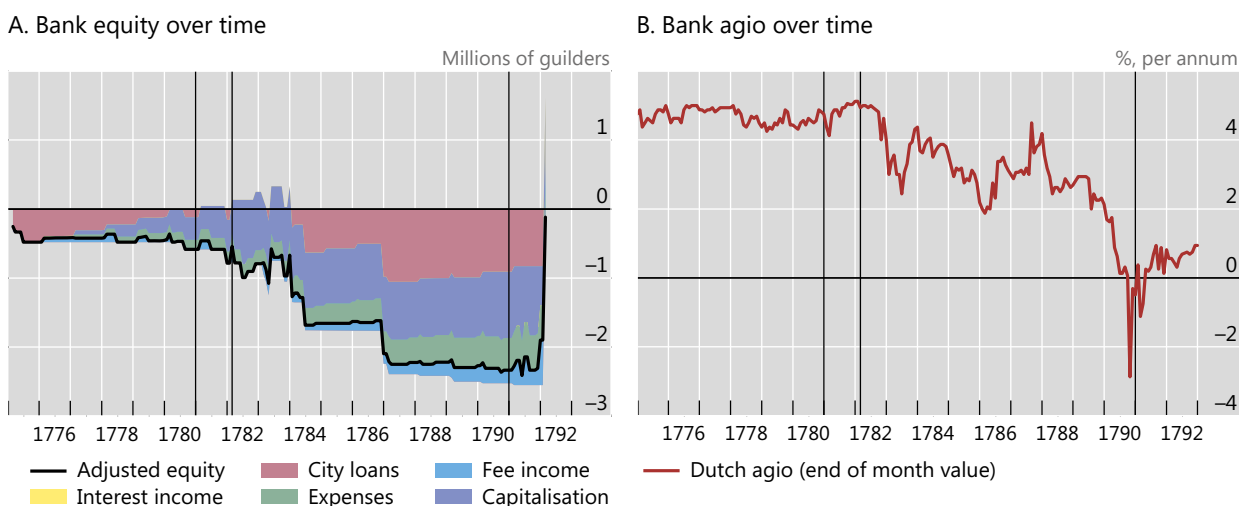
Yet soon after Smith's praise, trust in the Bank started to erode. In 1780, the Fourth Anglo-Dutch War broke out. This led to naval confrontations with the English in waters around the world. It also affected the ships and activity of the other great institution of the time – the Dutch East India Company (VOC). Throughout its history, the Bank had engaged in limited lending to the VOC, often on a seasonal basis, to allow for settlement liquidity in the period between ships' departure and their return with goods and fresh coin. Such lending had always occurred in secret, but it had been an important part of the Bank's operation and ability to support international trade. But starting in 1782, the Bank lent increasingly large amounts to the VOC, until such lending made up the majority of the Bank's assets. And when the VOC lost ships and was unable to repay the loans, trust in the Bank and the Bank guilder started to erode. As Bank equity turned negative (Figure 5.A), the agio fell below 5%. By 1790, it fell even below 0% (Figure 5.B).

The city authorities made limited attempts to recapitalize the Bank, but the funds were soon redirected to the city coffers and the Bank remained policy insolvent. If the

city authorities had successfully recapitalized the Bank, it may have survived.⁹ But in retrospect, the fiscal capacity of the city at the time was far too limited to support a global institution like the Bank; the lack of credible fiscal backing was a handicap that would have been hard to overcome. In the absence of sufficient fiscal support, trust in Bank guilders broke down. In 1795, as French revolutionary armies conquered Amsterdam, they made the full extent of the Bank's losses public, and the agio fell to -30%. The Bank continued as a weakened institution for another 25 years. The lack of a trusted monetary unit of account had real economic costs, with income per capita falling over this period. The Bank guilder lost its role as an international reserve currency, and the center of global commerce moved to London.

After Bank of Amsterdam equity turned negative, the agio collapsed

Figure 5



The three vertical lines refer to specific events in the downfall of the Bank: 1780 – outbreak of the Fourth Anglo-Dutch War; 1782 – Bank steadily ramps up lending; 1790 – agio turns negative.

Source: Bolt et al (2024); Quinn and Roberds (2016); van Dillen (1934); authors' calculations.

In the model of Bolt et al (2024), the value of bank money to users (ie the deposits issued by the Bank of Amsterdam) depends on its value in settlement of wholesale trade transactions, and therefore on the volume of trade and the general buoyancy of the economy. In the face of a negative shock to the economy that reduces the value to users, there is reduced demand for bank money. The network effects in the use of bank money further amplify the decline in the value to users of holding bank money. Other things equal, the excess supply of bank money would put downward pressure on the exchange rate (the "agio").

In principle, the Bank of Amsterdam could respond to the negative shock by reducing the money supply to restore the agio to the desired level. It could do so by selling local coins in the daily open market and debiting the accounts of the buyers, thereby reducing the money supply. However, in the presence of illiquid loans on the

⁹ If it had, the Bank would have likely transformed over time into a modern central bank, and the Netherlands would today have the oldest central bank in the world. That honour instead goes to Sveriges Riksbank, which was founded in 1668, modelled on Stockholms Banco, which was in turn modelled on the Bank of Amsterdam.

balance sheet, there is a hard limit to the reduction in the money stock. The hard limit binds more as losses mount and negative equity eats into the asset value of the Bank. Once the Bank has sold all the liquid assets (the coins), it has only illiquid assets (the loans). The sales needed to stabilize the agio cannot go further, as there is no more capacity for a reduction in the deposits. Bolt et al (2024) solve for the tipping point where negative equity and asset illiquidity render fiat money worthless.

Two key features stand out from Bolt et al (2024), which resonate even for debates of today.

First, while the network effects of fiat money allow monetary regimes to persist for quite some time, there are limits to how resilient such arrangements can be. Being able to issue fiat money gives the central bank considerable latitude to leverage up its balance sheet without loss of confidence in the value of money. Yet the Bank of Amsterdam's failure is a vivid lesson in how a central bank that loses public trust can push its luck too far. When it reaches the tipping point, it fails.

Second, the tipping point comes closer when central bank equity becomes more negative and when economic fundamentals are weaker. Crucially, the Bank of Amsterdam did not receive fiscal support from a sovereign with (adequate) power to tax. The ultimate backing for the value of money is the fiscal sustainability of the consolidated public sector, consisting of the central bank and fiscal authorities (Sims (1994), Cúrdia and Woodford (2011), Reis (2015)). In this sense, fiat currencies need backing, and modern central banks need credible fiscal support from the government that flows from the sustainability of public finances.

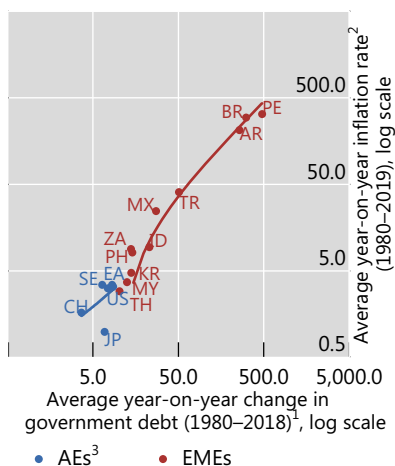
The credibility of fiat money may be at risk if holders of fiat money doubt the willingness of the fiscal authority to recapitalize the central bank in times of need. The loss of confidence manifests itself in a switch in the portfolio of monetary instruments used in the economy. The loss of trust results in a coordinated switch away from Bank money to metal coins. In a modern context, such a shock could occur through dollarization, as we have seen in the case of many emerging market economies, or potentially through "cryptoization," where the portfolio decision in the money system tilts towards modern digital assets such as cryptocurrencies or private stablecoins.

4. Cautionary tales from emerging markets

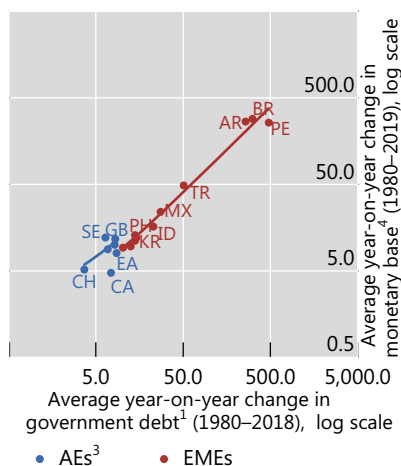
The experiences of many EMEs in the second half of the 20th century provide another cautionary tale. These underscore the key role of fiscal sustainability for the preservation of trust in money, and of the exchange rate as a key catalyst in this relationship.

Across major EMEs, there is a positive correlation between average nominal government debt growth and average inflation over the past four decades (Figure 6.A). The correlation is especially strong in Latin America, which experienced very high debt growth and hyperinflation over this period. By and large, EMEs in Asia and advanced economies exhibit correlations that are much lower. The correlation between government debt growth and inflation is mirrored in the close correlation between debt growth and base money growth, reflecting monetary accommodation of fiscal trends, ie fiscal dominance (Figure 6.B).

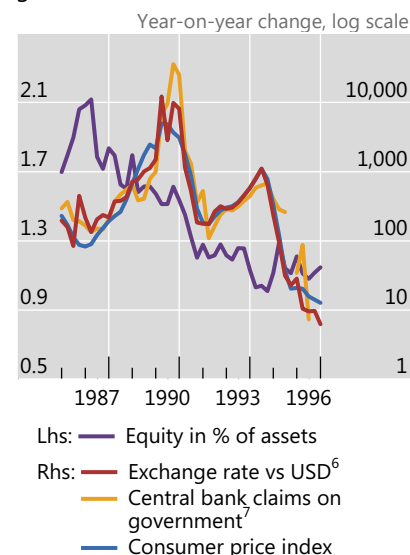
A. Public debt and inflation



B. Public debt and the monetary base



C. Central bank claims on government and inflation



¹ Central government debt, except for CA, DE, FR, GB, IT, JP, PH, SE and US, general government debt. No data for MX between 1981 and 1982; PE starting in 1981. ² Simple average across quarterly year-on-year changes. ³ For the euro area (EA), weighted average of DE, ES, FR and IT based on 2015 PPP GDP weights. ⁴ Before 1999, for the euro area countries, sum of currency in circulation and central bank liabilities to other depository corporations. Data for ID start in 1981 and data for AR are until 2017 and for CH until 2016. ⁵ Simple average across AR, BR, MX and PE. ⁶ Central government debt. No data for MX between 1981 and 1982 and PE data starting in 1981. ⁷ An increase indicates depreciation of local currency vis-à-vis the US dollar.

Sources: Reinhart and Rogoff (2011); IMF, *Historical Public Debt Database* and *International Financial Statistics*; Datastream; Global Financial Data; national data; authors' calculations.

The experience of Latin American EMEs in the 1980s and early 1990s shows how unsustainable fiscal developments, accommodated through the money printing press, lead to a progressive loss of price stability (Figure 6.C). Government financing through the central bank was trending higher over this period, accompanied by rising inflation. At the same time, central bank equity declined significantly. This indicates the strains that fiscal crises place on central banks as they are called upon to provide financial support to the government in the run-up and during the crisis, incurring losses in the process. These observations are consistent with formal evidence showing that the extent of deficit monetization was the key driving force behind most of the high inflation or hyperinflation experiences in Latin American economies (Sargent et al (2009), Ramos-Francia et al (2018)).

These past episodes of emerging market crises show that the exchange rate plays a key role in the process. The unfolding of unsustainable fiscal-monetary interactions was associated with a massive depreciation of the currency (Figure 6.C). The exchange rate depreciated along with rising inflation rates, with exchange rate movements predating jumps in inflation.

The role of the exchange rate highlights the portfolio choice of private entities who have access to central bank money as well as to alternatives. A sudden depreciation of the domestic currency can be seen as a sign that the portfolio choice

of such entities has reached the tipping point whereby they sell the domestic currency in favor of the alternative.

Effectively, the trust in domestic money comes under strain, and a surge in inflation is the symptom of this strain. As a consequence, exchange rate pass-through is higher during currency crisis periods. In Latin America, the pass-through of exchange rate changes to future inflation was persistently near one in the 1980s and early 1990s, when these countries experienced large depreciations (Figure 7.A). Only since the beginning of the 2000s has pass-through fallen significantly. In emerging Asia, pass-through has for most of the past two decades been lower than in Latin American countries (Figure 7.B). But also there, the Asian crisis of 1997 triggered a temporary significant rise in pass-through.

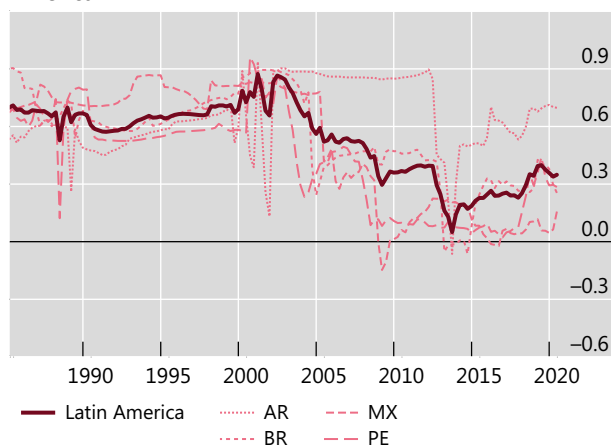
Note that in many cases where inflation surged, central banks have continued to hold positive equity. It is not the central bank's capital position that has driven trust. Rather, it is the portfolio choice of private holders of fiat money, who know that an unsustainable fiscal position puts the sustainability of the consolidated public sector – the government and the central bank – in danger. Domestic holders can move to alternative forms of money, in particular the US dollar. It is in this context that trust in money can be endangered.

Exchange rate pass-through

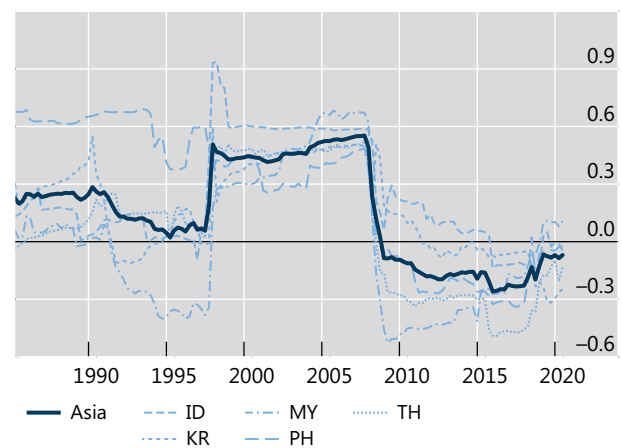
Correlation coefficient¹

Figure 7

A. Exchange rate changes and future inflation: Latin America²



B. Exchange rate changes and future inflation: Asia²



¹ Correlation coefficient on a 10-year rolling window. ² Simple average across individual countries within the panels. Correlation between the changes in the local exchange rate vis-à-vis the US dollar and the one-quarter-forward inflation rate, where the level of the exchange rate is positive when the local currency is depreciating vis-à-vis the US dollar.

Sources: IMF *International Financial Statistics*; Global Financial Data; national data; authors' calculations.

5. Concluding remarks

Central banks are unlike private financial entities in that central banks are public institutions that pursue public policy objectives. The standard test of solvency – having positive equity – does not apply in the same way to central banks. Instead, we have focused on the trust in money as the key issue and asked whether (and how much) central bank capital matters in preserving the trust in money.

The short answer is that a strong capital position is neither necessary nor sufficient for preserving trust in money. Nevertheless, central bank capital matters for the trust in money. This is because the pivotal economic mechanism highlighted in this paper is the portfolio decisions of private holders of central bank money. While network effects will preserve support from private financial entities, erosion of trust could shift the economy closer to potential tipping points when holders abandon domestic money in favor of alternatives, whether they are metal coins in the 1700s or other reserve fiat currencies or cryptocurrencies and stablecoins in the modern era. A weak or negative equity position of the central bank will have a bearing on how the tipping point of the switch to an alternative currency is determined. The outward symptom of such a tipping point would be the sudden collapse of the exchange rate during a currency crisis.

The last decade has ushered in a number of changes to the monetary system. The rapid rise of digital payments and a fall in the use of cash are leading to a shift from central bank money to commercial bank money in daily financial transactions (Di Iorio et al (2024), Auer et al (2022)). Meanwhile, the entry of new financial technology (fintech) firms and large technology companies (big techs) means that there are non-bank competitors in the payments market and in the provision of private money (such as electronic or e-money) (Feyen et al (2021)). Finally, new digital currencies, eg cryptocurrencies and stablecoins, are being promoted as an alternative to central bank fiat currencies and commercial bank money – even if their use as money in practice is quite limited (BIS (2022)).

Since the Covid-19 pandemic, further changes are afoot. The global inflationary shock and rapid rise in interest rates led to large-scale losses on long-term bond portfolios – including those held on central bank balance sheets. Central banks in a number of jurisdictions had losses (Bell et al (2023)). Meanwhile, for some jurisdictions the falling use of cash may erode seigniorage and thus central bank income in the years ahead. This income may require central banks to consider alternative sources of income. They could shift (eg to fees), increase reliance on reserve requirements or revise recapitalization arrangements with the government. (Of course, if central banks choose to issue central bank digital currencies (CBDCs) that do not pay interest, and these are widely adopted, this could offer a source of income that is similar to seigniorage from cash today).

In this context, it would be tempting to think that the economics of central bank money may change in the coming years. Yet we argue that the form that money takes (whether physical cash, physical ledger entries or digital formats) matter little for the underlying economics. And losses by several major central banks do not change the longer-term economic forces determining trust in fiat money. Indeed, the economics remain the same. In particular, the timeless principle of the need for sound public

finances underpinning monetary stability is as relevant today as it was in the 18th, 19th or 20th century.

Going forward, independent central banks with clear mandates, and solid fiscal backing, remain the best bet for a stable monetary system.

References

Archer D, Moser-Boehm P (2013), Central bank finances, *BIS Working Papers*, no 71, April.

Auer R, Cornelli G, Frost J (2022), The pandemic, cash and retail payment behaviour: insights from the future of payments database, *BIS Working Papers*, no 1055, December.

Bank for International Settlements (BIS) (2022), The future monetary system, *Annual Economic Report 2022*, Chapter III, June, pp 75–115.

Bell S, Chui M, Gomes T, Moser-Boehm P, Pierres Tejada A (2023), Why are central banks reporting losses? Does it matter? *BIS Bulletin*, no 68, February.

Bindseil U, Manzanares A, Weller B (2004), The role of central bank capital revisited, *ECB Working Paper Series*, no 392, September.

Bolt W, Frost J, Shin HS, Wierts P (2024), The Bank of Amsterdam and the limits of fiat money, *Journal of Political Economy*, forthcoming.

Buiter W (2020), *Central banks as fiscal players: the drivers of fiscal and monetary policy space*, Cambridge: Cambridge University Press.

Carstens A (2024), Trust and macroeconomic stability: a virtuous circle, lecture at the Center for Financial Studies, Goethe University, Frankfurt, 18 March.

Cecchetti S, Hilscher J (2024), Fiscal consequences of central bank losses, *NBER Working Papers*, no 32478, May.

Cochrane J (2023), *The fiscal theory of the price level*, Princeton: Princeton University Press.

Cúrdia V, Woodford M (2011), The central-bank balance sheet as an instrument of monetary Policy, *Journal of Monetary Economics*, vol 58, no 1, pp 54–79.

Del Negro M, Sims C (2015), When does a central bank's balance sheet require fiscal support? *Journal of Monetary Economics*, vol 73, July, pp 1–19.

Di Iorio A, Kosse A, Szemere M (2024), Tap, click and pay: how digital payments seize the day, *CPMI Briefs*, no 3, February.

Feyen E, Frost J, Gambacorta L, Natarajan H, Sall M (2021), Fintech and the digital transformation of financial services: implications for market structure and public policy, *BIS Papers*, no 117, July.

Goncharov I, Ioannidou V, Schmalz MC (2023), (Why) do central banks care about their profits?, *Journal of Finance*, vol 78, no 5, pp 2991–3045.

- Hall R, Reis R (2015), Maintaining central-bank financial stability under new-style central banking, *NBER Working Papers*, no 21173, July.
- Long J, Fisher P (2024), Central bank profit distribution and recapitalisation, *Bank of England Staff Working Paper*, no 1069, April.
- Nordström A, Vredin A (2022), Does central bank equity matter for monetary policy?, *Sveriges Riksbank Staff Memo*, December.
- Quinn W, Roberds W (2016), Death of a reserve currency, *International Journal of Central Banking*, vol 12, no 4, pp 63–103.
- Reinhart C, Rogoff K (2011), From financial crash to debt crisis, *American Economic Review*, vol 101, no 5, pp 1676–706.
- Reis R (2015), Different types of central bank insolvency and the central role of seigniorage, *NBER Working Papers*, no 21226, May.
- Rule G (2015), *Understanding the central bank balance sheet*, Bank of England Centre for Central Banking Studies.
- Ramos-Francia M, García-Verdú S, Sánchez-Martínez M (2018), Inflation dynamics under fiscal deficit regime switching in Mexico, *Banco de México Working Papers*, no 2018-21.
- Sargent, T J, Williams N, Zha T (2009), The conquest of South American inflation, *Journal of Political Economy*, vol 117, no 2, pp 211–56.
- Shin HS, Schnabel I (2004), Liquidity and contagion: the crisis of 1763, *Journal of the European Economic Association*, vol 2, no 6, pp 929–68.
- Sims C (1994), A simple model for study of the determination of the price level and the interaction of monetary and fiscal policy, *Economic Theory*, vol 4, no 3, pp 381–99.
- Smith A (1776), *An inquiry into the nature and causes of the wealth of nations*, Hamilton: McMaster University Archive for the History of Economic Thought.
- Stella P (1997), Do central banks need capital?, *IMF Working Papers*, no 97/083, July.
- (2002), Central bank financial strength, transparency, and policy credibility, *IMF Working Papers*, no 02/137, August.
- Ueda K (2003), The role of capital for central banks, speech at the Fall Meeting of the Japan Society of Monetary Economics, 25 October.
- Voltaire M de (1751), *Le siècle de Louis XIV*, translated by T Francklin and T Smolett (1779), *The works of M. de Voltaire*, chapter 10, London: S Crowder and Co.
- Wessels P, Broeders D (2022), On the capitalisation of central banks, *De Nederlandsche Bank Occasional Studies*, vol 20, no4.

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