GETTING MONETARY POLICY BACK ON TRACK

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CENTRAL BANK BALANCE SHEETS

10

Five Centuries of Central Bank Balance Sheets: A Primer

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Introduction

Central bank balance sheets have played a prominent role in response to the past decade's financial and public health upheavals, and they have been a focus of this conference series in previous years. In a bid to shield households and financial markets from the most severe economic strains, both the response to the Global Financial Crisis (GFC) of 2008–9 and the more recent response to the COVID-19 pandemic of 2020–22 featured large-scale asset purchases and the extension of significant amounts of liquidity to the financial sector. In these times of financial stress, major central banks chose to deploy balance sheet resources as their preferred tool to contain market volatility and prevent real economy spillovers (Cochrane 2022).

A growing literature seeks to understand the effects of such central bank interventions and to assess their potential to mitigate current and future economic shocks (Gertler and Karadi 2011; Wu and Xia 2016; Smets and Potter 2019; Bernanke 2020). However, the pre-2008 experience of using central balance sheets as a policy tool has barely been studied. Our paper is the first to provide historical data aggregating trends, drivers, and the full range of policy precedents associated with using central bank balance sheets (FKSS 2023). We undertake these analyses based on a new dataset that reconstructs central bank balance sheets for advanced economies

over multiple centuries using primary and secondary sources, on an annual basis, including the full breakdown of asset and liability components for many episodes.

Why is such a long-run historical view useful for both policymakers and researchers? We argue that, given the rarity of large macroeconomic and financial shocks, only a long-run approach yields a sufficient sample size across different types of shocks and across different macroeconomic environments. While long-run chronologies for various financial "tail events" exist in the literature, the history of central bank interventions has not been studied systematically. A longer view allows for a comprehensive study of the effects of balance sheet operations, including lender-of-last-resort interventions.

Conventional wisdom assumes that central banks' utilization of their balance sheets was limited prior to the 1970s. This is partly due to the emphasis on the interest rate as the primary operational tool in the treatises by Walter Bagehot ([1873] 1962) and others in the late nineteenth century, and partly due to central banks' supposedly "passive" mandates (Sayers 1957; Volcker 2004; Carlson and Wheelock 2015; Shafik 2016). However, it can be shown that time and again, central banks have deployed their power to create liquidity in bids to insulate economies from disasters. While such deployments first began to be linked to geopolitical shocks during the seventeenth and eighteenth centuries—occurring with increasing regularity during wars and revolutions—it can be shown that the trigger for central bank liquidity support gradually, but consistently, shifted towards financial crises. Not only the frequency of tail events but also the readiness of central banks to offer liquidity support changed over time. In particular, central banks' sensitivity to financial crises rose sharply over the twentieth century and, after the Great Depression, increasingly became a systematic response to financial distress.

The long-run historical data we compiled for FKSS (2023) allow for the study of the effects of central bank liquidity support during

financial crises. Building upon the classic paradigm of public runs on bank retail deposits (Diamond and Dybvig 1983), recent scholarship has placed liquidity at the heart of theories rationalizing financial turmoil (Caballero and Krishnamurthy 2008; Brunnermeier 2009; Acharya and Skeie 2011; Ashcraft et al. 2011; Bolton et al. 2011; Gertler and Karadi 2011; Guerrieri and Shimer 2014; Benmelech et al. 2016; Del Negro et al. 2017). Stress events associated with uncertainty about asset returns can spiral into a collective flight to liquid assets, i.e., central bank reserves and close substitutes, to meet unexpected shortfalls in returns and cash flows. Unless the monetary authority meets the elevated desire to hold liquidity in these situations, the shock will be transmitted beyond the financial system, fueling potentially severe real economic downturns.

Are the alleviating effects of crisis liquidity support large enough to dominate other possible general-equilibrium side effects? The recent literature is mostly skeptical. Using a sample of about eighty countries, Bordo et al. (2001) posited that banking crises since the late nineteenth century were, on average, associated with larger GDP losses when accompanied by open-ended liquidity support—a finding confirmed by, among others, Honohan and Klingebiel (2003), who showed that public liquidity support was associated with longer crises, larger output losses, and slower growth in sectors dependent on external finance.[1] Adverse selection effects and moral hazard can increase banks' risk-taking (Drechsler et al. 2016a; Behr and Wang 2020), financial frictions can foster credit misallocation (Bleck and Liu 2018), and the monetary authority risks being trapped by excess liquidity (Benmelech and Bergman 2012; Acharya et al. 2022). Yet large parts of the existing literature suffer from a potential endogeneity bias, because support will scale with crisis severity. We are the first to disentangle the effects of crisis severity and liquidity provision by proposing and implementing a novel identification strategy to estimate the causal effects of central bank liquidity support.[2] The FKSS (2023)

identification strategy is based on a narrative assessment of a central bank governor's beliefs prior to the outbreak of a banking crisis, relying on a detailed analysis of historical sources. It is well known that politicians and other policymakers can be sorted according to relatively stable economic ideologies. Recent research has established close links between the personal beliefs of political decision makers, relative economic preferences, and aggregate economic outcomes (Gohlmann and Vaubel 2007; Mishra and Reshef 2019; Monnet and Puy 2020; Malmendier and Wachter 2022). Financial commentators also routinely group current central bank governors into "hawkish" and "dovish/pragmatic" policy categories based on their assessment of their public statements (Kuttner and Posen 2010). In the same way, past central bank governors can be classified according to their policy beliefs over time.

In FKSS (2023), we utilize the extensive records of debates, speeches, and statements to locate each governor in the context of the ideological climate of his time but prior to a financial crisis, classifying governors as either "doves/pragmatists" or "hawks." To do so, we propose an algorithm that ranks governors' relative economic and financial preferences across six major variables. We argue that one of the defining features of "hawks" is that they consistently express concern about moral hazard dynamics and prioritize price stability, whereas "doves/pragmatists" consistently downplay moral hazard concerns and reject an active leaning against asset price bubbles.

Preexisting ideological beliefs of central bank governors correlate closely with central bank actions during crises. Dovish governors were 36% more likely to expand their central bank's balance sheet in a crisis, indicating that monetary policy reactions corresponded to governors' beliefs formed before the crisis. This provides us with an instrument to identify exogenous variation in crisis liquidity support and circumnavigate the inherent endogeneity entangling monetary policy and the macroeconomy. Importantly, such beliefs are uncorrelated to other factors driving any acute crisis. It is, in

theory, possible that the anticipation of dovish crisis management could encourage financial risk-taking ex ante, but this only raises the bar for finding positive macroeconomic effects of central bank liquidity injections.

In FKSS (2023), we show for the first time that central bank liquidity support regularly cushioned the effects of financial crises throughout the modern history of advanced economies. Using governors' beliefs as a statistical instrument, we estimate that a central bank balance sheet expansion of at least +15% during the first or second year after the onset of a financial crisis bolstered real GDP over the subsequent three years relative to the counterfactual. This stabilization was generally achieved without runaway inflation, whereas crises without support were often followed by protracted deflation. In the FKSS (2023) data, liquidity support seems effective in the form of lender-of-last-resort (LLR) action with Bagehot-style private asset purchases operations rather than through supporting public borrowing with intervention in government bond markets. These results are consistent with the hypothesis that risk absorption by the public sector matters in stimulating private-sector activity.

Thus, we can corroborate and generalize the case-study findings of Richardson and Troost (2009) and Benmelech et al. (2016), who evaluated particular liquidity provisions during financial crises. The results are also robust to factoring in differences in central bank independence and controlling for the fiscal policy reaction to crises.

Finally, we present evidence that these positive short-run effects come with an important caveat. Hawkish central bank governors often invoke moral hazard before and after the outbreak of a banking crisis. In FKSS (2023), we show that such concerns have merit. Central bank liquidity support in crises is associated with a rising probability of future financial crises. If central banks refrained from using their balance sheet to support markets in the previous crisis, episodes of renewed excessive risk-taking were much rarer.

Previous Literature

First, FKSS (2023) adds to the extensive literature on LLR operations. In the classic accounts by Thornton ([1802] 1939) and Bagehot ([1873] 1962), LLR policy works through lending by the central bank to illiquid but solvent private institutions against good collateral at high ("penalty") interest rates. Our measure of liquidity interventions based on central bank balance sheet expansions complements the policy chronologies of Calomiris (2011) and Bindseil (2019).

More specialized recent literature has investigated the impact of unconventional monetary policy (Bernanke et al. 2004; Gagnon et al. 2011; Joyce et al. 2011; Engen et al. 2015; Sims and Wu 2021), with big-picture contributions by Bernanke (2020) and Bailey et al. (2020). The literature has offered positive evaluations of large-scale asset purchases as they appear to have succeeded in reducing financial market uncertainty, lowered borrowing costs for households and sovereigns, and meaningfully raised inflation.[3]

The structure of this summary paper is as follows. In the next section, we present snapshots of how the size of central balance sheets has fluctuated over time, with reference to four case studies included in FKSS (2023). Then we turn to a discussion on the finding in FKSS (2023) that central bank balance sheets have responded to multiple types of macroeconomic shocks over the past four hundred years. From there, we focus on financial crises and studies of the suggestions in FKSS (2023) on the effects of central bank liquidity supply. Our conclusions follow.

Central Bank Balance Sheet Data since 1600: Case Studies

In FKSS (2023), we assembled data covering seventeen advanced economies. For some of these, we were able to trace de facto central bank data as far back as 1600. Here we summarize long-term

trends for four selected central bank balance sheets that are among the components in this new data set. FKSS (2023) presents historical data on both de jure national central banks and their de facto predecessor institutions. These institutions could be privately owned (as the Bank of England was prior to 1946) or publicly owned, as long as they were recognized as occupying a de facto position as a "bank among banks" or had a de facto monopoly on note issuance or government financing. The institutional organization of central banks varies across advanced economies, even in modern times. FKSS (2023) includes early modern data such as the public banks of Naples, the Bank of Amsterdam, and the Bank of the United States. In the nineteenth century, comparatively modern institutions such as the Bank of Finland (from 1813), the Royal Bank of Prussia (from 1817), and the Banco de San Fernando/Banco de España (from 1830) enter the stage. From 1870, we have data from the national central banks in Belgium, Finland, Norway, and Portugal, to give historical central bank balance sheet data for seventeen of the most advanced economies.

International Long-Term Trends: Four Case Studies

FKSS (2023) combines these new balance sheet series for modern and early modern central banks with associated macroeconomic and financial time series, including nominal GDP, total private assets, and government debt. The data suggest that, while central bank balance sheets relative to output have indeed reached unprecedented levels in the early twenty-first century, they are by no means exceptional in size relative to total private assets or the stock of government debt. Importantly, we show that central bank balance sheets provided meaningful amounts of elasticity even under the classical gold standard and did not move closely in tandem with any particular output or financial variable.

Bank of England, 1700–2020

Figure 10.1 shows the Bank of England's assets as a share of GDP, for which we utilize data presented in Dimsdale and Thomas (2017). We observe that the inception period of central banks in the seventeenth and eighteenth centuries saw sharp growth in this measure, followed by international dispersion during the second half of the eighteenth century, mainly driven by the international wars during this time. A key change set in with the Napoleonic Wars in the early nineteenth century. For the subsequent eighty years, aggregate central bank assets-to-GDP ratios varied in tight ranges, both across countries and across time, rarely surpassing 15% of GDP, even during costly macroeconomic and financial shocks such as the Crimean War (1853–56) or the 1857 and 1866 financial crises. But from the 1880s, there was a renewed growth of aggregate central bank assets relative to output, partly induced by new ideas about central banking, such as those of Bagehot ([1873] 1962), which triggered monetary policy reforms, notably in the UK (Calomiris 2011).

Figure 10.1 shows total central bank assets relative to GDP for the UK between 1700 and 2016 based on Dimsdale and Thomas (2017) and current GDP estimates at market prices via Broadberry et al. (2015). Britain has served as a key case study for financial-institutional modernization and the emergence of a centralized public financial system.[4] World War II and the post-2008 expansion stand out here on a historical scale, but we note that pre-GFC, all-time records were not, in fact, set during 1939–45, but rather during the early years of the Bank of England, following its 1694 foundation.

The British case is the first where we can directly associate expansion events with active emergency interventions. As early as 1711, the Bank of England expanded its asset base to counter a financial crisis, explicitly engaging in exchequer bill purchases,

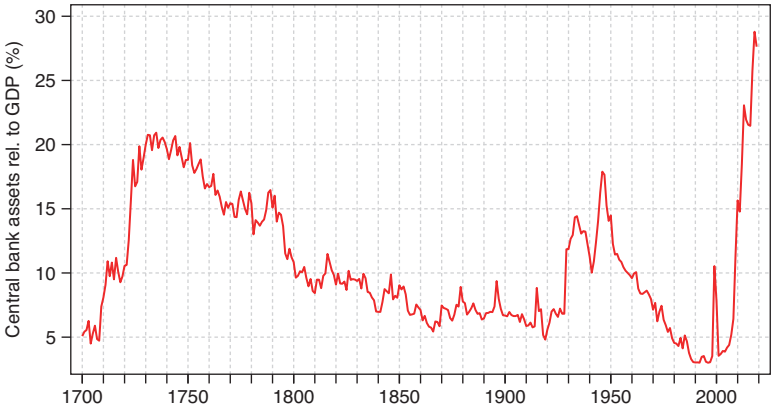

FIGURE 10.1. Bank of England, Total Assets, 1700–2020.
Note: In percent of current UK GDP (contemporary borders).
Sources: GDP data via Dimsdale and Thomas (2017) and underlying sources.

partly financed by a special GBP 45,000 Treasury loan. This is the first confirmed case of an early "asset purchase program" undertaken explicitly to "revive confidence in [exchequer] bills." That the operation could be deemed a success was determined with reference to the fall in exchequer discount rates from 3% in early January 1711 to 0.75% by the end of the month (Scott 1912; Hill 1971).[5] Next, while initially remaining agnostic during the summer of 1720, standing apart, the Bank eventually agreed to mobilize substantial amounts of balance sheet resources via the 1722 Act (at GBP 4.02M no less than 6.95% of total 1722 UK public debt outstanding, or 5.5% of 1722 GDP) to help restructure the South Sea Company in exchange for stock. This is visible in our series as a sharp acceleration in assets-to-GDP over 1721–22, a clear case of the balance sheet being driven by an active liquidity provision in the face of mounting fears of financial disaster (Clapham 1958, 84). Figure 10.1 shows sharp asset expansions beginning around the time of the South Sea Bubble, with total Bank of England assets relative to GDP reaching a peak of 24% by 1735, illustrating the fact that early central banks were able to provide substantial liquidity

volumes even under gold standard regimes, and were initially not bound to target real economic activity.[6]

Repeatedly, it can be documented how the Treasury opted to utilize the Bank of England's balance sheet resources instead of imposing regular taxes. This is key evidence that the size of the central bank balance sheet can serve as a major variable in the growing "state capacity" literature, quite distinct from the "tax ability" on which scholars overwhelmingly focus. The Duke of Newcastle frequently co-opted the Bank to anticipate regular tax revenues, particularly during the Seven Years' War, as chronicled in detail by Browning (1971). In other words, we can associate both active asset purchases and financial stability operations with balance sheet expansions as early as the eighteenth century. After this initial expansion, the British record is remarkable for the near-undisturbed reduction in assets-to-GDP until the eve of World War I. Over the period 1700–1870, the average total assets-to-GDP ratio stands at 12.2%—a figure very close to both modern twentieth-century averages and the long-run averages for privately owned central banks operating in centralized public finance regimes.

Riksbank, 1668–2020

Next, figure 10.2 displays the Riksbank's total assets as a share of Swedish GDP, 1668–2020, based on recently released data (Fregert 2014). Sweden—in contrast to the British case—serves as an example of a historical laggard in the development of public finance. From its inception, the Swedish central bank was formally under public (parliamentary) ownership.[7] Public ownership did not preclude substantial active central bank balance sheet expansions relative to GDP, however. Once again, large asset expansions can be linked directly to the motivation to reduce liquidity risks in financial markets. In the Swedish case, the most dramatic increase in total assets over the very long term was between 1750 and 1765, when

FIGURE 10.2. Riksbank, Total Assets, 1668–2020.
Note: Total assets of the Riksbank, as a percentage of current Swedish nominal GDP.
Sources: Fregert (2014); Edvinsson (2014).

the share surged from below 20% to a record 49.8% in 1759. The backdrop was the Seven Years' War, with the costly Pomeranian campaign almost exclusively financed by rapid Riksbank note issuance. The erosion of silver prices and heavy bank runs in Stockholm during the 1740s eventually triggered a suspension of convertibility by 1745 and a period of floating currency in Sweden (Heckscher 1954; Fregert and Jonung 1996). We can speak of a major liquidity provision operation that sought simultaneously to calm currency markets and underpin demand for government debt.[8]

Another sharp rise in assets-to-GDP occurred during the Napoleonic Wars, with peak assets-to-GDP levels in 1809 reaching 21.7%. This provides another example of active asset purchases. While both publicly and privately owned institutions were utilized during war efforts, the Riksbank case confirms that a public ownership model was more susceptible to co-optation by the political executive. By contrast, Bank of England assets were virtually flat relative to GDP during 1795–1810. As in the British case, however, the general evidence confirms that the Swedish executive utilized the Riksbank balance sheet as a substitute for tax impositions.

"As it took time to collect the new taxes . . . the Bank was used in a way that circumvented the Parliament's instructions against further government borrowing" (Fregert and Jonung 1996, 461). No fewer than seven times prior to World War I, the Riksbank used its balance sheet to assist the financial sector during periods of stress, in 1811, 1815, 1857, 1876, 1890, 1897, and 1907.[9] Well before Bagehot's formalized LLR principles, the Riksbank—like its counterpart in London—thus repeatedly saw its balance sheet expand for both emergency liquidity provision and active asset purchases, even under gold standard constraints. The English and the Swedish cases saw central bank balance sheet co-optation by the political executive well before the inflection points posited in the literature.

Public Banks of Naples, 1587–1808

Figure 10.3 displays the total nominal assets of the public banks of Naples, as reconstructed by Balletta (2008) and as discussed there and in Costabile and Nappi (2018) and Balletta et al. (2018). The Kingdom of Naples was a Spanish possession from 1559, apart from brief periods as a republic (1647) and under Austrian rule (1714–35). It was, therefore, more politically and economically aligned with Spain than with northern Italy. Balance sheet expansions for the public banks of Naples are highly correlated with local tail events. We observe rather tepid growth in the initial phase, sharp volatility around the infamous 1622 and 1702 financial crises, as well as around the 1656 Naples Plague, and sustained expansion of total assets from circa 1715 until 1806, when Naples lost its independence to Napoleon.

Bank of Amsterdam, 1610–1819

Finally, figure 10.4 displays the total nominal assets of the Bank of Amsterdam, a privately owned institution regarded as a leading

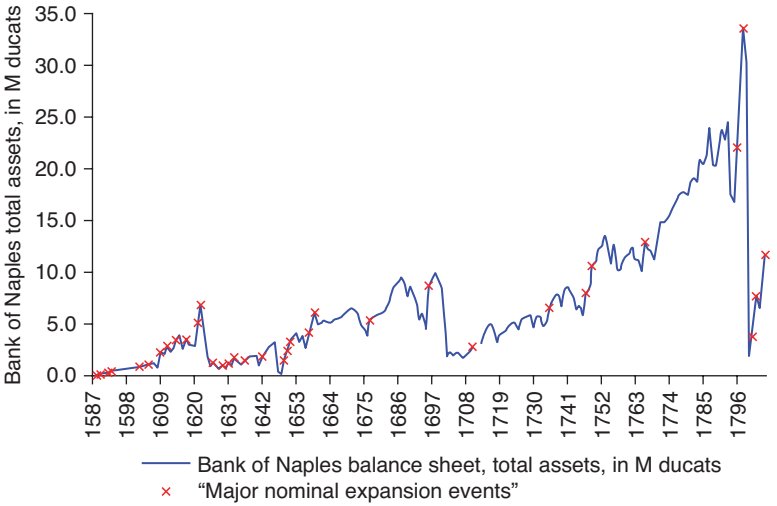

FIGURE 10.3. Public Banks of Naples, Total Assets, 1587–1808.

Note: Balance sheet data in total nominal terms (million Neapolitan ducats).

Source: Data via Balletta (2008).

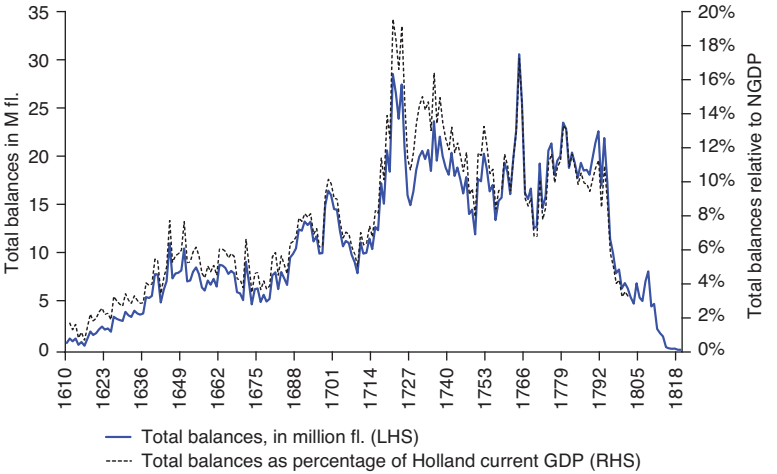

FIGURE 10.4. Bank of Amsterdam, Total Assets and Total Assets-to-GDP, 1610–1819.

Note: Balance sheet data is in million Dutch Guilder (left axis) and relative to Holland GDP (right axis).

Sources: Van Dillen (1934); Van Zanden and Van Leeuwen (2012).

early central bank, and assets relative to GDP (RHS), with annual total assets data sourced from Van Dillen (1934). The Netherlands was often considered the "safe asset provider" prior to the Glorious Revolution, and therefore the actions of the Bank of Amsterdam reverberated well beyond the political borders of Holland. We observe that its total assets reached around Guilders 15M near the end of the seventeenth century, or close to 10% of Dutch GDP. The measure peaked around the time of the South Sea Bubble, when assets reached around 20% of GDP, as Amsterdam was the destination of substantial amounts of capital flight. With the Napoleonic Wars, the Bank was restructured, and De Nederlandsche Bank (DNB) took over its functions. The DNB's asset data in FKSS (2023) are based on primary sources in the Dutch archives.

As in the case of Naples, we can associate early modern balance sheet expansion events closely with a variety of tail events, including wars (1665, 1674, and 1810) and financial crises (1720 and 1763). The elasticity of the bank's balance sheet in absolute terms and relative to Dutch output is striking, and this was continued during the nineteenth century by the DNB.

One observation based on our examples is that bullion standard regimes did not necessitate static balance sheets relative to output. Conversely, the floating era (when balance sheet sizes were freed from any remaining gold coverage ratios) did not unleash an acceleration of central bank asset growth. Both absolute and relative assets (assets-to-GDP), in other words, evolved opportunistically in response to crisis events rather than in compliance with the "rules of the game."

Stylized Historical Facts and Summary Statistics

In FKSS (2023), we present a variety of aggregate global balance sheet data sets, including central bank assets relative to GDP over centuries, assets relative to total financial assets, and assets relative

to the stock of government debt. Generally, the variation in annual growth rates of central bank balance sheets was substantial across all historical episodes, suggesting that balance sheets were, in principle, able to behave elastically, even under the constraints of the classical gold standard. FKSS (2023) determines the precise policy motivation and event context for each central bank balance sheet expansion, defining a "major balance sheet expansion" as an individual country-year during which total nominal central bank assets grew by at least 15% year-over-year (YOY). However, all our key conclusions are robust to other cutoffs or real-term expansion measures. Over the period 1600–2020, 742 country-years fulfilled the 15% nominal asset expansion criterion (out of 7,157 total country-year observations). Across all central banks over time, annual balance sheet growth exceeded +15% YOY for around 16.3% of country-years pre-1870 (23.7% post-1870).[10]

Table 10.1 analyzes the distribution of annual balance sheet fluctuations across polity and central bank ownership types. We observe that privately owned central banks had lower balance sheet sizes relative to GDP and lower major expansion frequencies under both republican and monarchical political regimes. Interestingly, publicly owned central banks had similar absolute balance sheet sizes relative to GDP and similar expansion frequencies in both

TABLE 10.1. Balance Sheet Size and Expansion Frequency by Polity and Central Bank Type, 1600–2020.

Balance Sheet Size (% of GDP)	Republic	Monarchy	Expansion Frequency (% Country-Years)	Republic	Monarchy
Privately owned	5.4	12.2	Privately owned	4.7	0.6
Publicly owned	9.8	10.9	Publicly owned	6.0	7.6

Note: The table displays central bank balance sheet size relative to GDP (left panel) and central bank balance sheet expansion frequency (right panel), defined as country-years with nominal total asset growth of at least 15% year-over-year, as a share of total observation years.

Source: See FKSS (2023) for the full list.

republics and monarchies. Therefore, it appears that the ownership structure associated with central banks might be a more relevant constraint on balance sheet dynamics than the political system per se, though that issue requires more careful study.

Different Categories of Balance Sheet Expansions

Previous literature has offered some guidance on how to distinguish between different central bank balance sheet drivers, classifying types from the operational side. According to Bindseil (2004), central bank balance sheet expansions can be a function of (a) currency issuance; (b) a foreign exchange operation; (c) an investment of own funds; (d) liquidity assistance; or (e) a monetary policy operation.

FKSS (2023) distinguishes four main underlying macro shock categories that have led to major balance sheet expansions (as defined above), all of which have historically been associated with the operational responses in Bindseil (2004).[11] The first three represent instances where either public- or private-sector stress prompted an active deployment to the central bank balance sheet with the intention of reducing short-term liquidity or refinancing risks—in other words, a "safety net" function. We add a fourth, residual category: actions that were not intended to reduce short-term risk premia or refinancing stress but exclusively reflected transactional or operational fluctuations.[12]

- *Financial crisis*: FKSS (2023) uses this category to denote those country-years primarily associated with financial market volatility to which the central bank responded. Existing chronologies provide a robust picture of several types of volatility in this context, including stock market crashes, bank runs, systemic liquidity shortages, or other threats to the systemic health of the private financial sector. Our classification concentrates on the standard banking crisis chronologies in Reinhart and Rogoff (2009), Schularick and Taylor (2012), and Baron et al. (2021) rather than on sovereign debt or

currency crises to capture more narrowly traditional LLR events. We count eighty-three country-year events in this category—mainly representing private-sector recourse to the safety net—of which forty-seven were in the post-2007 period. The average country-year in this category saw a 44.6% annual balance sheet expansion.[13]

- *War or revolution*: FKSS (2023) uses this category to denote country-years that were primarily related to major geopolitical events, during which either rising military spending led to requests by fiscal authorities to monetize ensuing deficits or domestic political uncertainty motivated policymakers to monetize fiscal outlays, or provide private-sector liquidity.[14] War and revolutionary events are identified based on long-run military history chronologies (Clodfelter 2017). Over the long run, this category constitutes by far the most important one: there were 142 country-year events in this category since 1588, of which thirty-nine occurred during World War I and forty-seven during World War II. The average country-year in this category saw a 50.8% balance sheet expansion.
- *Pandemics or natural disasters*: This is a category with limited pre-2020 significance, because in no previous pandemic was there anything resembling the fiscal and monetary response to that seen in 2021–22.[15] The sample for this category is therefore comparatively small (n=19), and—except for the 1656–58 pandemic in Naples, in response to which the viceroyalty launched a grain purchase program (Fusco 2007)—restricted to the most recent central bank policy actions over 2020–21. Country-years in this category have, on average, so far seen a 48% balance sheet expansion.

How has the relative importance of these expansion types changed over time? Figure 10.5 addresses this question by showing rolling probabilities of major central bank balance sheet expansions, by the three broad event types, since 1600. The spikes in the rolling probability over centuries are associated with major political and financial shocks, with concerted balance sheet expansions first jumping significantly during Louis XIV's wars from the 1670s.

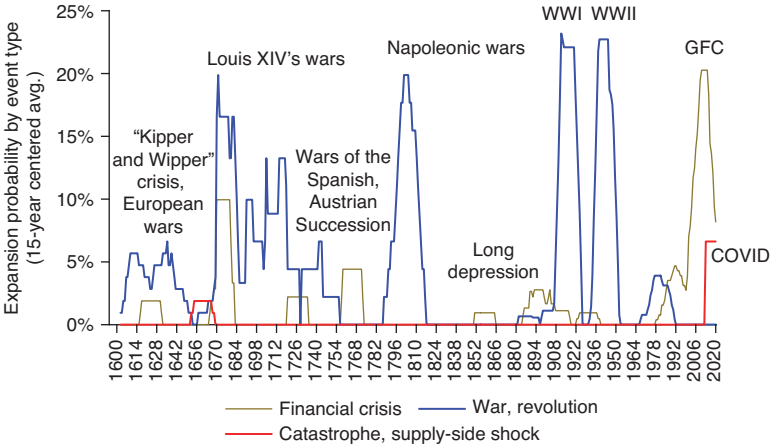

FIGURE 10.5. Rolling Central Bank Balance Sheet Expansion Probabilities, by Crisis Type, 1600–2020.

Notes: Balance sheet expansion events are defined as +15% year-over-year total nominal asset growth. Probabilities are shown as fifteen-year centered averages of realized "major" expansion events.

Source: FKSS (2023).

Clearly, the drivers of central bank balance sheet expansions have undergone fundamental shifts over the long run. Geopolitical and financial crisis events account for six out of ten of all balance sheet expansions, but the relative importance of the two main drivers has undergone a substantial shift, partly due to changing event frequencies.[16] While almost half of all balance sheet expansions in the pre-1870 era (48.5%) can be linked to wars, revolutions, or other geopolitical events, such motivations have become rare in the post-1945 world. In turn, more than 40% of all central bank balance sheet expansions after World War II were linked to financial crises, whereas the share was less than 15% in the years prior to 1870 and remained of secondary importance even during the interwar period.[17]

Figure 10.6 ranks the largest nominal total asset expansions across all central banks on the YOY basis in the FKSS (2023) sample.[18] The Bank of Japan (BoJ)'s 1883 balance sheet expansion (+728% YOY) by far exceeds all other events over five centuries of

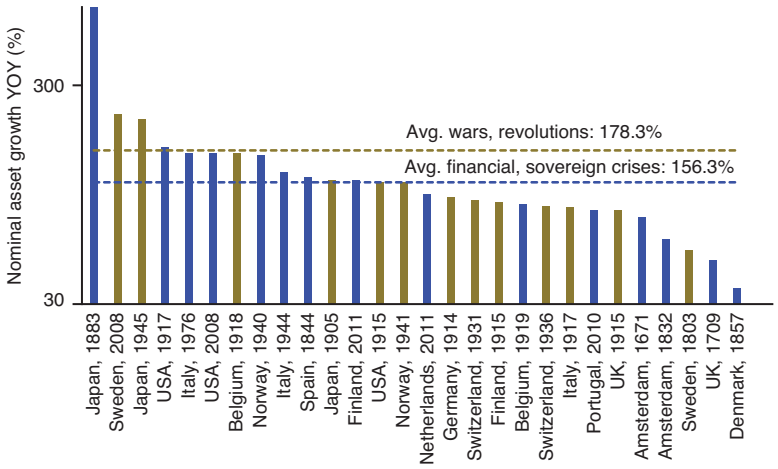

FIGURE 10.6. The Largest Nominal Balance Sheet Expansion Events, 1600–2020. Notes: Largest YOY nominal total asset balance sheets expansions. Y-axis in log scale. Source: FKSS (2023).

data—though it was a "technical expansion" that is explained by the inception of the BoJ in 1882 rather than specific financial or geopolitical crises (though there remained some legacy macro effects from the Seinan Civil War of 1877, see Shizume 2020). However, a number of twenty-first-century annual events also make it into the "all-time top ten," including Sweden 2008 (+230%) and US 2008 (+151%). By type, interestingly, we observe a relatively even distribution of extremely large nominal balance sheet expansion years across both geopolitical distress (average expansion: 178.3%) and financial distress (average expansion: 156.3%).

The Macroeconomic Effects of Liquidity Support during Crises

Throughout their history, we can find instances in which central banks sought to mitigate financial distress by expanding balance sheets to keep markets liquid. As the financial sector grew in

economic importance—and with it, the cost of systemic distress—such interventions became more frequent, as we saw in the previous section. The benefits and side effects of such liquidity injections have long been the subject of scholarly debate, but consensus is elusive to this date. Systematic and reliable empirical quantification has been undermined by an inherent identification problem: How to measure the effects of interventions on crisis developments if the intervention itself endogenously depends on factors that shape crisis severity?[19]

FKSS (2023) proposes an empirical strategy to estimate the macroeconomic effects of central bank liquidity injections by isolating a variable in the central bank's reaction that is arguably exogenous to the acute crisis situation: The central bank governor's economic policy orientation prior to the crisis. We argue that the decision to use the central bank balance sheet and provide liquidity to struggling financial intermediaries depends crucially on the governor's economic beliefs and ideology. The latter has evolved over decades of life experience prior to, and thus independent of, any given crisis—though, of course, previous crises have contributed to that experience. Variations in liquidity injections caused by governors' beliefs can therefore be argued to be exogenous to other factors shaping crisis trajectories. To that end, we develop a new measure of central bank governors' beliefs.

Ex Ante Central Bank Governor Beliefs

A relatively new body of literature has explored the impact of personal attitudes and individual preferences of economic policymakers, their formation through particular experiences or formative life episodes (e.g., the "impressionable years" hypothesis), and their subsequent impact on decision making and macroeconomic variables (Gohlmann and Vaubel 2007; Mishra and Reshef 2019; Monnet and Puy 2020; Malmendier and Wachter 2022; Bordo

TABLE 10.2. Central Bank Governor Attributes, by Ideology.

	Hawks	Doves/Pragmatists
Crisis observations	29	47
Age at crisis	58	61
Treasury experience (share)	27.6%	40.4%
Political party membership (share)	17.2%	36.2%
Financial sector experience (share)	51.7%	31.9%
Pre-appointment crises	2.22	1.57
Avg. inflation experience	3.03%	4.35%

Notes: Central bank governor attributes prior to appointment or banking crisis. "Party Political Experience" counts either official political offices held prior to appointment (e.g., senator) or position within a national political party (e.g., press secretary) but not passive party memberships. "Pre-appointment crises" counts panics on the BVX basis between the birth year and the appointment year for the respective governor. "Avg. inflation experience" measures the average of the annual change in the CPI [consumer price index] from the respective governor's birth year to the final year prior to the banking crisis outbreak, with the CPI sourced via the "JST database."

Source: FKSS (2023).

and Istrefi 2023). It is increasingly understood how individuals' past occupational, educational, and other biographical experiences shape long-lasting economic preferences. For instance, individuals who experience a recession during the ages of eighteen to twenty-five have distinct lifelong political and economic beliefs (e.g., Aksoy et al. 2022).

We built on insights from this literature, using evidence of stated (publicly available) personal policy preferences to classify central bank governors as either "doves/pragmatists" or "hawks." We developed a classification algorithm that incorporates information available to the public immediately prior to the outbreak of a banking crisis and allows for the fact that governors may have undergone ideological shifts during their careers. FKSS (2023) focuses on advanced economy central banks during financial tail-event years across the seventeen countries since 1870, using the crisis coding in Baron et al. (2021), referred to as BVX.

The algorithm to classify governors builds on existing methodologies. It incorporates qualitative and quantitative information

across six main economic variables, the first four of which designate the key categories: moral hazard (the most relevant variable), full employment, economic growth, price stability, exchange rate stability, and income inequality.

We then studied a wide range of primary and secondary historical material to trace governors' attitudes across these categories and to establish a ranking of economic preferences for each. Whenever central bank governors were publicly worried about asset bubbles, speculative excess, or loose lending standards, or when they used other catchphrases indicating at least an implicit preference to curb such exuberance, we took it as a hawkish signal. Together with price stability concerns, the evidence of worry about moral hazard received the highest relative weight in determining hawkishness.

Dovish governors typically either did not comment at all on moral hazard, price stability, and excessive risk-taking concerns or did so in a manner that ranked them as relatively less important than the goals of fostering employment or promoting economic growth, the two variables that receive the highest weight in our "doves/pragmatists" classification. A negative dovish signal is established when a governor cautions against a rigid interpretation of price stability mandates or downplayed risk-taking concerns. FKSS (2023) reaches a final classification verdict once the minimum criteria regarding source consistency, evidence on the person's actual decision authority, and ex ante timing for the evidence are all met.

Importantly, the governor coding approach in FKSS (2023) does not depend on taking a position on whether or not political parties or governments were influencing monetary policy.[20] The exceptions are instances where the central bank was not de facto independent (for instance, Germany during the 1930s). To assess such influences, FKSS (2023) either codes the Treasury leaning (in obvious cases) or, for the more recent period, benchmarks our classifications against one of the most recent and widely used "central bank independence" (CBI) indices (Garriga 2016). When we

exclude all "weakly independent" central banks, our main results continue to hold.[21]

How does this classification algorithm work in practice? The following contours illustrate the interplay between governors' beliefs about emergency liquidity and moral hazard on the one hand and the broader context of output, price, and exchange rate preferences on the other:

- During the pre-1914 period, central bank governors remained widely indebted to the British debate between "banking" and "currency" schools. Amid a worldwide deflationary environment emphasizing monetary cooperation according to the "rules of the game," governors engaged in controversies surrounding the merits of bimetallism. Looming over all other policy delineations was the "real bills" controversy, which "hawks" generally interpreted as ruling out open-ended bank liquidity support (Green 1988; Dimand 2020). Governors were also shaped by the major British banking crises occurring over the second half of the nineteenth century, which triggered foundational debates over the merits of banking crisis interventions. Hawkish governors subsequently internalized the dictum advanced in 1866 by the Bank of England that "long-term benefits derived from refusing to rescue insolvent institutions may outweigh the temporary fruits of cooperation" (Schneider 2022). The moralistic undertones of prominent hawks such as Richard Koch at the Reichsbank were echoed in France but opposed by the Banca d'Italia's Giacomo Grillo, who objected to the idea of "self-correcting" economic forces.[22]
- Central bank governors during the 1920–70 period were preoccupied with policy debates on re-establishing the prewar gold standard. Advocates of a transition to free or managed-float currency regimes—"doves/pragmatists" in the FKSS (2023) classification—downplayed the adverse effects that such regimes would have on price stability. Bonaldo Stringher, the Banca d'Italia governor, personified this belief set during three decades (1900–30) in office, stubbornly opposing the deflationary demands of the government during the

1920s (Segreto 2019) but swiftly though selectively accommodating the 1927–28 banking crisis via LLR (Molteni and Pellegrino 2022). Meanwhile, governors favoring a return to fixed exchange rates were classic "hawks" who regarded emergency assistance to the financial sector not just as morally wrong but also as a threat to price stability (Meyer 1954). Junnosuke Inoue, the Bank of Japan governor during the 1920s, was one of these representative "hawks."

- During the 1970s and early 1980s, central bank governors across all seventeen advanced economies took part in the debates on inflation (Timberlake 1993). In this context, even "dovish/pragmatist" governors could be receptive to certain elements of monetarism without wholly accepting them. An example in this category was the Australian Reserve Bank governor Robert (Bob) Alan Johnston (1982–89), who experimented with monetary targets in the early phase of his tenure. Prior to the Australian crisis of 1989, Johnston adopted a similarly middle-ground attitude, mimicking the poet Arthur Hugh Clough: "Thou may not kill, but needst not strive officiously to keep alive." We see here how a moderate stance on price stability coincided with pragmatic attitudes on bank support.[23] "Hawks," on the other hand, were converts to Milton Friedman's ideas and favored tight control over inflation via the money-supply channel, a stance that led them to reject emergency lending to banks during crises if it violated money growth targets (Meltzer 1998; White 2012). Characteristically, Rolf Kullberg of the Bank of Finland (1983–92) repeatedly voiced dire warnings about the moral hazard implications of lax financial conditions prior to the Finnish banking crisis of the 1990s, when he justified his long hesitation to provide support to banks by the need to wait until they "capitulate and submit [themselves] to the Bank" on punitive terms (Sulkunen 2015).
- Finally, from the 1990s, governors focused on the designs of new inflation-targeting regimes (Goodfriend 2005) and the onset of the "great moderation." These debates again exemplify the coincidence of price and currency stability beliefs on the one hand and emergency crisis attitudes on the other. In Japan, the Governor of the Bank of Japan Yasushi Mieno sounded warnings about inflated land values on

the eve of a financial crisis, motivating his deployment of the hawkish "Mieno Shock" program (Brierley and Hadfield 1990). Similarly, Mervyn King, who served as Governor of the Bank of England from 2003 to 2013—having spent years building a personal "arch-inflation hawk mythology" (*Herald* 2003)—resisted the deployment of emergency liquidity to British banks in 2007–8, long after peer institutions including the European Central Bank (ECB) had approved them, highlighting the moral hazard implications: "The provision of large liquidity facilities penalises those financial institutions that sat out the dance, encourages herd behaviour and increases the intensity of future crises" (King 2007). Jean-Claude Trichet (president of the ECB 2003–11), on the other hand, was representative of "dove/pragmatist" beliefs. Though he had been hawkishly inclined earlier in his career, by 2003, markets identified him with a "pragmatic and flexible policy stance" (Johnson et al. 2003). Prior to the beginning of the GFC, Trichet explicitly rejected a formalistic leaning against asset price bubbles, advocating a pragmatic stance on moral hazard dynamics and, in principle, approving official financial sector support (Trichet 2003a; Trichet 2003b).

Governor Beliefs, Central Bank Action, and Crisis Outcomes

Did the ex ante beliefs of governors actually affect central bank policies during financial crises? Were they strong enough to drive consequential choices, or did central bank committees counterbalance and dilute their ideological predispositions? FKSS (2023) shows that, under hawkish governors, central banks were significantly less likely to expand their balance sheets in response to financial crises. While hawks also reacted to financial crises by expanding balance sheets, they did so less often than their more dovish colleagues.

The differentiated effects of governors' preconceived ideological leanings on central bank policies also appear to have altered macroeconomic outcomes. Figure 10.7 shows average trajectories

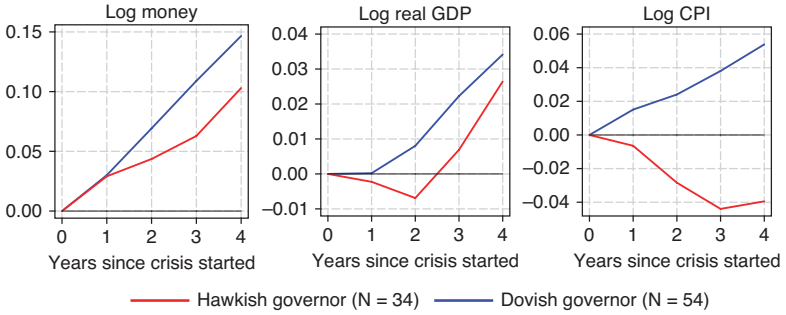

FIGURE 10.7. Macroeconomic Dynamics after Financial Crises by Governor Classification.

Notes: Postcrisis average trajectories for central bank assets, real GDP per capita, and consumer prices by ex ante governor beliefs estimated by the following local projections: $y_{i,t+h} - y_{i,t+1} = \alpha_{i,h} + \beta_h g_{i,t+1} + \varepsilon_{i,t+h}$ for $h = 2, 3, 4$ where $g_{i,t}$ is a binary indicating a hawkish governor, $y_{i,t}$ and stands for each of the three different outcome variables. Sample of eighty-nine financial crises that occurred since 1870 in seventeen advanced economies with an operating central bank and available macroeconomic data, excluding 1914–18, 1939–45, the German hyperinflation, and the Spanish Civil War. Averages purged of country-fixed effects.

Source: FKSS (2023).

for the money aggregate (M2), real GDP per capita, and consumer prices since the start of a crisis split by ex ante governor beliefs, controlling for country-fixed effects. In the raw data, more dovish policy stances were indeed associated with vigorous money growth, quicker economic recoveries, and less deflation.

To test these patterns rigorously, FKSS (2023) estimates instrumental variables in local projections (*LP–IV*) for the macroeconomic effects of balance sheet expansions induced by preexisting central bank governors' beliefs. The empirical strategy is based on the notion that, ceteris paribus, hawkish governors are less likely to engage in balance sheet expansions than their dovish colleagues when facing a similar crisis. This will induce variation in liquidity injections that is exogenous to the crisis situation itself. Based on this exclusion restriction, we estimate expected changes of macro variables from a total of seventy-eight crisis observations using local projections for horizons $h = 2, 3, 4$, counting the years since the start of the crisis:

$$\textit{First stage:} \quad m_{i,t+t} = a_i + bg_{i,t+1} + cx_{i,t+1} + e_{i,t+1} \tag{1}$$

$$\textit{Second stage:} \quad y_{i,t+h} - y_{i,t+1} = \alpha_{i,h} + \beta_h \hat{m}_{i,t+1} + \gamma_h x_{i,t+1} + \varepsilon_{i,t+h} \tag{2}$$

where $y_{i,t}$ denotes a macroeconomic aggregate to be evaluated in natural logarithm to interpret differences as approximate growth rates. The binary variable $m_{i,t}$ takes a value of one if there has been an exceptional expansion—defined as annual central bank asset growth of 15% or more—during at least one of the preceding two years. Importantly, monetary policy $m_{i,t+1}$ will be instrumented by the binary variable $g_{i,t}$ indicating that the current central bank governor holds hawkish beliefs. Country-fixed effects $\alpha_{i,h}$ absorb time-invariant heterogeneity across countries while controls $\gamma_h x_{i,t+1}$ capture macro-financial dynamics prior to the crisis. FKSS (2023) shows that results hold qualitatively for various alternative control vectors.

The first stage relationship of equation (1) is statistically and quantitatively significant. Using our governor classifications, FKSS (2023) shows that hawkish governors have been roughly 36% less likely to conduct a balance sheet expansion either during a crisis year or one year after that. The first stage *F*-statistic for a test of instrument exclusion is 18.9, with results robust to the inclusion of governor-biographical and macro-institutional controls.

In FKSS (2023), we demonstrate that liquidity support during financial crises substantially cushioned negative effects on output. With liquidity support, real GDP per capita started to grow on average during the second year after a crisis outbreak and exceeded counterfactual levels of macroeconomic activity by more than +7% at medium-term horizons. Correspondingly, these estimates imply large gains in terms of *cumulative* real aggregate income, amounting to +21% over the projection horizon.

Moreover, balance sheet expansions led to persistent growth of broad money aggregates and typically prevented protracted deflation. Without central bank interventions, it is estimated that

financial crises without liquidity support were followed on average by three years of falling prices. By contrast, deflation was typically avoided altogether when the central bank provided liquidity. These operations typically did not cause runaway inflation, however. On average, prices increased by +20% over four years, implying annual inflation of about 4.6%.

Our evidence corroborates the literature that has posited positive real effects from liquidity support, such as Richardson and Troost (2009). Based on the identification of exogenous variation in central bank balance sheet expansions, this evidence stands in contrast to previous assessments, including Bordo et al. (2001) and Honohan and Klingebiel (2003), which took a negative view on the real macroeconomic effects of liquidity support. Estimates are qualitatively robust to a range of alternative control setups, sample restrictions, and measurement choices, such as a continuous balance sheet expansion variable.

What if public knowledge about governors' beliefs changes pre-crisis dynamics? Kuttner and Posen (2010) show that financial markets react to the announcement of central bank governor appointments. Possibly, markets not only price in new trajectories of rates and inflation but also change the way they operate: The mere anticipation of dovish crisis management could encourage financial risk-taking ex ante. Accordingly, dovish governors might face not just more but crucially more severe financial crises, violating the instrument's exclusion restriction. Yet such mechanisms would load the dice against finding positive macroeconomic effects under dovish crisis management, because doves would face systematically worse situations. That is, the *LP–IV* estimates would be conservative, making it harder for FKSS (2023) to find anything.

Moral Hazard Effects Dominate the Long Term

Concerns that public policy for financial stabilization may encourage riskier behavior by market participants are not new. There are several empirical cross-country studies on the moral hazard effects of deposit insurance (Cordella and Yeyati 2003; Duchin and Sosyura 2014; Anginer and Demirguc-Kunt 2018). However, systematic evidence on the moral hazard effects of central bank liquidity support is limited. FKSS (2023) asks: Do short-term gains from balance sheet expansions incur long-term costs in the form of financial instability? This is a relevant concern, particularly because for many hawkish central bankers since 1870, the effects of balance sheet expansions on future financial sector risk-taking lay at the heart of their refusal to act more aggressively.

Moral hazard implies financial investments by market participants who expect the central bank to bear private liquidity risk or even bail out insolvent institutions. When such behavior becomes widespread, low-risk premia and easy leverage can fuel credit expansions of the detrimental type (Kirti 2018; Greenwood et al. 2022). If dovish central bank policy precipitated such financial fragility in the past, one should find a link between crisis intervention and subsequent credit booms gone bad.

On this basis, FKSS (2023) systematically explored the moral hazard channel for its crisis sample and found that the data reveal a clear pattern. After financial crises without liquidity support, credit booms generally occurred with a moderate and stable probability. Around 25% of country-years belong to a credit boom episode, a fraction only marginally higher than observed across our entire post-1870 sample. By contrast, the probability of credit booms rose after a crisis with liquidity support, peaking fifteen years after the crisis, with more than 50% of country-years experiencing a credit boom episode. Importantly, the discrepancy in credit boom probability is almost entirely driven by credit booms that turned sour. Such

booms occasionally occur after crises without liquidity support: 4.3% of observations over a twenty-year window. However, after crises with liquidity support, the probability of "bad booms" sharply rises, with the probability averaged over a twenty-year window almost doubling to 8.4% relative to the no-expansion scenario. These differences are statistically significant across a variety of model constraints and specifications, controlling for confounding factors.

Overall, therefore, the data do not allow one to reject concerns about moral hazard. The worries about long-run moral hazard voiced by "hawkish" governors may have had a certain justification. This implies that governors in financial crises face a trade-off between short-run financial stability gains and long-run financial stability risks. Those findings tally with the recent literature on LLR operations and bank behavior, highlighting the moral hazard problem (Drechsler et al. 2016b; Anginer and Demirguc-Kunt 2018; Acharya et al. 2022).

Conclusion

Despite academic recognition of the importance of central bank balance sheets, their long-run empirical evolution, their actual size, and the precise economic effects of their deployment have, so far, not been studied systematically. FKSS (2023) fills this gap. We suggest that balance sheets have not simply traced transaction volumes in economies or any other specific macroeconomic variable and that the classical gold standard era was characterized by a surprising degree of balance sheet elasticity. The long-run evidence suggests that, while central bank balance sheets have indeed assumed unprecedented proportions relative to output in recent years, they continue to lag relative to total financial assets and total public debt.

While a willingness to expand balance sheets in times of geopolitical stress existed as early as the seventeenth century, FKSS (2023) shows that the expansion of central bank balance sheets did not

yet constitute a systematic response to financial crises in Walter Bagehot's lifetime (1826–1877). Rather, this role evolved gradually until the post-1945 era, when investors could increasingly expect meaningful central bank liquidity support in the event of financial distress. How much support and with what consequences? Using the policy orientation of the key decision makers responsible for deploying central bank balance sheets in crisis times—typically central bank governors, but sometimes other officials at the central bank or Treasury—the ongoing work in FKSS (2023) suggests that one can address these questions empirically. FKSS (2023) shows that the deployment of liquidity support during financial crises contributes in a statistically significant and economically relevant way to a faster return to trend inflation, trend real GDP growth, higher stock prices, and stronger real investment. It does not appear to make a difference whether such liquidity support focuses on a particular asset type. Such results stand in contrast with the more skeptical findings of Bordo et al. (2001) and Honohan and Klingebiel (2003).

FKSS (2023) also adds an important qualification, however. For a long time, many economists and central bankers suspected that balance sheet expansions during financial crises could give rise to moral hazard—a concern that demonstrably motivated hawkish governors in the past to reject balance sheet expansions. We find evidence that such a sting in the tail exists. The time until the next systemic financial crisis is significantly shorter after major balance sheet expansions.

This paper summarizes insights from ongoing work by the authors, specifically, the working paper titled "The Safety Net: Central Bank Balance Sheets and Financial Crises, 1587–2020," abbreviated FKSS (2023) throughout this summary. Readers are advised to consult FKSS (2023) for all data, results, discussions, and exercises. We thank Barry Eichengreen for discussing FKSS (2023) and both the organizers and attendees of the Hoover Monetary Policy Conference 2023 for very helpful additional comments.

References

Acharya, Viral, Rahul Chauhan, Raghuram Rajan, and Sascha Steffen. 2022. "Liquidity Dependence: Why Shrinking Central Bank Balance Sheets Is an Uphill Task." Presented at the Jackson Hole Economic Policy Symposium sponsored by the Federal Reserve Bank of Kansas City, Jackson Hole, Wyoming (August).

Acharya, Viral, and David Skeie. 2011. "A Model of Liquidity Hoarding and Term Premia in Inter-bank Markets." *Journal of Monetary Economics* 58, no. 5 (July): 436–47.

Aksoy, Cevat G., Barry Eichengreen, and Orkun Saka. 2022. "The Political Scar of Epidemics." National Bureau of Economic Research Working Paper 27401, May.

Anginer, Deniz, and Asli Demirguc-Kunt. 2018. "Bank Runs and Moral Hazard: A Review of Deposit Insurance." World Bank Policy Research Working Paper 8589 (September).

Ashcraft, Adam, James McAndrews, and David Skeie. 2011. "Precautionary Reserves and the Interbank Market." *Journal of Money, Credit, and Banking* 43, Supplement 2 (October): 311–48.

Bagehot, Walter. (1873) 1962. *Lombard Street: A Description of the Money Market*. Reprint, Homewood, IL: Richard D. Irwin.

Bailey, Andrew, Jonathan Bridges, Richard Harrison, Josh Jones, and Aakash Manodi. 2020. "The Central Bank Balance Sheet as a Policy Tool: Past, Present, and Future." Bank of England Staff Working Paper 899 (December).

Balletta, Francesco. 2008. *La circolazione della moneta fiduciaria a Napoli nel Seicento e nel Settecento, 1587–1805*. Naples: Edizioni scientifiche italiane.

Balletta, Francesco, Luigi Balletta, and Eduardo Nappi. 2018. "The Investments of the Neapolitan Public Banks: A Long Run View (1587–1806)." In *Financial Innovation and Resilience: A Comparative Perspective on the Public Banks of Naples (1462–1808)*, edited by Lilia Costabile and Larry Neal, 95–123. London: Palgrave Macmillan.

Baron, Matthew, Emil Verner, and Wei Xiong. 2021. "Banking Crises without Panics." *Quarterly Journal of Economics* 136, no. 1 (February): 51–113.

Behr, Patrick, and Weichao Wang. 2020. "The (Un)intended Effects of Government Bailouts: The Impact of TARP on the Interbank Market and Bank Risk-Taking." *Journal of Banking and Finance* 116 (July): 1–19.

Benmelech, Efraim, and Nittai Bergman. 2012. "Credit Traps." *American Economic Review* 102, no. 6 (October): 3004–32.

Benmelech, Efraim, Ralf R. Meisenzahl, and Rodney Ramcharan. 2016. "The Real Effects of Liquidity during the Financial Crisis: Evidence from Automobiles." *Quarterly Journal of Economics* 132, no. 1 (April): 317–65.

Bernanke, Ben. 2020. "The New Tools of Monetary Policy." *American Economic Review* 110, no. 4 (April): 943–83.

Bernanke, Ben, Brian Sack, Vincent Reinhart, Benjamin Friedman, and Lars E.O. Svensson. 2004. "Monetary Policy Alternatives at the Zero Bound: An Empirical Assessment." Brookings Papers on Economic Activity 2 (December).

Bindseil, Ulrich. 2004. *Monetary Policy Implementation: Theory—Past—Present.* Oxford: Oxford University Press.

———. 2019. *Central Banking before 1800: A Rehabilitation*. Oxford: Oxford University Press.

Bleck, Alexander, and Xuewen Liu. 2018. "Credit Expansion and Credit Misallocation." *Journal of Monetary Economics* 94 (April): 27–40.

Bolton, Patrick, Tano Santos, and Jose Scheinkman. 2011. "Outside and Inside Liquidity." *Quarterly Journal of Economics* 126, no. 1 (October 22): 259–321.

Bordo, Michael, and Harold James. 2007. "From 1907 to 1946: A Happy Childhood or a Troubled Adolescence?" In *The Swiss National Bank 1907–2007*, edited by Ulrich Kohli, 29–107. Zurich: NZZ Libro.

Bordo, Michael D., Barry Eichengreen, Daniela Klingebiel, and Maria Soledad Martinez-Peria. 2001. "Is the Crisis Problem Growing More Severe?" *Economic Policy* 16, no. 32 (April 1): 52–82.

Bordo, Michael D., and Klodiana Istrefi. 2023. "Perceived FOMC: The Making of Hawks, Doves, and Swingers." *Journal of Monetary Economics* 136 (May): 125–43.

Borio, Claudio, and Anna Zabai. 2018. "Unconventional Monetary Policies: A Re-appraisal. In *Research Handbook for Central Banking*, edited by Peter Conti-Brown and Rosa M. Lastra, 398–444. Northampton, MA: Edward Elgar Publishing.

Brierley, David, and Peter Hadfield. 1990. "Turmoil in Tokyo." *Sunday Times* (London), April 8.

Broadberry, Stephen, Bruce Campbell, Alexander Klein, Mark Overton, and Bas van Leeuwen. 2015. *British Economic Growth, 1270–1870*. Cambridge: Cambridge University Press.

Browning, Reed. 1971. "The Duke of Newcastle and the Financing of the Seven Years' War." *Journal of Economic History* 31, no. 2 (June): 344–77.

Brunnermeier, Markus K. 2009. "Deciphering the Liquidity and Credit Crunch 2007–2008." *Journal of Economic Perspectives* 23, no. 1 (Winter): 77–100.

Caballero, Ricardo, and Arvind Krishnamurthy. 2008. "Collective Risk Management in a Flight to Quality Episode." *Journal of Finance* 63, no. 5 (October): 2195–230.

Calomiris, Charles W. 2011. "Banking Crises and the Rules of the Game." In *Monetary and Banking History: Essays in Honour of Forrest Capie*, edited by Geoffrey Wood, Terence C. Mills, and Nicholas Crafts, 88–131. New York: Routledge.

Carlson, Mark, and David C. Wheelock. 2015. "The Lender of Last Resort: Lessons from the Fed's First 100 Years." In *Current Federal Reserve Policy under the Lens of Economic History: Essays to Commemorate the Federal Reserve System's Centennial*, edited by Owen F. Humpage, 49–101. Cambridge: Cambridge University Press.

Clapham, Sir John. 1958. *The Bank of England: A History*, vol. 1, *1694–1797*, 2nd ed. Cambridge: Cambridge University Press.

Clodfelter, Micheal. 2017. *Warfare and Armed Conflicts: A Statistical Encyclopedia of Casualty and Other Figures, 1492–2015*. Jefferson, NC: McFarland & Company.

Cochrane, John H. 2022. "UK Finance Fable Update." *The Grumpy Economist* (blog), October 14.

Cordella, Tito, and Eduardo Levy Yeyati. 2003. "Bank Bailouts: Moral Hazard vs. Value Effect." *Journal of Financial Intermediation* 12, no. 4 (October): 300–30.

Costabile, Lilia, and Eduardo Nappi. 2018. "The Public Banks of Naples between Financial Innovation and Crisis." In *Financial Innovation and Resilience: A Comparative Perspective on the Public Banks of Naples (1462–1808)*, edited by Lilia Costabile and Larry Neal, 17–53. London: Palgrave Macmillan.

Del Negro, Marco, Gauti Eggertsson, Andrea Ferrero, and Nobuhiro Kiyotaki. 2017. "The Great Escape? A Quantitative Evaluation of the Fed's Liquidity Facilities." *American Economic Review* 107, no. 3 (March): 824–57.

Dell'Ariccia, Giovanni, Enrica Detragiache, and Raghuram Rajan. 2008. "The Real Effect of Banking Crises." *Journal of Financial Intermediation* 17, no. 1 (January): 89–112.

Diamond, Douglas W., and Philip H. Dybvig. 1983. "Bank Runs, Deposit Insurance, and Liquidity." *Journal of Political Economy* 91, no. 3 (June): 401–19.

Dimand, Robert W. 2020. "J. Laurence Laughlin versus Irving Fisher on the Quantity Theory of Money, 1894 to 1913." *Oxford Economic Papers* 72, no. 4 (October): 1032–49.

Dimsdale, Nicholas, and Ryland Thomas. 2017. "A Millennium of Macroeconomic Data." OBER Dataset—Bank of England.

Dincecco, Mark. 2011. *Political Transformations and Public Finance: Europe, 1650–1913*. Cambridge: Cambridge University Press.

Drechsler, Itamar, Thomas Drechsel, David Marques-Ibanez, and Philipp Schnabl. 2016a. "Who Borrows from the Lender of Last Resort?" *Journal of Finance* 71, no. 5 (October): 1933–74.

———. 2016b. "Who Borrows from the Lender of Last Resort?" *Journal of Finance* 71, no. 5 (October): 1933–74.

Duchin, Ran, and Denis Sosyura. 2014. "Safer Ratios, Riskier Portfolios: Banks' Response to Government Aid." *Journal of Financial Economics* 113, no. 1 (February 19): 1–28.

Edvinsson, Rodney. 2014. "The Gross Domestic Product of Sweden Within Present Borders, 1620–2012." In *Historical Monetary and Financial Statistics for Sweden*. Vol. 2, *House Prices, Stock Returns, National Accounts and the Riksbank Balance Sheet, 1620–2012*, edited by Rodney Edvinsson, Tor Jacobson, and Daniel Waldenström, 101–82. Stockholm: Riksbank and Ekerlids Förlag.

Engen, Eric M., Thomas Laubach, and David L. Reifschneider. 2015. "The Macroeconomic Effects of the Federal Reserve's Unconventional Monetary Policies." In *Finance and Economics Discussion Series 2015-5*. Washington, DC: Board of Governors of the Federal Reserve System.

Ferguson, Niall, Martin Kornejew, Paul Schmelzing, and Moritz Schularick (FKSS). 2023. "The Safety Net: Central Bank Balance Sheets and Financial Crises, 1587–2020." CEPR Press Discussion Paper No. 17858 (January 31).

Ferguson, Niall, Andreas Schaab, and Moritz Schularick. 2014. "Central Bank Balance Sheets: Expansion and Reduction since 1900." CESifo Working Paper Series No. 5379 (June): 1–51.

Fregert, Klas. 2014. "The Riksbank's Balance Sheet, 1668–2011." In *Historical Monetary and Financial Statistics for Sweden*. Vol. 2, *House Prices, Stock Returns, National Accounts and the Riksbank Balance Sheet, 1620–2012*, edited by Rodney Edvinsson, Tor Jacobson, and Daniel Waldenström, 339–93. Stockholm: Riksbank and Ekerlids Förlag.

Fregert, Klas, and Lars Jonung. 1996. "Inflation and Switches between Specie and Paper Standards in Sweden 1668–1931: A Public Finance Interpretation." *Scottish Journal of Political Economy* 43, no. 4 (September): 444–67.

Fusco, Idamaria. 2007. *Peste, demografia e fiscalità nel regno di Napoli del XVII secolo*. Milan: Franco Angeli.

Gagnon, Joseph E., Matthew Raskin, Julie Remache, and Brian Sack. 2011. "The Financial Market Effects of the Federal Reserve's Large-Scale Asset Purchases." *International Journal of Central Banking* 7, no. 1 (March): 3–43.

Garriga, Ana Carolina. 2016. "Central Bank Independence in the World: A New Data Set." *International Interactions* 42, no. 5 (March 20): 849–68.

Gertler, Mark, and Peter Karadi. 2011. "A Model of Unconventional Monetary Policy." *Journal of Monetary Economics* 58, no. 1 (January): 17–34.

Gohlmann, Silja, and Roland Vaubel. 2007. "The Educational and Occupational Background of Central Bankers and Its Effect on Inflation: An Empirical Analysis." *European Economic Review* 51, no. 4 (May): 925–41.

Goodfriend, Marvin. 2005. "Inflation Targeting in the United States?" In *The Inflation Targeting Debate*, edited by Ben Bernanke and Michael Woodford, 311–50. Chicago: University of Chicago Press.

Green, E. H. H. 1988. "Rentiers versus Producers? The Political Economy of the Bimetallic Controversy c. 1880–1898." *English Historical Review* 103, no. 408 (July): 588–612.

Greenwood, Robin, Samuel G. Hanson, Andrei Shleifer, and Jakob Ahm Sorensen. 2022. "Predictable Financial Crises." *Journal of Finance* 77, no. 2 (April): 863–921.

Guerrieri, Veronica, and Robert Shimer. 2014. "Dynamic Adverse Selection: A Theory of Illiquidity, Fire Sales, and Flight to Quality." *American Economic Review* 104, no. 7 (July): 1875–1908.

Heckscher, Eli F. 1954. *An Economic History of Sweden*. Cambridge, MA: Harvard University Press.

Herald (Scotland). 2003. "King's First Outing as Governor Surprises Market. Rate Cut Taken as Sign That Hawkish Image Is Softening," July 10.

Hill, B. W., and L. S. Sutherland. 1971. "The Change of Government and the 'Loss of the City,' 1710–1711." *Economic History Review* 24, no. 3 (August): 395–413.

Honohan, Patrick, and Daniela Klingebiel. 2003. "The Fiscal Cost Implications of an Accommodating Approach to Banking Crises." *Journal of Banking and Finance* 27, no. 8 (August): 1539–60.

Johnson, Jo, Tony Major, and George Parker. 2003. "Trichet Gets Green Light for ECB." *Financial Times*, June 19.

Johnston, Robert. 1985. "Prudential Supervision of Banks" address to the Victorian Division of the Securities Institute of Australia and the Institute of Chartered Accountants, on February 2, 1985, in Melbourne. Published in *Reserve Bank of Australia Bulletin* no. 1 (March): 571–75.

Joyce, Michael, Ana Lasaosa, Ibrahim Stevens, and Matthew Tong. 2011. "The Financial Market Impact of Quantitative Easing in the United Kingdom." *International Journal of Central Banking* 7, no. 3 (September): 114–61.

King, Mervyn. 2007. "Turmoil in Financial Markets: What Can Central Banks Do?" Paper submitted to the Treasury Committee (September 12). http://img.thisismoney.co.uk/docs/king_letter.pdf.

Kirti, Divya. 2018. "Lending Standards and Output Growth." International Monetary Fund Working Paper No. 2018/23 (January 26).

Kuttner, Kenneth D., and Adam S. Posen. 2010. "Do Markets Care Who Chairs the Central Bank?" *Journal of Money, Credit, and Banking* 42, nos. 2–3 (March–April): 347–71.

Malmendier, Ulrike, and Jessica A. Wachter. 2022. "Memory of Past Experiences and Economic Decisions." Unpublished manuscript, prepared for the *Oxford Handbook of Human Memory*. https://eml.berkeley.edu/~ulrike/Papers/Memory Handbookv17.pdf.

Martin, Antoine. 2009. "Reconciling Bagehot with the Fed's Response to September 11." *Journal of Money, Credit, and Banking* 41, nos. 2–3 (March–April): 397–415.

Meltzer, Allan H. 1998. "Monetarism: The Issues and the Outcome." *Atlantic Economic Journal* 26, no. 1 (March): 8–31.

Metrick, Andrew, and Paul Schmelzing. 2021. "Banking-Crisis Interventions, 1257–2019." National Bureau of Economic Research Working Paper 29281 (September): 1–47.

Meyer, Eugene. 1954. "From Laissez Faire with William Graham Sumner to the RFC." *Public Policy* 5: 3–27.

Mishra, Prachi, and Ariell Reshef. 2019. "How Do Central Bank Governors Matter? Regulation and the Financial Sector." *Journal of Money, Credit, and Banking* 51, nos. 2–3 (March–April): 369–402.

Molteni, Marco, and Dario Pellegrino. 2022. "The Establishment of Banking Supervision in Italy: An Assessment (1926–1936)." *Business History* (published online October 28).

Monnet, Eric, and Damien Puy. 2020. "Do Old Habits Die Hard? Central Banks and the Bretton Woods Gold Puzzle." *Journal of International Economics* 127 (November): no. 103394.

Reinhart, Carmen M., and Kenneth S. Rogoff. 2009. *This Time Is Different: Eight Centuries of Financial Folly*. Princeton, NJ: Princeton University Press.

Richardson, Gary, and William Troost. 2009. "Monetary Intervention Mitigated Banking Panics during the Great Depression: Quasi-Experimental Evidence from a Federal Reserve District Border, 1929 to 1933." *Journal of Political Economy* 117, no. 6 (December): 1031–73.

Romer, Christina, and David Romer. 2018. "Phillips Lecture—Why Some Times Are Different: Macroeconomic Policy and the Aftermath of Financial Crises." *Economica* 85, no. 337 (January): 1–40.

Sayers, R. S. 1957. "The Development of Central Banking after Bagehot." In *The Development of Central Banking after Bagehot*, edited by R. S. Sayers, 8–19. Oxford: Oxford University Press.

Schneider, Sabine. 2022. "The Politics of Last Resort Lending and the Overend & Gurney Crisis of 1866." *Economic History Review* 75, no. 2 (May): 579–600.

Schularick, Moritz, and Alan M. Taylor. 2012. "Credit Booms Gone Bust: Monetary Policy, Leverage Cycles, and Financial Crises, 1870–2008." *American Economic Review* 102, no. 2 (April): 1029–61.

Scott, William Robert. 1912. *The Constitution and Finance of English, Scottish and Irish Joint-Stock Companies to 1720*. Cambridge: Cambridge University Press.

Segreto, Luciano. 2019. "Stringher, Bonaldo." In *Dizionario Biografico degli Italiani*, 94. Rome: Istituto della Enciclopedia Italiana.

Shafik, Minouche. 2016. "Small Is Beautiful, but Big Is Necessary." Speech given at Bloomberg Markets Most Influential Summit in London, September 28.

Shizume, Masato. 2020. "The Historical Evolution of Monetary Policy (Goals and Instruments) in Japan: From the Central Bank of an Emerging Economy to the Central Bank of a Mature Economy." In *Handbook of the History of Money and Currency*, edited by Stefano Battilossi, Youssef Cassis, and Kazuhiko Yago, 923–52. Singapore: Springer.

Simmons, Beth A. 1996. "Rulers of the Game: Central Bank Independence during the Interwar Years." *International Organization* 50, no. 3 (Summer): 407–43.

Sims, Eric, and Jing Cynthia Wu. 2021. "Evaluating Central Banks' Tool Kit: Past, Present, and Future." *Journal of Monetary Economics* 118 (March): 135–60.

Smets, Frank, and Simon M. Potter. 2019. "Unconventional Monetary Policy Tools: A Cross-Country Analysis." Committee on the Global Financial System Papers no. 63 (October): 1–85.

Sulkunen, Pekka Juhani. 2015. "What Is Neo-liberalism? Justifications of Deregulating Financial Markets in Norway and Finland." SIFO-National Institute for Consumer Research Project Note no. 6 (June): 1–48.

Thornton, Henry. (1802) 1939. *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*. Reprint, London: George Allen & Unwin Ltd.

Timberlake, Richard H. 1993. *Monetary Policy in the United States: An Intellectual and Institutional History*. Chicago: University of Chicago Press.

Trichet, Jean-Claude. 2003a. "Asset Price Bubbles and Their Implications for Monetary Policy and Financial Stability." In *Asset Price Bubbles: The Implications*

for Monetary, Regulatory, and International Policies, edited by William C. Hunter, George G. Kaufman, and Michael Pomerleano, 15–22. Cambridge, MA: MIT Press.

———. 2003b. "Financial Stability." Speech delivered at the Forum Financier Belge, Brussels, November 26. Printed in *BIS Review* 53 (2003). https://www.bis.org/review/r031205a.pdf.

van Dillen, J. G. 1934. "The Bank of Amsterdam." In *History of the Principal Public Banks*, edited by J. G. van Dillen, 79–124. The Hague: Martinus Nijhoff.

van Ommeren, Emile, and Guilia Piccillo. 2021. "The Central Bank Governor and Interest Rate Setting by Committee." CESifo Economic Studies 67, no. 2 (June): 155–85.

van Zanden, Jan Luiten, and Bas van Leeuwen. 2012. "Persistent but Not Consistent: The Growth of National Income in Holland, 1347–1807." *Explorations in Economic History* 49, no. 2 (April): 119–30.

Volcker, Paul A. 2004. "Foreword." In *Too Big to Fail: The Hazards of Bank Bailouts,* by Gary H. Stern and Ron J. Feldman, vii–x. Washington, DC: Brookings Institution Press.

Webb, Stephen B. 1985. "Government Debt and Inflationary Expectations as Determinants of the Money Supply in Germany, 1919–23." *Journal of Money, Credit, and Banking* 17, no. 4 (November): 479–92.

White, Lawrence H. 2012. *The Clash of Economic Ideas: The Great Policy Debates and Experiments of the Last Hundred Years*. Cambridge: Cambridge University Press.

Wu, Jing Cynthia, and Fan Dora Xia. 2016. "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound." *Journal of Money, Credit, and Banking* 48, nos. 2–3 (March–April): 253–91.

Notes

1. Romer and Romer (2018) have recently reached a more benign assessment of the impact of monetary policy on output during financial crises. However, they use only a post-1970s event sample and investigate only policy rate reductions.
2. Across this literature, Ferguson et al. (2014) is the only one concerned with aggregate long-run balance sheet trends but focused on a restricted historical sample and also did not isolate the causal effects of balance sheet expansions.

3. For summaries of studies and the posited financial and macroeconomic effects, see, for instance, Borio and Zabai (2018) or Smets and Potter (2019).
4. Following Dincecco (2011)'s classification, who posits a completion of fiscal centralization for England in the year 1066, which is echoed in related literature.
5. Clapham (1958) in addition reports a GBP 20,000 loan to an anonymous private debtor extended by the Bank in 1711, with Bindseil (2019) interpreting the event as an early LLR instance.
6. In nominal terms, the key expansion years for total BoE assets at the time are 1720 (+19.5% year-on-year), 1723 (+24.1%), and 1724 (+19.1%). None of these years technically qualifies as a "major" expansion event along the FKSS (2023) definitions.
7. Dincecco (2011) posits a fiscal centralization for Sweden only by the year 1840, almost eight centuries after the English centralization. The 1668 and 1719 statutes explicitly formalized ownership of the Riksbank by the Riksdag, and contained a pledge by the King to respect the Bank's independence, see Fregert and Jonung (1996).
8. Fregert and Jonung (1996) provide both real (goods-based) and nominal Riksbank balances for the period to distinguish the effects of the currency devaluation: on their goods-based real Riksbank basis, balances tripled during the period of 1750–9, with the Riksbank essentially constituting the sole source of financing for both the Russian and the Seven Years' War after attempts to tap private markets failed. For the private sector, Fregert and Jonung (1996) highlight the Hat Party policy of protectionism and state subsidies for the merchant community underpinning generous emergency lending.
9. See the detailed chronology and context of lending interventions in Metrick and Schmelzing (2021).
10. As analyzed further in FKSS (2023), a liquidity provision event can be neutral with regard to the overall central bank balance sheet size if "risky" assets held by the private sector are swapped for "safe" assets held by the public sector or if lending is sterilized.
11. While we focus on summary statistics here, FKSS (2023) provides full historical context for the "top 25" largest historical expansion events, and respective sources, to illustrate our classification rationale.
12. FKSS (2023) counts 140 country-years in this category, and the average year-on-year nominal expansion in this category across country-years

stands at 55.9%. In this group, the German hyperinflation year of 1922 represents a significant outlier. Reichsbank nominal total assets in 1922 were expanding at 1186% year-on-year, mainly driven by sharply rising commercial bill discounting activity. Webb (1985, 480–83) argues the Reichsbank behaved passively through this phase, effectively letting the market decide its balance sheet size.

13. For all exercises involving the pre-1870 period, they use banking crisis definitions in Metrick and Schmelzing (2021). Twin crises—as long as they include a banking crisis event as classified by these chronologies—are part of our "financial crisis" sample.
14. "War or revolution" events are repeatedly associated with a "sovereign default" classification in financial crisis chronologies: for instance, Germany 1943, which Reinhart and Rogoff (2009) classify as a sovereign default event; unless also accompanied by a quantitatively dominant banking crisis, these events remain in the "war or revolution" category despite these overlaps.
15. FKSS (2023) noted that even major previous natural or health-related disasters, such as the 1918–19 Spanish influenza, the 1957–58 "Asian flu," or the 1906 San Francisco Earthquake, did not typically engender a measurable monetary policy response. We would also consider events such as the 9/11 balance sheet expansion in the US under this category, but the YOY growth for 2001 does not pass our 15% threshold: see Martin (2009, 400).
16. For the long-run evolution in "bank stress," see Metrick and Schmelzing (2021). For wars, conflict deaths per million population for the seventeen-country sample stands at 122.5 per country-year between 1650–1945, dropping to 2.12 for 1946–2020; 90.5% of country-years since 1946 are fully conflict-free, all on the Clodfelter (2017) basis.
17. FKSS (2023) generally focuses attention on banking crises, as opposed to other types of financial crises for which chronologies exist: it notes that the association between currency crises and major balance sheet expansions is less firm, using chronologies distinguishing between currency and banking crises to confirm the general patterns, including Reinhart and Rogoff (2009).
18. Excluded is the German hyperinflation episode of 1922–23.
19. Existing empirical evidence on the effectiveness of liquidity provisions is mixed and either deals with the post-2007 experience (e.g., Wu and Xia 2016, Smets and Potter 2019, and Bernanke 2020), selected historical case

studies (e.g., Richardson and Troost 2009 and Benmelech et al. 2019), or suffers from the simultaneity of crisis severity and liquidity injection (e.g., Bordo et al. 2001, Honohan and Klingebiel 2003, and Dell'Ariccia et al. 2008).

20. Our rationale relies on existing literature, e.g., Simmons (1996), who showed that during the interwar period central banks systematically tried to steer against government policies. Consistent with such views, the "political leanings" of the nominating government as identified by Van Ommeren and Piccillo (2021) do not accord consistently with the market reactions analyzed by Kuttner and Posen (2010).
21. The governor coding focuses on the most relevant single decision maker in the monetary executive: at times, this person does not have to be the central bank governor—or the finance minister—but rather a different person within the central bank. In a total of nine cases, either central bank independence indices or historical sources indicate clear constraints on the central banks' independence. These cases are discussed further in FKSS (2023).
22. The economic debate during the Third Republic was deeply influenced by moral hazard concerns, with Banque de France governors Pierre Magnin and Georges Pallain subscribing to Clément Juglar's dictum that "a crisis for a nation is the operation made necessary to re-establish an equilibrium broken by speculation" (Bordo and James 2007, 81).
23. Johnston's quote in Johnston (1985).

DISCUSSANT REMARKS

Barry Eichengreen

The chapter by Niall Ferguson, Martin Kornejew, Paul Schmelzing, and Moritz Schularick exploring the trade-off between stabilizing financial market intervention on the one hand and encouraging additional risk-taking on the other could not be more timely, given recent events surrounding, inter alia, Silicon Valley Bank. For purposes of their analysis, the authors assemble a remarkable four-hundred-year-long dataset on central bank balance sheets and their correlates. They have undertaken a monumental task of historical and empirical financial reconstruction for which we, meaning both the disciplines of economics and history, will be eternally grateful. This is not meant as a backhanded compliment; it is not meant to minimize their other contributions. But there is much more in these pages than additional crunching of existing datasets. This chapter will be widely cited, in part but not exclusively because of its invaluable new data.

In addition to important data, the chapter reports important findings, of which I would highlight three. First, the authors document that the circumstances in which central banks expand their balance sheets have changed over time, away from war finance, their traditional charge, and toward financial rescues, their recent preoccupation. Second, they find that liquidity support during financial crises tends to be stabilizing. Third, such support also raises the probability of future boom-bust cycles; it is a source of moral hazard.

The first finding, about changing motivations, is well known to historians though no less important for that fact. Central banks were originally created as financiers to the sovereign and the state.

And what is more important to sovereigns and states than the ability to wage defensive (and sometimes offensive) wars? The second finding of stabilizing effects on financial markets confirms the modern conventional wisdom about the importance of the central bank's lender-and-liquidity-provider-of-last-resort functions. And the third finding about boom-bust cycles confirms economic intuition, namely that financial market participants respond to incentives, if not always in socially desirable ways.

A number of the ancillary patterns documented in the chapter should reassure the "balance-sheet alarmists" amongst us. The authors' longtime series suggest that fiscal dominance is not, in fact, more of a problem now than in the past. They show that central bank balance sheets in recent years are not unprecedentedly large relative to the financial sector. To be sure, central bank balance sheets have grown relative to gross domestic product. But this is entirely because—some might say that it is a byproduct of the fact that—financial sectors have grown.

Along with praise, I have questions about the chapter, some of which are also posed by the authors themselves, others not. To start, what exactly is a central bank? The authors answer: a central bank is an institution established under the provisions of a central banking law. But what exactly constitutes a central banking law? They suggest that a central bank is an institution with a monopoly of note issuance. But if we adopt this definition, we are led to disqualify what is commonly thought of as the first central bank, the Swedish Riksbank (est. 1668), which lacked this monopoly privilege for much of the nineteenth century. Is a central bank an institution with special responsibility for accommodating the government's financial needs? Then, what responsibilities and needs exactly? Ultimately, the authors default to defining a central bank as an institution "occupying a position as 'bank among banks.'" I, for one, am not sure what this means. At this point, it is perhaps appropriate to invoke Justice Potter Stewart.

It makes a difference in practice. Thus, the authors count the Banque de France (est. 1800) as a central bank. But they do not count the Banque Générale (est. 1716, later the Banque Royale) or the Caisse d'Escompte (est. 1776), which carried out some of the same functions. The present example is French, but the problem is general. All scholars who work on central banking face this dilemma. The authors have, on balance, made sensible judgment calls. But they are, nonetheless, judgment calls.

The authors categorize balance sheet expansions as related to war (broadly defined), financial crises and rescues, and a small residual category labeled "other." This categorization is not entirely straightforward; it's not hard to cite ambiguous episodes that resist categorization. Take the Federal Reserve's balance sheet expansion in the spring and summer of 1932. Was this a response to the 1931 banking crisis (a financial-rescue-related expansion) or a response to congressional pressure to help struggling farmers (an "other" balance sheet expansion)? My reading is that the "second banking crisis"—the wave of US bank runs following the UK's departure from gold in September 1931—had largely dissipated by the spring of 1932 and that the Fed was motivated to act by congressional pressure in an election year. Which way do the authors classify this episode? The answer is unclear (they don't tell us in the chapter). This makes it somewhat difficult to assess the reliability of the three-way categorization.

I also have questions about the utility of pushing back the analysis fully four hundred years. If the authors' key point is that liquidity operations, while stabilizing in the short run, foment moral hazard and fuel boom-bust episodes in the long run, then I'm not sure how much mileage is added by the first two hundred years of data, since those earlier balance sheet operations were not liquidity related (central banks only acknowledging their lender-of-last-resort responsibilities and functions in the second half of the nineteenth century). I'm a believer that, to paraphrase the

authors, a long-run historical view is useful for both policymakers and researchers as a complement to studies focusing on the past decade. This is especially true when studying relatively rare events such as financial crises, as the authors note. But how long is the long run when there are fundamental regime changes in the midst of the sample period?

Speaking of early recognition of lender-of-last-resort responsibilities, what about Bagehot's rule? Shouldn't moral hazard effects and the likelihood of boom-bust cycles depend on whether or not emergency liquidity was provided at a penalty rate? Might we want to distinguish balance sheet expansions accompanied by penalty rates from other balance sheet expansions?

The authors instrument their measure of liquidity support with a dummy variable for the "preexisting ideological beliefs of central bank governors." But is the identification of preexisting beliefs straightforward? Subsequent historical analyses and biographies are among the inputs used to characterize ideological beliefs. Might contributors to that literature have been influenced by subsequent actions actually taken?

In any case, is it really the governor who takes the decision (as opposed to a committee of board members, or the government itself when the central bank lacks legal, financial, and practical independence)? In the 1920s, Daniel Crissinger and then Roy Young served as chairmen of the Federal Reserve Board, while Benjamin Strong served as governor of the Federal Reserve Bank of New York. Who was more important in shaping the Fed's views toward the financial system? Starting in 1930, Eugene Meyer served as chairman of the Federal Reserve Board. But George Harrison served as governor of the New York Fed. Who was more important in framing the Fed's views of the desirability of lender-of-last-resort operations? The authors approvingly cite an influential article by Gary Richardson and William Troost comparing lender-of-last-resort operations in different Federal Reserve

Districts in 1931–2.[1] Was the decision to expand Federal Reserve Bank balance sheets in 1931–2 taken by Eugene Meyer and colleagues at the board or by the heads of the St. Louis and Atlanta Feds—William McChesney Martin Sr. and Eugene R. Black, respectively? Richardson and Troost suggest the latter.

There is much to like in this important chapter and much more still to be done.

Note

1. Gary Richardson and William Troost, "Monetary Intervention Mitigated Banking Panics during the Great Depression: Quasi-Experimental Evidence from a Federal Reserve District Border, 1929 to 1933," *Journal of Political Economy* 117, no. 6 (December 2009): 1031–73.

GENERAL DISCUSSION

MICHAEL BORDO (INTRODUCTION): I have been involved in these conferences for over ten years, and they keep getting better every year. This is a session in economic history on the evolution of central bank balance sheets in mitigating financial distress. The background is the Global Financial Crisis of 2007–8, leading to a massive response by the Federal Reserve, which expanded its balance sheet in unprecedented amounts and in novel ways. Such expansions in the past were only done during major wars. The Global Financial Crisis was followed by quantitative easing in 2009, which led to an even more massive expansion in the Fed's balance sheet. A similar response followed the onset of the COVID-19 pandemic in 2020. Similar policies were followed in other countries.

The massive fiscal and monetary expansions that occurred from 2020 to 2022 led to an upsurge in inflation, which is still problematic. Moreover, quantitative easing and balance sheet expansion has created new challenges for the conduct of monetary policy and a call to return to something like the "bills only" policies that were followed in the past. Also, the lender-of-last-resort and credit policies that were followed in 2020 were largely sterilized and did not impact the Fed's balance sheet. They may have prevented market meltdowns, but they may produce distortions and disincentives further down the road.

This very ambitious and interesting paper takes on extremely important topics: the impact of central bank balance sheet policies, most notably lender-of-last-resort and financial-stability policies on the economy, and the extent to which these policies have led to moral hazard. A major contribution of this paper

is the impressive database the authors put together on the balance sheets of seventeen countries that goes back four hundred years and the narratives that go along with it. In addition to its historical depth, the paper develops an interesting identification strategy to isolate the independent effect of balance sheet policy on the economy. In sum, the paper has important lessons for the conduct of monetary policy.

* * *

BORDO: Thanks a lot. Did you want to say something, or should I just go for questions?

NIALL FERGUSON: Well, there are a few things that I could quickly react to, and maybe Paul [Schmelzing] can address some too. Barry [Eichengreen], thank you for an admirably thorough referee's report, which will be enormously useful to us as we revise the paper.

I think that the case of France is interesting, because there was such a discontinuity there and there's more continuity in the other cases. France had long, long periods without anything resembling a central bank until the Banque de France was created, not least because John Law had blown the entire system up with the Mississippi Bubble.

The paper does have an "other" category. I think the [slide presentation] deck doesn't reflect that. The standout cause of crisis is war and then financial crisis, but we have this kind of "other" category. I think we probably should put that in the main body rather than a footnote because clearly there are, as you rightly say, some political cases that don't fit into either bucket.

It's true that the paper has two different time frames, one of which is the long run, going back to the very origins of public banks. There's just no getting away from the fact that this is two

papers pretending to be one, and that second paper is really a post-1866 paper.

And I couldn't agree more with you about the importance of adherence or nonadherence to Bagehot's rule about a penalty rate, and what is clearly differentiating about recent central bank balance sheet expansion is that there is no penalty rate. And that would shock [Walter] Bagehot if he were commentating on Bloomberg TV these days.

I'll add one more point. I'm eager to read the [Didac] Queralt book *Pawned States*, because of my own history of the Rothschilds. You cited yourself, so I'll do it. The history of the Rothschild bank shows that the Rothschild bank was much bigger than really any of the institutions that we're talking about in the nineteenth century, including the Bank of England, which Bagehot represents as absolutely central. But when one gets down into the weeds of nineteenth-century financial history, it becomes clear that private-sector actors are, in fact, really, really powerful in the game. Maybe that's also true today. I sometimes wonder if Jamie Dimon [CEO of JPMorgan Chase] is, in fact, the master of the financial system more than Jay Powell is. Paul, do you want to add anything on the specific data points that Barry raised?

PAUL SCHMELZING: Yeah, just briefly; also, thank you very much for these great comments. On the definition of central banks, I would just add that it's an art, not a science. We rely on some of the most recent books on central banks over time, like Ulrich Bindseil's book. And we're going beyond the idea that if it walks and quacks like a duck, it's a duck, in our framework.

Then I would just point to ongoing research on policy interventions over time that I did with Andrew Metrick, for instance, which looks at both the private-sector and the public-sector responses to financial distress. And based on that work, we can, in a more refined way, analyze which banks have previously been

co-opted by policymakers in the private sector and have been endowed with at least implicit monopolies to react during distress episodes. And so, we are picking the banks that were seen by policymakers or markets over time, even if they were privately owned, to have a central place in the financial sector. And we can weigh that against the other policy options that obviously they had even in the seventeenth or eighteenth century. We can show that, say, they chose to activate rules-based interventions as opposed to liquidity or capital injection interventions in a crisis context. But we can balance the private-sector with the public-sector response from that angle and pick relevant actors.

Just on the national biographies, that's, of course, a very fair point that we naturally in these sources will have biases from these dictionaries and elsewhere. We do try to address that and check with the contemporary precrisis sources and newspapers, like the interviews you saw, to adhere to these ex post narratives. And we have a couple of cases in there. I don't expect people to read page 126 or wherever it is there. But we do throw out cases where it's glaringly obvious to contemporaries that someone else rather than the governor is in charge. Australia during the 1930s is, I think, one of the examples where contemporaries are convinced it's the vice governor calling the shots and the existing governor is really a passive observer of events.

And other than that, on the Richardson-Troost paper, we do focus on the aggregate level, but we are very much aware of the regional-level dynamics that are going on. And we face a similar problem, obviously, with the ECB [European Central Bank] dynamics these days, where interventions might happen on the country level, say in Spain or Italy, that are not necessarily always captured by the aggregate ECB balance sheet. And so, we're looking at the aggregate level to capture aggregate effects on the macroeconomy to really compare apples with apples. We think this is the cleanest way possible. And in the case of the Fed, if

I'm not mistaken, the Federal Reserve balance sheet includes the Atlanta Fed and the regional bank liquidity injections in the 1930s when we capture it at the aggregate data level. And so, we would capture if other regional central banks acted in concert with the Atlanta Fed and raised the aggregate level to an extent that crosses our threshold.

BORDO: I am going to take some questions. I'd like people to identify themselves, and before we do that, I'll just take one chairman's prerogative here—and I could ask a lot of questions—but Niall, you mentioned this, but economic science is evolving over time over this whole period, and that affects the glasses you're looking through, right? Well, how do you really pick that up? I mean, you said it's changing, but in a sense, that could really affect that chronology, and how you pick these guys out and classify them. So it's just something to think about. Let's see. Jeff Lacker.

JEFFREY LACKER: Thank you. Jeff Lacker, Shadow Open Market Committee. So first, let me commend the authors for a truly prodigious compilation of material that will be useful to your work and others' and to many others in the future, I'm sure. You identify the central bank balance sheet size with lender-of-last-resort operations. Now there are two definitions of the phrase "lender of last resort." Well, let me say, at least two. One is what might be thought of as the classic meaning of Walter Bagehot and, more importantly, Henry Thornton before him, of unsterilized lending that expands the central bank balance sheet to offset a drain out of a fractional reserve banking system to avoid a monetary contraction. And this is the sense in which [Milton] Friedman and Schwartz, particularly Anna Schwartz, adopt what's thought of as the narrower definition. And, relevant to 1932, whether it's lending or purchases of securities is immaterial. So they would have classified, I think, 1932's open market operations by the Fed as a lender-of-last-resort expansion of Fed liabilities.

Now, there's a broader definition that's around, and it's very common. It's probably the more common usage, which is "any central bank lending," whether sterilized or not. And this definition typically thinks of unsterilized open market purchases that expand the balance sheet as not lender-of-last-resort operations. And the second definition, as I said, seems to be more common.

Now, when you think about expanding the financial safety net, it's the lending that kind of matters whether or not it expands the balance sheet. So, there's a bit of a disconnect here. Your measure of balance sheet size includes lender-of-last-resort operations in the first sense, which includes government securities purchases, but it also includes those government securities purchases that arguably wouldn't engender the same sort of moral hazard problem. And your measure misses sterilized lending, which would, of course, have the same sort of effect as a financial rescue and the like. But these are often called "lender of last resort." This is bound to affect the size of the safety net, the scale and scope of the part of the finance sector that's viewed as likely to be rescued by a central bank, as does other non–balance sheet actions like the capital forbearance in the 1980s for large banks. And in addition, FDIC [Federal Deposit Insurance Corporation] rescues are sort of right out, right? They're just not in your measure. So, my first question is, do these distinctions seem important? They seem important, but do they affect the interpretation of your results?

My second question has to do with central bank intervention in credit markets over time itself having had a conditioning effect on the political system and sort of gradually shifting and desensitizing the political system to large central bank interventions that over time could have sort of softened up the political system for it and tilted their preferences—tilted their Overton window and shifted their preferences about the type of central banker they wanted to choose. So, is that a sort of an endogeneity

in the choice of central bankers and their ideologies that would affect the interpretation of the results? I couldn't tell from reading the paper. So those are my two questions. Thank you.

BORDO: We will get a couple more questions. Andy Levin and Chris [Erceg].

ANDREW LEVIN: I'm Andrew Levin from Dartmouth College. So, really fascinating work. I just wanted to follow up on a couple of things Barry and Mike both said. It seems important that the central bank should be run by a team of experts instead of having all of the power concentrated in any single person. When Bagehot wrote his classic book [*Lombard Street: A Description of the Money Market*], the governor of the Bank of England only served for two years, but then he didn't leave the bank. Each of those who had previously served as governor stayed and formed a standing committee called the Committee of Treasury. And Bagehot writes, "The influence of the Committee of Treasury is always considerable, though not always the same. They form a cabinet of mature, declining, and old men just close to the executive, and for good or evil, such a cabinet must have much power." Okay, so I think what Bagehot was trying to say is that the governor did not have absolute authority, that there was a team of experts, seasoned veterans, who were kind of making sure that things stayed on an even keel. Now, that may not be true for some of the other central banks that you're looking at over this period. But you have this fascinating historical data set, so it will be informative to look at the extent to which each central bank is run by a single person or by a team of experts who help ensure that sensible decisions are made.

BORDO: Chris.

CHRISTOPHER ERCEG:[1] Thanks, that was a really excellent paper and discussion. So I just want to build on various comments. And in particular, I'd like to note that the rationale, as well as the design of interventions, matter both for their effectiveness and to limit

moral hazard risks. In that vein, it matters whether they're conducted to serve financial stability goals and whether they're temporary and targeted. Of course, these are difficult aspects to get at, but I was wondering if you could at least exploit the duration dimension and investigate whether longer-lived interventions, in fact, have created moral hazard problems.

BORDO: Please give them an answer.

FERGUSON: In a way, these questions are like a research agenda for further work, because clearly we can slice and dice the material a good deal more than we have. This has been a lumping exercise, and next comes the splitting. You know, one thing that we didn't talk about, but you could equally well have asked is, "What about the other side of the balance sheet?" And that's something that is highly relevant when we're comparing recent events with the past because of innovations like interest on excess reserves. But I think in an exercise like this, we're lumping. And we're consciously taking everything, including the narrow and broad definitions of lender of last resort, and we're throwing it in with war finance. We're throwing it in with just about anything that causes central bank balance sheets to expand, the emphasis being the heterogeneity of rationales, the different ways in which these institutions have worked over time. And I think the next step is to get more precise.

In answer to Andy's point, you know, history is really just all about saying, "It's complicated." Every decision that we want to attribute to the president of the United States, on close inspection, is, in fact, the result of an interagency battle that is waged in the bureaucratic jungle that we call the Beltway. In that sense, all decision making in history should not be taken to be the work of the person at the top of the org chart. It almost never is. And I think what was rewarding about this exercise for me was that it forced us to look at all the central banks over a long period of time and get at least enough acquainted with the biographies

of the central bankers to see just how diverse [the history] is. I mean, there were, of course, towering figures at the central banks of the twentieth century, the "lords of finance." But as Barry pointed out, it wasn't actually the Fed chairman who called the shots. So, I think this is an argument for digging deeper.

Bagehot's well worth rereading. I remember rereading Bagehot prior to one of the first of these conferences that I attended and realizing with horror that Bagehot would have been against the Taylor rule. In fact, implicitly, the whole of *Lombard Street* is a critique of the Taylor rule before it was even invented.

And finally, I think that what's really interesting, Chris, is precisely that we can get a sense of the duration of intervention. I'll hand it over to Paul on this, because we can certainly provide more precision. Can't we?

SCHMELZING: If I could just add one more thought on the other two questions. It's very much the case that we use a broader definition of lender of last resort among competing definitions. And we certainly don't distinguish what exact type of assets—from a risk profile, for instance—are purchased in each individual instance. So the aggregate size of the balance sheet can stay flat. However, you can swap risky assets for safe assets, and that might make a big, big difference for financial markets. We do have that data on a more granular level, as shown on the government side. We can at least distinguish between safe assets and "unsafe" assets, and it did not affect any of our main results. So that makes us confident that it's these aggregate dynamics that are decisive in the end.

And then I think a couple of questions go toward the idea that it might not really be the governor who's de facto in charge. There might be a lot more going on. Or does the executive, the government itself, mainly influence? And obviously, I should add that we do not consider, say, the Reichsbank during the 1930s

as an independent central bank, where the governor has the autonomy to expand the balance sheet or not. So, we use some of the independence series that people have come up with. But we also rely on some research. Beth Simmons wrote a famous article, I think, on the interwar dynamics, where she shows that the governors systematically opposed the nominating government policy down the line once they were appointed. And a couple of other studies suggested that actually, the opposite is true, that once central bankers are appointed, they have a mind of their own, and they are not easily adhering to some sort of implicit dealmaking here.

On the duration, I'll just say this is a point very well taken. And at least for, you know, the second part of the sample, we should have a pretty good idea and work out in more nuanced ways some of the other attributes of these expansions. So that's a point very well taken. So, thanks for that.

BORDO: Do you have something that can be fast?

KRISHNA GUHA: I'll keep it very quick. Krishna Guha, Evercore Partners. I was struck looking at the long historical series that of course you're covering periods of very different monetary regimes. You've got pre–gold standard. You've got the gold standard. You've got post–gold standard Bretton Woods floating rates. One might have expected that there would be some breaks in behaviors associated with these regimes. That didn't seem to come across in your work. And I just wanted to ask, a) is that right, b) were you surprised, and c) are there any conclusions you draw from that?

FERGUSON: Well, this is a longer-answer type of question than we've got time for. But I think it's fair to say that we've been for some time skeptics about the clarity of these monetary orders. Paul has a paper (which I'm not sure was ever published) on the messiness of exchange regimes in practice; that many of these stories that we tell ourselves about monetary orders are stories; that what

economists call "stylized facts," we historians call "fictions." And the realities are quite different when one actually scrutinizes the monetary regimes in practice. And Barry, of course, has written brilliantly on how the gold standard actually worked. So we weren't really expecting this to be a big sort of predictor of regime change. Paul, do you want to add anything to that?

SCHMELZING: No, I think you captured it very nicely. I mean, I would just add, yes, I think we pointed out some of the regime change narratives that one can draw from the data, certainly. I mean, the 2008–9 inflection relative to GDP is jumping into your eyes. It's glaringly obvious that something qualitatively has changed relative to output dynamics. But the point is, this paper, for the first time, I think, allows us to look at the question of whether there have been regime changes or not, because so much of the overwhelming debate has focused on 2008 and 2009 and has tried to draw structural conclusions and secondary implications from the policy actions that we've seen. And many of these other charts that Niall has shown put doubt on the idea that there was a big inflection point in 2008–9. So that's something we tried to stress in the first part of the paper, that this idea that something unprecedented happened in 2009 is only true in a very qualified sense.

BORDO: Okay, I think that's it. I'd like to thank you, everybody.

Note

1. The views expressed in this discussion are those of the author and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.