Liquidity Management and Central Bank Strength: Bank of England Operations Reloaded, 1889-1910

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Abstract:

Is a strong commitment to monetary stability enough to ensure credibility? The recent literature suggests it might not be if the central bank cannot perform pure interest rate policy and has to resort to balance sheet policy: the central bank's financial strength (i.e. the long-term sustainability of its policy) is also a determinant of credibility. This paper provides historical evidence on the issue by focusing on the case of the Bank of England at the heyday of the classical gold standard. It shows that as the Bank was not perceived as having the means to fulfil all of its obligations, the efficacy of its interest rate policy was poor. Failing to reform for political economy reasons, the British monetary system eventually imploded.

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Adm Boom: "How are things in the world of finance?"
Mr Banks: "Never better. Money's sound. Credit rates are moving up, up, up. And the British pound is the admiration of the world".

Walt Disney's *Mary Poppins* (1964).

Credibility is key to the success of monetary policy. A priori, a central bank implementing pure interest rate policy only needs to be seriously committed to long-term price stability in order to reach this goal. But things are different when it comes to balance sheet policy. Here central bankers do not only need to prove that they are committed to their targets, but also that they have the means to pursue them. This means that credibility may also depend on the sustainability of monetary policy – or differently said, on the central bank's financial strength.[1] Is financial strength a necessary condition for successful liquidity management also when commitment to monetary stability is unquestioned?

In order to shed light on this topical question, this paper provides out-of-sample evidence from a very different institutional framework than today's. It focuses on Britain at the time of its financial heyday, when it stood at the very center of the international monetary system. The pre-WW1 Bank of England is universally considered as the symbol *par excellence* of an absolute engagement to conservative monetary policy. This paper points out that notwithstanding its strong commitment to the gold standard, the Bank faced credibility problems due to the inconsistency of the package of rights and obligations assigned to it. On the one hand, the Bank could not devote to pure interest rate policy because of its engagement to perform lending of last resort through its standing facilities and its lack of control over opportunity cost of cash. On the other hand, though, the Bank also lacked adequate financial resources for performing balance sheet policy in a satisfactory way. This situation made monetary policy implementation increasingly difficult over time. Because of the strict constraints imposed on its balance sheet adjustment process, the Bank was unable to control interest rates. This exposed the country to violent fluctuations of domestic interest rates that were unanimously considered as obnoxious to the real economy. Such equilibrium was clearly suboptimal, but reform was stopped by harsh lobbying from the banking sector. As a result, central bank policy was considered as less and less credible by market participants, and the whole monetary system eventually collapsed when a foreign-originated liquidity shock hit the money market in July 1914. This important historical episode suggests that even a core central bank strongly committed to "good housekeeping" rules can suffer from policy credibility issues when the prospective value of its rights and obligations is dubious.

The paper is structured as follows. The next section reviews the recent literature on liquidity management and central bank strength. Section 2 reviews the state-of-art knowledge on the Bank of England's monetary policy in the period preceding WW1. Section 3 assesses the central bank's financial strength in the context of the British banking system. Section 4

[1] "Financial strength" is defined as the capability to meet financial engagements. It is determined by the amount of financial resources (available or callable) but also by the extent of risk transfer mechanisms (contingent assets and liabilities). For a discussion about the concept of central bank financial strength, see Archer and Moser-Boehm (2013).

analyses the strategies put in place by the Bank in order to cope with its situation. Section 5 concludes.

1. Liquidity Management and Central Bank Strength: A Review

Until the recent crisis, it was conventionally thought that central banks should implement pure *interest rate policy*. According to this view, central bankers are only supposed to signal the level of short-term interest rate they desire and set the opportunity cost of cash (i.e. the spread between the interbank rate and the rate of remuneration on banks' deposits). The central bank does not need to perform any kind of liquidity management: if the central bank is credible, banks will behave according to its signal without the need for any open market operations to be implemented. But this can only work in a world in which access to the central bank's standing facility is totally exceptional, so that the size of the central bank's balance sheet is completely determined by autonomous factors. If this is not the case, the monetary authority will be forced to engage into *balance sheet policy* and liquidity management operations (Borio and Disyatat 2010; Bindseil and Jabłecki 2011).

The wave of aggressive balance sheet policy put in place by central banks during the recent crisis has brought to the front the issue of the actual solidity of their capital structure: to what extent is policy viable in the long term when the monetary authority becomes massively exposed to potential losses? Beyond the specificities of the current situation, this debate poses the more general question of the relationship between the strength of central banks as financial organizations and their capability of performing monetary policy in an effective way. This question has long been overlooked by the economic literature. In fact, textbooks assume that the right to issue cash allows the central bank to expand liabilities at will, thus subtracting it from the basic constraints to which common banks are subjected: as the financial strength of such an organization is basically infinite, its credibility as a money issuer is thought to depend only on its willingness to comply with a number of "good housekeeping" rules. But central banks are not merely money-issuing agencies: they are complex organizations endowed with a bundle of different (and possibly conflicting) tasks. As a result, their financial strength will depend on the combined prospective value of its rights (seigniorage) and obligations (contingent assets and liabilities from monetary intervention). As the effectiveness of monetary policy crucially depends on credibility, financial strength (or differently said, the sustainability of that policy) is then a fundamental determinant of central banks' ability to pursue their targets effectively (Stella 1997; Bindseil *et al.* 2004; Archer and Moser-Boehm 2013).

Monetary policy can be unsustainable because a real-world central bank *does* face concrete limitations to its balance sheet action. For instance, liquidity-absorbing open market operations may find a limit in the exhaustion of the bank's portfolio of marketable assets, while liquidity-injecting ones may find a limit in counterparties' unwillingness to hold

deposits with it.[2] If the possibility exists that (for whatever reason) the monetary authority may become unable to adjust its balance sheet as required by the pursuit of its targets without defaulting on its mandatory commitments, the credibility of the whole policy will be shaken.[3] The literature outlines two strategies for coping with policy sustainability problems through a strengthening of the liabilities side of the central bank's balance sheet. The first one consists of having more investment into the central bank: this means recapitalizing it through an injection of marketable assets. For obvious political economy reasons, this is generally an uneasy way to go for both monetary and fiscal authorities (Stella 1997). The alternative one consists of having more loans to the central bank: this may mean attracting either more voluntary loans (by issuing interest-bearing debt certificates or by remunerating deposits)[4] or more forced loans (by raising liquidity requirements). Also these ways may, however, be difficult to go. On the one hand, collection of voluntary loans/deposits is not always appealing: it may not necessarily succeed – and if it does, it may end up compromising monetary policy effectiveness in case it exacerbates the banking system's structural liquidity surplus with respect to the central bank (Bindseil 2004). On the other hand, forced loans are indeed more appealing, as they also have beneficial regulatory properties.[5] Due to their poor performance as monetary policy tools during the postwar period, however, liquidity requirements have long been considered as a factor of financial instability, and have only been reevaluated by regulators in the aftermath of the recent crisis (Bouwman 2014).

To sum up, an adequately strong central bank may not be a straightforward achievement, but lack of it is doomed to have an impact on the pursuit of monetary targets. The existence of a correlation between central bank strength and policy effectiveness has now been confirmed by a number of empirical studies (see e.g. Klüh and Stella 2008; Adler *et al.* 2012; Perera *et al.* 2013). All enquiries, however, have only covered recent time periods and one might wonder whether their conclusions are tied to the peculiarities of today's international monetary system – especially in the case of peripheral countries, whose short-dated adoption of "sound" monetary targets might be at the root of weak credibility. As a result, it is interesting to ask whether also core countries with a consolidated record of policy target stability may be vulnerable to the same kind of problem. Pre-WW1 Britain provides valuable insights on this question.[6]

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[2] A central bank faced to such problems can resort to alternative strategies (e.g. buying or selling derivatives), but these may be only very imperfect substitutes of standard operations and may not necessarily strengthen its position.

[3] Policy unsustainability may also be due to the need to limit potential losses: although a central bank can well run with a negative capital, losses may be very costly from both a reputational and a political viewpoint (Archer and Moser-Boehm 2013).

[4] Although formally different, the two are substantially equivalent from an economic viewpoint (Borio and Disyatat 2010).

[5] The simple reason is that by increasing liquidity requirements, regulators expect to decrease leverage – and hence, risk-taking – in the banking system (Bouwman 2014). Liquidity requirements do not necessarily prevent banks from expanding liabilities as long as other sources of funding are available – provided, however, that there is perfect substitutability between cash and other liquid assets (Borio and Disyatat 2010).

[6] Contemporary studies on the link between financial strength and policy effectiveness have generally focused on the central bank's ability to attain the inflation target. Taking this as an indicator of policy effectiveness would however be inappropriate for 19th-century central banks, which were assigned a gold convertibility mandate whose compatibility with price stability was often questioned by the fluctuations of the real price of gold. In view of this and of the institutional design of central bankers' mandate in the 19th century (Ugolini 2012), this paper will rather take interbank rates' volatility and divergence from policy rates as an indicator of policy

2. The Bank of England's Monetary Policy: A Review

What monetary policy targets did the Bank of England pursue at the heyday at the classical gold standard? For many decades, a vast research effort has approached this question by trying to assess whether the Bank was actually complying with so-called "rules of the game" (see Eichengreen and Flandreau 1997 for a survey). What "rules of the game" of the gold standard actually meant in practice is far from straightforward (Flanders 1993). The most popular account of Britain's pre-WW1 monetary policy – viz. the Cunliffe Report of 1918 – described the Bank as automatically adjusting the official discount rate to gold flows in order to foster stabilizing changes in the monetary base (Cunliffe Committee 1997 [1918]). On this basis, both supporters and detractors of the Committee's views started to conceive of the "rules" as a pro-active policy to magnify the effects of gold flows, implemented through open market operations to adjust the volume of commercial banks' reserves. In particular, the influential contribution by Hawtrey (1934) consecrated the idea that an embryonic version of the reserve position doctrine had *de facto* been followed by Threadneedle Street already before the war.[7] In order to test this, a wealth of studies has subjected data on the Bank's securities holdings to a variety of empirical techniques. The results of the effort have been controversial. Some have rejected adherence to the "rules" (Bloomfield 1959; Goodhart 1986 [1972]; Giovannini 1986), while some other have restated it (Pippenger 1984; Dutton 1984; Davutyan and Parke 1995; Jeanne 1995). Irrespective of their conclusions, all of these papers share the same basic assumption: they all interpret variations in securities holdings as voluntarily-implemented changes in the monetary base. As pointed out by Moggridge (1984), however, this assumption is incorrect, because variations may have been determined by the functioning of the standing facility rather than by open market operations.[8] As central banks are unable to check consistently the expansion of the monetary base, it is improper to try to infer the monetary stance by merely looking at the evolution of balance sheet items (Bindseil 2004; Disyatat 2008).

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effectiveness. Central banks' inability to make interbank rates coincide with policy rates is often taken as an indicator of policy ineffectiveness also today, although institutional differences across countries matter in determining such spreads (Bindseil and Jabłecki 2011).

[7] According to Hawtrey (1934, pp. 150-1), the rationale of the Bank's policy in the 19th century had been the following: "The regulation of credit depends upon the power of the central bank to influence the lending operations of the competitive banks. The lending operations of the competitive banks are limited by their relation to their cash reserves, and the central bank has the power of increasing or decreasing those reserves by increasing or decreasing its own assets. […] It is the function of the sales of securities to make Bank rate effective. This can also be accomplished by the central bank itself coming into the market as a borrower. In the 19th century the Bank of England adopted a compromise between the two methods by what was called "borrowing on Consols". If it simply sold Consols it might suffer a capital loss. If it borrowed in the market like a discount house, its operations might attract attention to an inconvenient extent among those dealing in the money market. The Bank therefore adopted the plan of selling Consols for cash and at the same time buying an equal amount forward for the next account. The net result was that the Bank borrowed from the Stock Exchange for a fortnight or less at a rate of interest equal to the contango rate".

[8] Among the above-quoted scholars, the only one who seems to have been aware of this issue is Hawtrey (1934, p. 151), to whom it was nonetheless not an issue. According to Hawtrey, in fact, in concomitance with open market operations the Bank kept the official discount rate high enough that voluntary changes in the monetary base were not offset by involuntary ones. This claim will receive serious qualifications in Section 4.3.

In contrast to the traditional view, a number of scholars have emphasized that international adjustment under the classical gold standard took place through short-term capital flows rather than gold shipments, and that British interest rates had a paramount role in driving them (Bloomfield 1959; Goodhart 1986 [1972]; De Cecco 1974; Eichengreen 1987).[9] International capital flows, however, were directly determined by interbank ("market") interest rates, not by official ("Bank") ones (Officer 1996). Building on extensive qualitative evidence, Sayers (1936, 1976) demonstrated that open market operations were aimed precisely at impacting the interbank rate in a context of limited control by the Bank over the money market. This substantially disproved Hawtrey's (1934) claim that some sort of reserve position doctrine had already existed before WW1,[10] as well as the idea that the Bank was actively operating to magnify the effects of gold flows. However, Sayers (1936, 1976) did not present systematic quantitative evidence on the Bank's intervention strategy. Moreover, while the relationship between the Bank's institutional constraints and the forms taken by its action has been studied for some specific aspects of its functioning – such as branching (Ziegler 1990), lending of last resort (Flandreau and Ugolini 2014), or gold dealing (Ugolini 2013) –, no such analysis has yet been performed for the case of its interest rate policy. By resorting to previously unused archival material, this paper fills this gap.

3. The Bank of England's Strength: An Assessment

3.1) Assessing Central Bank Strength

Measuring central bank financial strength is difficult. This is due to the eminently contingent nature of many of the factors determining the financial solidity of the money-issuing organization. Estimating the strength of today's central banks requires access to a substantial amount of soft information which is not only often unavailable, but also subjected to serious comparability issues due to differing accountability standards across countries (Klüh and Stella 2008; Archer and Moser-Boehm 2013). While a number of different indicators of strength have been proposed, all of them revolve around the same idea – viz., capturing the prospective "net worth" of the package of rights and obligations assigned to the central bank.

Constructing a precise quantitative indicator of the pre-WW1 Bank of England's financial strength would plainly be impossible on the basis of available historical information. As a consequence, this section tries to assess the Bank's overall capability to meet its engagements by reviewing all its privileges and constraints. In particular, the question of the Bank's ability to adjust its balance sheet in order to perform monetary policy operations is

[9] Studies of the determinants of the Bank of England's interest rate policy during this period include Goodhart (1986 [1972]); Contamin and Denise (1999); Tullio and Wolters (2008); Morys (2013).

[10] Sayers' (1936) argued that before 1914 the Bank's open market operations had nothing to do with the reserve position doctrine: they had merely consisted of occasionally "borrowing in the market" (i.e., reducing the amount of short-term loanable funds in the money market, not the amount of commercial banks' cash) with the aim of reducing the spread between the official and the interbank rate. This was confirmed by Goodhart's (1986 [1972]) finding that the level of cash reserves was not determined by the Bank's policy, but by real economic activity.

taken into scrutiny. The analysis is partly based on a complete reconstruction of the Bank's consolidated balance sheet at a high frequency (weekly) from original archival sources (see Figure 1). The period covered runs from January 1889 to February 1910, corresponding to the entire time span during which the Bank implemented open market operations alongside ordinary standing facility lending (Sayers 1936, 1976). In order to complement the analysis, a number of international comparisons with a simple of eight European central banks for a benchmark year (1909) are also provided in Table 1.

Figure 1 and Table 1 about here

3.2) Capital

The Bank of England was a relatively highly-capitalized banking corporation. A quick comparison shows that the size of the central bank's capital with respect to the domestic economy was high by international standards, and highest among big countries (with the exception of Austria-Hungary: see Table 1). Between 1889 and 1910, the Bank's capital remained unchanged at £14.5m – which made between 12.2 and 20.6% of its total liabilities. The Bank was a joint-stock company which was not participated by the State: its stock was widely held by small private investors, featuring more than 10,000 shareholders of which only 191 held more than £4,000 nominal of stock. This was due to the fact that the Bank could not be controlled by any single investor: only holders of £500 nominal of stock had voting rights, but no one could have more than a vote (Hannah 2007). The Treasury had a say in the nomination of the governor and board members, who were appointed for short periods (governors stayed in place for two non-renewable years) and were customarily chosen from the merchant banking community – i.e., among the Bank's customers rather than owners (Clapham 1944). Another reason why it may not have been interesting to take over the company was its relatively poor profitability. The Bank's dividends largely underperformed not only those paid by commercial banks, but also those paid by other central banks. Towards the end of the 19th century, dividends became less and less affected by the level of official interest rates, and the stock substantially evolved into a quasi-bond (Flandreau 2008). Such underperformance generated increasing tensions between the board and shareholders, thus encouraging the former to develop more aggressively retail operations in the provinces (Ziegler 1990).

All this suggests that the Bank was a fully private company with a quasi-public governance but without a clear fiscal backstop behind it. Although provided with a solid capital basis, the Bank struggled to generate profits and could not then grow by retaining earnings. The company was governed by a number of old, rigid rules which made recapitalization a particularly complex process to put into place. Had the Bank been in need of expanding its balance sheet, it would have certainly been unlikely to do it through an increase of its capital base.

3.3) Banknotes

Unlike in most countries adhering to the gold countries, in Britain the central bank did not have to keep the amount of bullion reserves proportional to the level of issued money (Bloomfield 1959). In 1844, Peel's Act had decreed that the Bank of England would have been authorized to circulate a fixed amount of notes without gold backing, while all additional issues had to be entirely covered by bullion. The amount of fiduciary circulation determined in 1844 was relatively large, but the sum had never been revised since. As a result, total circulation remained almost stable over time – fluctuating between £23m and £31m between 1889 and 1910 (see Figure 1). The amount of banknotes issued did not have any relation to the size of gold reserves: bullion coverage fluctuated between 72 and 197% of circulation.

If the remarkable stability of note issuance makes the pre-WW1 Bank of England very similar to today's central banks (to whom circulation is an "autonomous factor" determined by exogenous determinants: Bindseil 2004), it also makes it very dissimilar to coeval ones. Prior to 1914, circulation was typically the biggest component of central banks' liabilities. In all other eight European countries in our sample, notes issued by the central monetary authority amounted to between 4.71 and 14.92% of GDP in 1909 – while in Britain, they only amounted to 1.44% (see Table 1). As the public's demand for banknotes was at the time more elastic than it currently is, the cap fixed for the Bank of England's circulation put a serious limitation to the expansion of its balance sheet. Beside undermining its profitability (by capping seigniorage revenues) and preventing it from developing its provincial branch network (Ziegler 1990), it might also have compromised its ability to expand its balance sheet in times of monetary disturbances.[11]

3.4) Deposits

Since the end of the 18th century, the legal privileges granted to the Bank of England had made it the center of the national payments system (Thornton 1802). As a result, deposits with the Bank had long been used by British banks in order to clear payments among them. In obedience to the Currency Principle, deposits had been exempted by the Act of 1844 from any compulsory gold backing. As a result, deposits were supposed to play – and according to some (Hawtrey 1934), *did* play – the role of ideal instruments for expanding or contracting the Bank's balance sheet, and hence for impacting money supply. As pointed out by Goodhart (1986 [1972]), however, this was hardly the case. The amount of bankers' deposits was largely driven by factors largely independent of the Bank's stance (such as business cycles or stock exchange settlements). As the Bank was formally forbidden to pay interest on deposits,

[11] In the mid-19th century, the additional amount of banknotes the Bank was authorized to issue (accounted as "Banking Department cash reserve" on the Bank's published balance sheet) was interpreted by the public as an indicator of the Bank's ability to sustain market pressure (Ugolini 2012). The further development of banking transactions after 1870 may have downsized the preoccupation that the Bank could run out of banknotes during a crisis. Still, the cap to circulation prevented the Bank from diffusing high-powered money beyond the boundaries of the banking system – which held most of the notes issued, and whose demand of banknotes was less elastic than the one of common people.

bankers always kept with it what they considered as the minimum sum necessary to perform daily payments, and this sum was determined outside the scope of the Bank.

Between 1889 and 1910, deposits averaged £47.5m and made between 40 and 60% of total liabilities; variations of the former largely determined those of the latter (Figure 1). They featured three kinds of depositors: the Treasury, private customers,[12] and bankers. Deposits by all three groups tended to be volatile, although the patterns were different (see Figure 2). The Treasury's balances displayed a high degree of seasonality as they were mostly determined by the timing of tax collection and coupon payments; their variations could hence be anticipated relatively easily by the Bank. Private customers' drawing accounts were the less volatile of the three; except for a relevant spike in 1895-7 (probably imputable to gold dealers: Ugolini 2013), they fluctuated between £15m and £20m throughout most of the period. Bankers' balances were the most important component of deposits. They displayed a certain degree of seasonality tied to technical reasons (constantly peaking, for instance, at year's ends), yet their pattern was less regular than the Treasury's. Bankers' deposits grew more sizeable over the period (they passed from averaging less than £17m in the 1890s to more than £24m in the 1900s),[13] but their volatility also increased. One striking feature of their behavior is that unlike in previous crises (such as e.g. May 1866: Bank of England 1967, p. 29), monetary shocks did not translate into an accrued appetite for central bank deposits. Moments of severe strain like November 1890, December 1899, or November 1907 did not coincide with major increases in bankers' balances (figure 2). The banking system's unwillingness to leave cash with the Bank might be interpreted as evidence of bankers' confidence in its commitment to act as a lender of last resort and sustain the money market through its standing facilities. This attitude, however, posed a serious limitation to Threadneedle Street's capability to stick to such a commitment. In fact, it meant that even the most obvious buffer for adjusting its balance sheet and thus accommodating disturbances was indeed unavailable to the monetary authority.

Figure 2 about here

3.5) Lending of Last Resort

The Bank of England had gradually started to implement lending-of-last-resort policies in the mid-19th century. Since at least the 1866 crisis, the Bank had actually been expected to support the money market in a crisis and thus prevent the drying-up of liquidity. As the Bank's acceptance of this duty had been coupled with the adoption of prophylactic measures, the amount of risk that it was likely to take onboard through crisis lending was actually limited. Indeed, central bank's losses had experienced a secular downward trend

[12] Private customers included a bunch of fairly different agents, such as colonial and foreign semi-institutional actors (e.g. the Crown Agents for the Colonies, the India Council, the Bank of Japan), multinational (e.g. Nestlé) as well as local firms, retail customers of provincial branches, etc. (Sayers 1976).

[13] Pressnell (1968) argues that this was the outcome of a "gentlemen's agreement" between central and commercial bankers (see Section 3.6). However, the high volatility of the series seems to imply that banks only deposited minimum working balances. The increase in the average level of deposits might actually only reflect the growth of transactions over time.

throughout the second half of the 19th century (Bignon *et al.* 2012; Flandreau and Ugolini 2014).

Although the risk associated with lending-of-last-resort operations may not have been a major concern, their size actually was. The Bank's standing facility featured both discounts of bills and advances against marketable assets. While the Bank's portfolio of government and corporate securities tended to be stable over time, discounts and advances were subject to abrupt changes (see Figure 3). These variations were generally the match of those of deposits (see Figure 2), but this was not always the case. During the Baring crisis (November 1890), for instance, expansion of standing facility lending had not corresponded to a proportional increase in bankers' balances. In order to be able to sustain market pressure without expanding its balance sheet, the Bank had then been obliged to perform outright sales of Treasury bonds.

Therefore, the question is how much of the money market the Bank would have been able to "internalize" in its balance sheet given the constraints that were imposed on it. At the time Walter Bagehot had been writing *Lombard Street*, the central bank was still relatively big with respect to the money market, and this made an internalization of a sizeable portion of it a viable option (Bagehot 1873).[14] Already by the early 1880s, however, this had no longer been the case (Sayers 1936). The growth of the Bank of England had not kept pace with that of the overall financial sector. If one is to believe Sheppard's (1971, p. 30) estimates, between 1891 and 1909 the ratio of the central bank's assets to the total assets of British financial institutions was low and slightly shrinking (see Figure 4).[15] Comparing the central bank's size with GDP provides a consistent picture: in 1909, the Bank of England was small with respect to the British economy, and relatively much smaller with respect to the central banks of countries that certainly had less developed financial sectors (see Table 1). But the Bank was not only small in relative terms: it also was in absolute terms. Besides being smaller than its main counterparts (French, German, and Austrian), the Old Lady was surrounded by a number of commercial banks of similar if not greater size: nothing similar happened in the other most important financial centres except Belgium (see Figure 5). Concentration in the banking system might not have been a concern for the Bank had it not been associated with increasing leverage (Braggion *et al.* 2012). The level of liquidity reserves (including coins, banknotes, and central bank balances) officially reported by the most important commercial banks stabilized around 15% of their total assets in the period of our concern.[16] This might look an extremely prudent ratio by nowadays' standards. Once the actual liquidity

[14] Bagehot explicitly linked the Bank's ability to implement interest rate policy effectively to the banking system's liquidity deficit: "The Bank of England used to be a predominant, and is still a most important, dealer in money. It lays down the least price at which alone it will dispose of its stock, and this, for the most part, enables other dealers to obtain that price, or something near it. The reason is obvious. At all ordinary moments there is not money enough in Lombard Street to discount all the bills in Lombard Street without taking some money from the Bank of England" (Bagehot 1873, p. 114).

[15] Sheppard's (1971) data deliberately underestimate the size of the British financial system, as they do not include all colonial and foreign banks and financial institutions that operated in London and had thus access to the Bank of England's standing facilities (Flandreau and Ugolini 2014).

[16] It must be noticed, however, that the amounts of cash reserves reported in published balance sheets were certainly higher than the ones actually kept by banks. It is well known that, as no formal regulation concerning the disclosure of information did exist (see section 3.6), bankers indulged massively in window-dressing practices when voluntarily publishing their monthly situation. The actual extent of such practices is difficult to assess (Goodhart 1986 [1972]).

transformation business of the banks is taken into scrutiny, however, the soundness of this number appears more questionable. Unlike today, pre-WW1 British banks almost exclusively financed themselves through the collection of sight deposits (between 80 and 86% of total liabilities). As no deposit insurance scheme existed at the time, they were therefore exposed to runs. To cope with such a risk, banks kept most of their funds invested in short-term money market instruments like discounts and advances (between 50 and 54% of total assets) or in callable deposits with discount houses (between 9 and 13% of total assets) (Goodhart 1986 [1972]). Such assets could be considered as liquid only as long as the money market worked smoothly, and this was only possible thanks to the Bank of England's ability to perform the lender-of-last-resort function. Although commercial banks had grown less and less used to access the standing facility, their holdings of money market instruments could well make their way to the central bank through the intermediary of money market institutions like discount houses. Besides this, there were the amounts of money market instruments held by foreigners, fresh creation of new bills eligible for discount, as well as the total stock of bonds and equities eligible for advances. This made for an enormous (and growing) amount of assets having the potential to get into the Bank's balance sheet, but only a tiny (and shrinking) share of this stock could be accommodated as long as the banking system preferred to stick to other liquid assets than central bank deposits.

Figures 3, 4 and 5 about here

3.6) The Bank of England's Strength: Sum-Up

In the decades following 1844, the prospective value of the Bank of England's rights and obligations had evolved unfavorably for the monetary authority. On the one hand, the growth of its financial resources had come to a halt: seigniorage revenues had since long reached their limit, capital calls were not an option, and deposit collection was compromised by the formal prohibition to pay interests. On the other hand, potential pressure on its standing facilities had not ceased to increase: the definitive adoption of the lender-of-last-resort function, as well as the considerable development of a leveraged financial system, exposed the Bank to the concrete risk of being unable to fulfil all its obligations at the time. To put it differently, the central bank's financial strength had gradually eroded in Britain over the decades. Despite the strong commitment of both monetary and fiscal authorities to the defense of current monetary arrangements, such a weakness posed a threat to their actual continuation.

The difficulties experienced during the Baring crisis – in the event of which the Bank had been obliged to resort massively to unconventional gold policies in order not to discontinue convertibility (Sayers 1936; Ugolini 2013) – had exposed the limits of its interest rate policy. That the Old Lady was in need of additional resources was by then straightforward to the whole financial and political community (Pressnell 1968). While a recapitalization was not a serious option (the Bank being already highly capitalized by all yardsticks), the two other strategies for increasing central bank strength identified by the modern literature (encouraging voluntary loans and imposing forced loans to the central bank) were actually considered. On the one hand, it was proposed to allow the Bank to pay interests

on deposits. As the central bank was then (unlike today) open to all kinds of counterparties, however, commercial banks feared the Bank's competition in the retail business – and accordingly, fiercely opposed the measure (Sayers 1976). As a surrogate, bankers agreed to index the interest rate paid by them on deposits to the Bank's official rate (Anderson and Cottrell 1974, pp. 281-5 and 301-4). While this agreement created a sort of "interest rate corridor" that bears some similarities to today's implementation frameworks (Bindseil 2004), it failed to provide the central bank with the resources it was in need of. On the other hand, the introduction of liquidity requirements was also discussed. Again, bankers lobbied against this measure on the grounds that it would have allowed the Bank to keep lower official rates and hence compromised the profitability of their own business. In exchange for the withdrawal of the proposal, commercial banks vowed to increase their voluntary deposits at the Bank and to publish monthly statements of their liquidity situation – which was supposed to discourage leverage through market discipline (Pressnell 1968). These measures hardly were of any help to the Bank: the growth of bankers' deposits was not as significant as hoped, while window-dressing practices associated with voluntary reporting probably increased the volatility of this item (see Figure 2).

For political economy reasons, the Bank of England failed to be strengthened in the aftermath of the 1890 crisis, and momentum for reform rapidly waned afterwards. This did not mean that public opinion perceived the problem to be solved. In particular, the fact that the Bank appeared unable to keep its bullion reserve apace with international standards (see Table 1) raised increasing concern. The question of the adequacy of gold reserves (and of the capability of the Bank to continue the gold standard) became commonplace during the entire period leading to the war (Goodhart 1986 [1972]; Sayers 1976). Instead of keeping deposits with the Old Lady, commercial banks started to keep an increasing share of their cash reserves directly in gold (De Cecco 1974; Roberts 2013). The credibility of the Bank's monetary policy got more and more tarnished. At the same time, discontent mounted about the Bank's attitude towards interest rates.

4. The Bank of England's Liquidity Management: A Reassessment

4.1) Was the Bank Happy with Its Interest Rate Policy?

In the decades preceding WW1, Britain was an outlier as far as interest rate policy was concerned. As illustrated by Figure 6, while the average level of interest rates was only slightly higher than in most other major European financial centers, their volatility definitely was much higher.[17] Extreme volatility of short-term interest rates was considered as particularly obnoxious to the real economy at the time. This was due to the fact that commercial and manufacturing activities were generally financed through three-month loans: because it impeded correct expectation formation in these sectors, short interest rate volatility morphed into macroeconomic instability which damaged real growth. This was a serious concern for a country that considered itself as rapidly losing its international economic lead.

[17] Morys (2013, p. 212) also shows that over the period 1883-1913, the Bank of England performed 5.7 changes of the official discount rate per year – i.e., almost twice the average of core gold standard countries.

Industrialists, politicians, but also authoritative economists started to complain loudly about the Bank's policy (see e.g. Palgrave 1903).

Figure 6 about here

The Bank of England's aggressive interest rate policy was a matter of necessity rather than choice. It did not reflect a deliberate commitment to pure interest rate policy – after all, many members of the board came from the business community that was particularly damaged by volatility. That the Bank was not happy with it is proved by the fact that it did engage into "unconventional" liquidity management practices in order to avoid taking to the extreme its use of the interest rate instrument. There were two main such practices. The first one was known as "gold devices" (Sayers 1936, 1976) and consisted of changing bid and ask prices on different kinds of gold assets. Ugolini (2013) shows that unconventional gold policy was deployed in connection with interest rate policy, in order to help the Bank adjust its balance sheet. The second one was known as "borrowing on Consols" (Hawtrey 1934; Sayers 1936, 1976) and consisted of implementing liquidity-absorbing open market operations (reverse repos). This section reconstructs the rationale of this liquidity management practice that has traditionally been seen as the ancestor of 20th-century monetary policy implementation frameworks (Hawtrey 1934). It shows that Bank's resort to this instrument was actually a symptom of its lack of control over interbank rates.

4.2) Liquidity Management: Rationale

The Bank of England's official rate was a standing facility rate. When the market rate was lower than the Bank rate, only retail customers used to borrow from it. When the spread disappeared, however, the market came "in Bank" – meaning that standing facility became actively used. Once the market was "in Bank", Threadneedle Street would try to push it back to Lombard Street by tightening rates. But then a vicious circle could set in motion. Expecting further tightening, borrowers could be tempted to take profit from current rates and hurry to the standing facility. If the Bank's margins for accommodating demand were thin, the Bank would then be obliged to increase the official rate very sharply in order to prevent the process from degenerating and stop inflows to the standing facility. The result was that the slightest monetary disturbance could actually morph into a major tightening with serious macroeconomic consequences.

In order to try to prevent such vicious circles from taking place when little room for balance sheet policy was available, the Bank tried to beat the market to the draw. The gamble consisted in triggering an early increase in market rates in order to avoid an escalation of the official rate afterwards. To do so, the Bank artificially generated expectations of an imminent tightening by borrowing at very short term from the money market. Bank's borrowings had an impact on overnight rates and thus produced an inversion of the yield curve. Because an inversion of the yield curve is generally a predictor of economic downturns (it typically occurs when the supply of short-term credit rarifies but the need to fund ongoing business remains high), its manifestation was bound to cool down market sentiment and induce lenders

to stick to liquidity. As a result, credit growth would slow down before becoming excessive, and the three-month rate would rise to a level considered as more appropriate by the Bank.

The fact that inversions of the yield curve are associated with worsening economic conditions was fully understood at the time. For instance, an early student of the statistical behavior of financial data series, Edward Gordon Peake, noticed that during the period 1883-1913 a positive spread of overnight rates over six-month rates had been a good predictor of higher interest rate levels in the following month. Curiously, Peake (1923, pp. 14-5) considered the hypothesis that such a correlation might have been determined by some intervention by the monetary authority, but only to reject it. While the accuracy of these comments is disputable, they are nonetheless evidence of the fact that the Bank was trying to make use of widespread beliefs in order to impact expectations, and that its actual intervention was impossible to appreciate for observers.

4.3) Liquidity Management: Evidence

Figure 7 gives the behavior of the main market rate (the three-month rate) between the ceiling rate (the central bank's standing facility rate) and the "surrogate" floor rate (commercial banks' deposit rate). The periods in which the Bank was implementing liquidity-absorbing open market operations are emphasized. It is shown that intervention was generally associated with increases in the official rate. Because the Bank rate had no clear role in the determination of the market rate (the spread between the two was variable and often very large), an increase of the former was a poor signal that might not necessarily have an impact on the latter. To make contractionary policy credible, the Bank had to couple the interest rate rise with a liquidity management operation that would spur the interbank rate to follow the same direction as the official one. The goal was not to make the market come "in Bank",[18] but to create more solidarity between the Bank's intentions and market sentiment.

Figure 7 about here

Contrary to Peake's (1923) opinion, the Bank's policy did play some role in determining the shape of the yield curve. During the whole 1889-1910 period, it is possible to observe thirty-two episodes of inversions of the short end of the yield curve – viz., a positive spread between overnight and six-month rates, as defined by Peake (1923). Of these, fourteen were associated with Bank of England's interventions in the money market: these "artificially-induced" inversions were slightly more intense than "natural" ones.[19] Figure 8 suggests that the Bank's action actually contributed to transforming the yield curve: the beginning of intervention periods was generally followed by an increase of market interest rates, while their end was followed by a decrease. As the Bank intervened on the very short

[18] Hence the confusion in Hawtrey (1934): it was true that the Bank coupled borrowings with high official rates with the goal of discouraging use of the standing facility, but the goal was to avoid changes in the *assets* side of its balance sheet (discounts and advances) – not to offset changes in its *liabilities* side (bankers' liquidity reserves).

[19] For inversions associated with Bank interventions, the average spread is 0.70% and the median 0.50%, while for the other ones the average is 0.61% and the median 0.47%.

end of the curve, the impact of intervention was particularly strong on the overnight rate, but transmission to the three-month rate (the Bank's actual target) appeared to be rather effective.[20] The precise impact of liquidity-absorbing operations is analyzed by Figure 9, which associates daily variations of the "borrowings" with the variation of interest rates in the ensuing week. The charts confirm that an increase in the amount borrowed was indeed generally followed by an increase in interest rates, and vice-versa; again, interventions had a stronger effect on overnight rates, but the three-month rate was also impacted.

Figures 8 and 9 about here

These results are remarkable in view of the fact that the size of intervention was not very large.[21] Yet, intervention could not have been conducted on a much bigger scale by the Bank. Despite having come to be known as "borrowings on Consols", liquidity-absorbing operations did not quite consist of reverse repos on government bonds. In order to be able to impact expectations, the Bank needed to keep its operations secret. But the Act of 1844 was strict about how the Bank had to publish information about its situation. Had the Bank really borrowed on Consols, the size of intervention would have been visible in its published balance sheet as a decrease in government securities – normally a very stable item. Unlike Treasury bonds, corporate bonds and stocks were not accounted as an independent item as they were merged with "Discounts and advances" in the Banking Department's balance sheet. Because changes in this aggregate item were far more difficult to interpret for external observers, the Bank preferred to absorb liquidity by pledging corporate bonds and stocks from its investment portfolio (see Figure 10). Such a portfolio, however, was not infinite, and the Bank's operations found a natural limit in the depletion of marketable securities.[22] Once more, balance sheet policy was constrained by the obligations imposed on the Bank. The Old Lady could not fully deploy liquidity management in support to interest rate policy, and this seriously undermined the Bank's effort to control market rates.

Figure 10 about here

4.4) Epilogue: The Credibility Crisis

At the end of July 1914, news of Austria-Hungary's declaration of war to Serbia triggered market closures and moratoria to be adopted by many Continental financial places. Faced with the freezing of foreign assets and remittances, the London money market ground

[20] Unfortunately, for 1889-1905 we only have little information about the Bank's intervention, viz. 1) the start date, 2) the end date, and 3) the maximum amount borrowed during the period. Figure 8 is constructed on the basis of this information. Only for 1905-1910 we have detailed information on the Bank's borrowings on a daily frequency. These data are used to construct Figure 9.

[21] In 1905-1910, the mean size of interventions was £3.75m and the median £3.40m. The biggest liquidity-absorbing operation in the whole 1889-1910 period amounted to £10.85m (January 1906). This can be compared with the size of the monetary base, which exceeded £200m in those very years (Capie and Webber 1985, p. 52).

[22] Note that in order to perform the biggest liquidity-absorbing operation of the 1889-1910 period (the one implemented in January 1906), the Bank could not resort only on corporate securities and had actually to borrow on some of the Consols in its portfolio (see Figure 10).

to a halt. The Bank of England stood ready to provide lending of last resort to the market, and asked commercial banks – which had not experienced any run from depositors yet – not to withdraw funds from it. But commercial banks thought that the moment had come when the Bank would no longer be able to fulfil its obligations. Instead of being happy with the liquidity reserves the Bank might have infinitely provided to them, they tried to accumulate another type of cash: gold. By suddenly stopping all payments in gold to their depositors, they generated a run of note holders on Threadneedle Street. The Bank desperately tried to resist by using the traditional instruments, and implemented a number of consecutive sharp increases of the official rate (from 3 to 8%). Faced with the powerlessness of interest rate policy, however, the Bank had soon to capitulate and ask for the suspension of Peel's Act (De Cecco 1974; Roberds 2013). The credibility problem of the Bank's policy had finally exploded: well before its involvement into the conflict, Britain had seen its monetary institutions crumble down for lack of internal consistency. The reconstruction of their credibility after the war was destined to be a costly process.

5. Conclusions

At the eve of WW1, the Bank of England was universally considered as the stronghold of the international gold standard. Yet the sustainability of the central bank's policies had become less and less obvious over time. The Bank had become relatively small with respect to the domestic financial system, and its margins for intervention had gradually eroded. Its commitment to perform standing facility lending prevented it from performing pure interest rate policy, but the constraints imposed on it by legislation prevented it from performing large-scale balance sheet policy. As a result, the Bank lacked control over domestic interest rates, and the credibility of the signals it sent to the market (i.e. changes in the official rate) was poor. Interest rates were hence very volatile, which was a serious issue for the real economy. The Bank was not happy with this situation. It proposed solutions for strengthening its position (paying interests on deposits and introducing reserve requirements), but commercial bankers' lobbies watered down the reforms because of the general reduction of domestic interest rates they would have entailed. As a second best, the Bank engineered some "unconventional" liquidity management measures in order to smooth interest rate volatility, but the extent of intervention was – again – limited by formal constraints. The overall weakness of the Bank's situation was exposed by the crisis of July 1914, when commercial banks refused to accumulate central bank reserves – hence triggering the fall of the gold standard well before the beginning of the war.

This important episode in international monetary history suggests that the long-term sustainability of central banks' policies cannot be taken for granted: if the equilibrium between the rights and obligations assigned to the monetary authority is unsatisfactory, a strong commitment to sound policy may not be enough for preventing a serious deterioration of credibility. This lesson should be of some interest in view of the challenges central bankers will have to face in the next few years.

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Table1: Size of selected central bank assets and liabilities relative to GDP (1909). Source: Lévy (1911); Mitchell (2003); Jobst and Ugolini (2014).

	Stock Capital	*Banknote Circulation*	*Bullion Reserve*	*Total Balance Sheet*
Britain (end-of-year)	0.72%	1.44%	1.91%	5.33%
France	0.46%	12.88%	10.95%	15.59%
Germany	0.41%	4.71%	2.06%	6.89%
Austria-Hungary	0.83%	8.66%	6.42%	11.96%
Italy	0.31%	7.66%	4.60%	10.93%
Belgium	0.68%	11.56%	4.21%	14.75%
Netherlands	1.06%	14.92%	7.38%	16.89%
Switzerland	1.41%	7.40%	3.91%	9.94%
Norway	1.44%	5.89%	3.82%	9.09%
Britain (mid-December)	0.72%	1.41%	1.72%	4.54%

Note: In view of the fact that the Bank of England's balance sheet were on average much larger at year's end than in the rest of the year, data for mid-December are also provided.

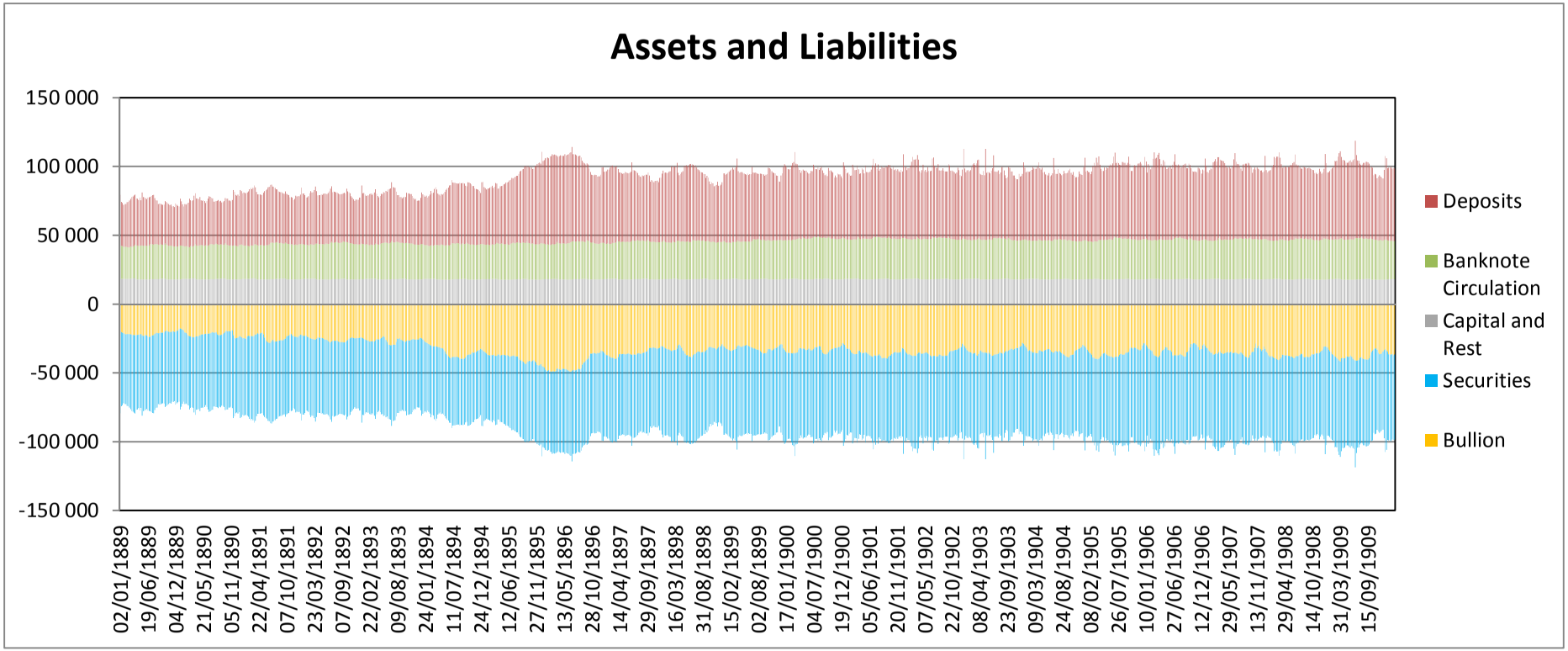

Figure 1: Composition of the Bank's balance sheet (1889-1910): assets (positive numbers) and liabilities (negative numbers) (thousand pounds, weekly data). Source: Bank of England Archive.

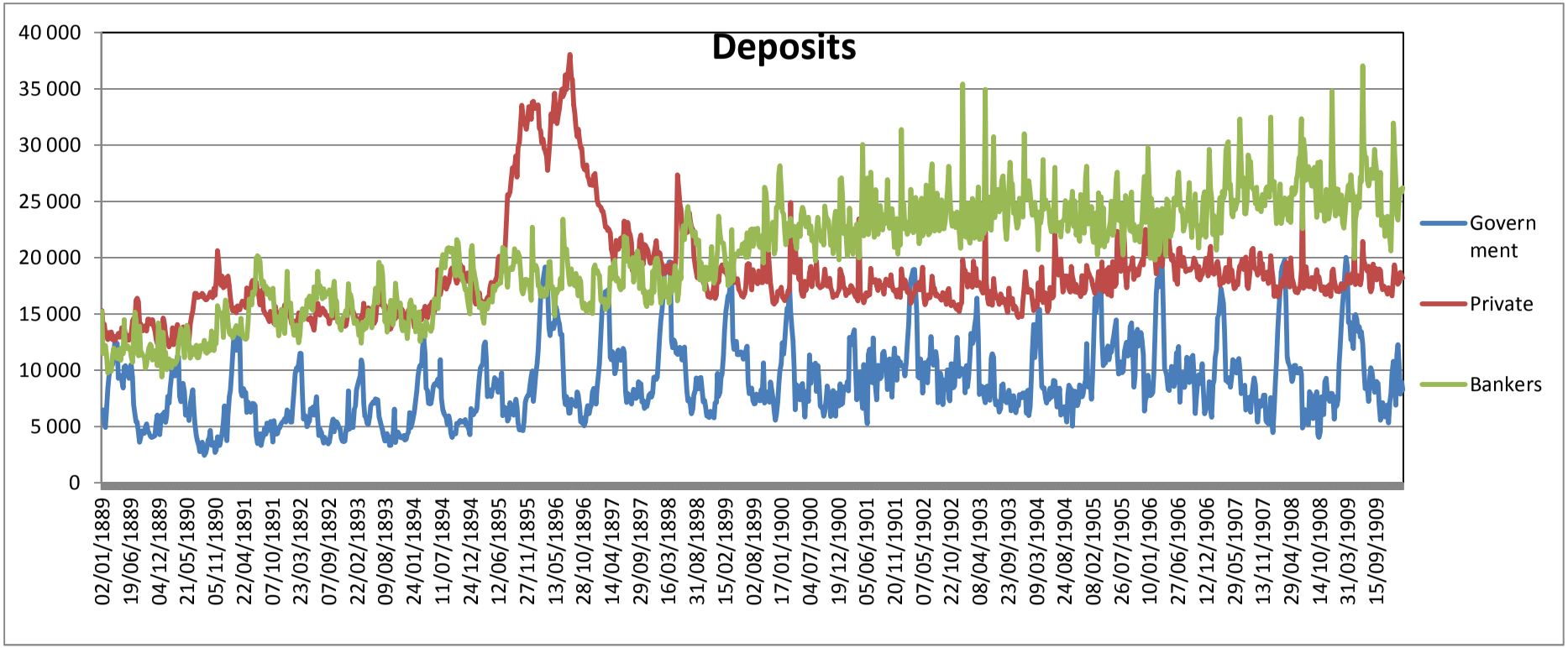

Figure 2: Composition of the Bank's deposits (1889-1910): by kind of depositors (thousand pounds, weekly data). Source: Bank of England Archive.

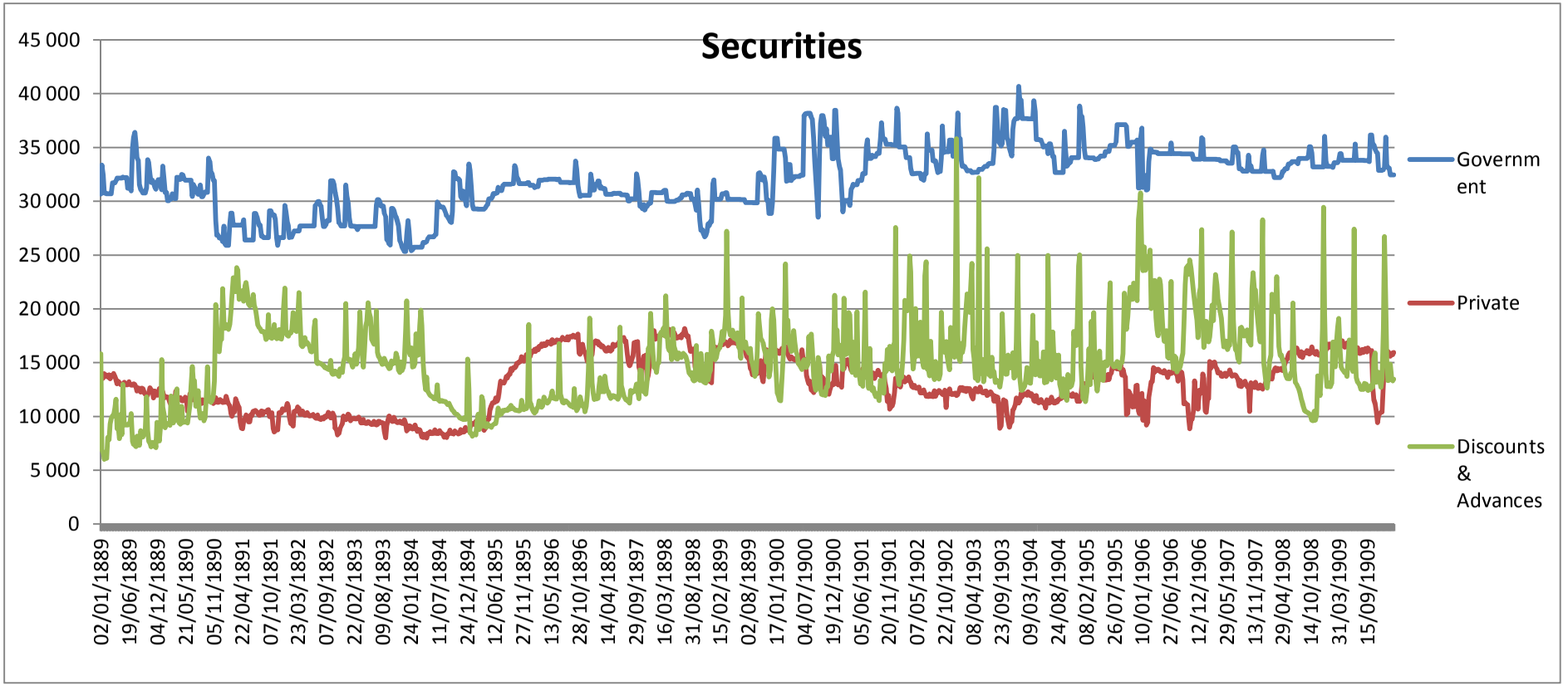

Figure 3: Composition of the Bank's securities (1889-1910): by kind of securities (thousand pounds, weekly data). Source: Bank of England Archive.

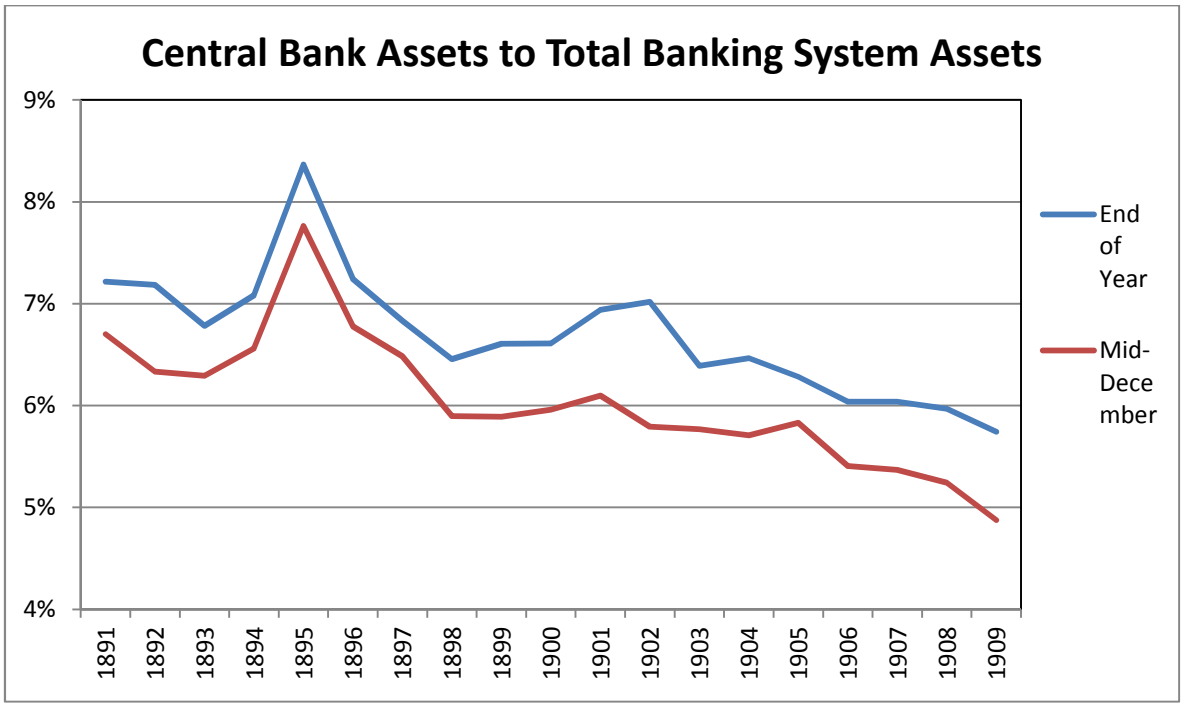

Figure 4: Ratio of central bank assets to total assets of the banking system (1891-1909). Source: Sheppard (1971); Bank of England Archive.

Note: In view of the fact that the Bank of England's balance sheet were on average much larger at year's end than in the rest of the year, data for mid-December are also provided.

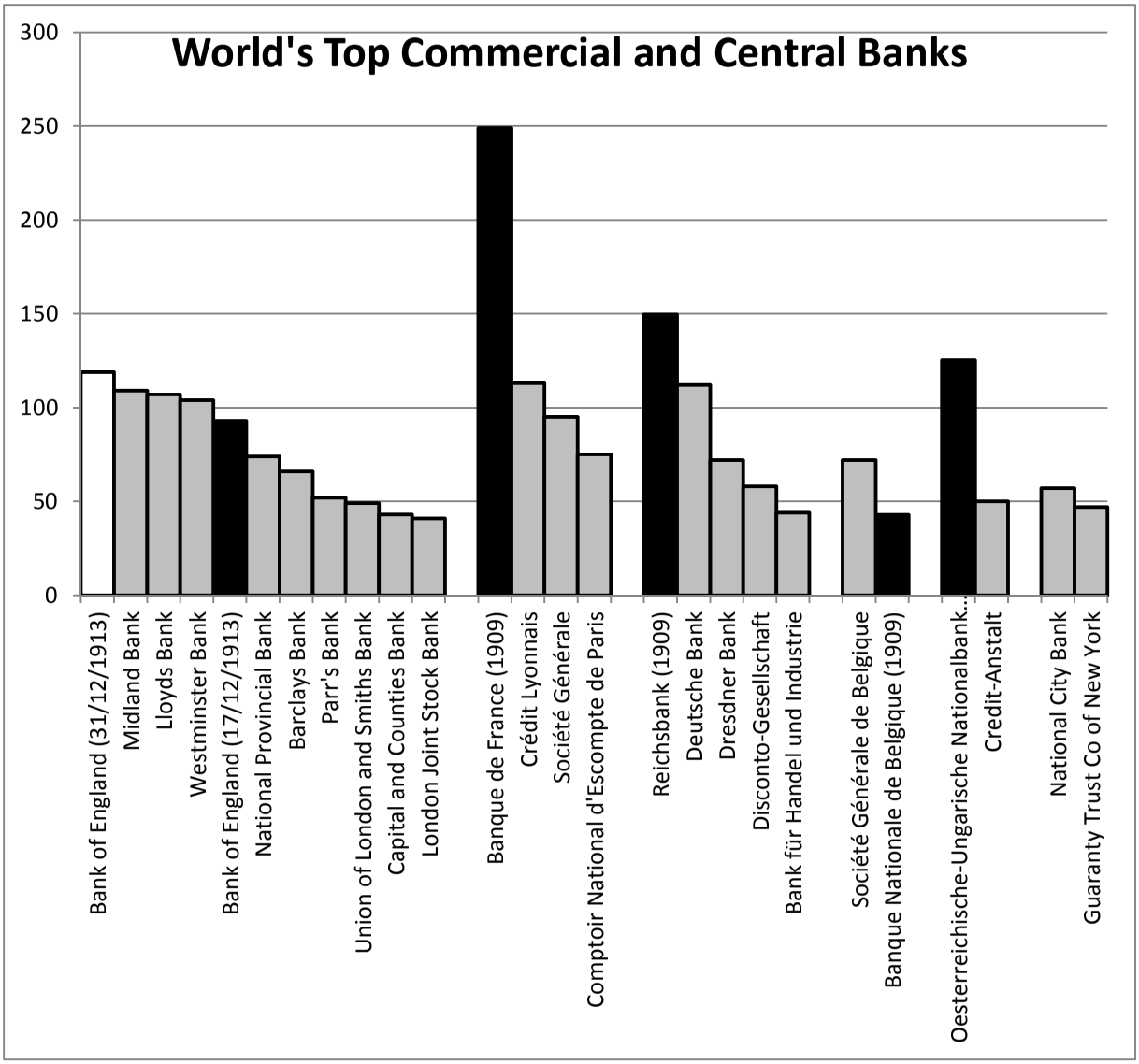

Figure 5: Total assets of the world's top 20 commercial banks and of their national central banks (1913) (million pounds). Source: Lévy (1911); Cassis (2006); Bank of England Archive.

Note: In view of the fact that the Bank of England's balance sheet were on average much larger at year's end than in the rest of the year, data for mid-December are also provided.

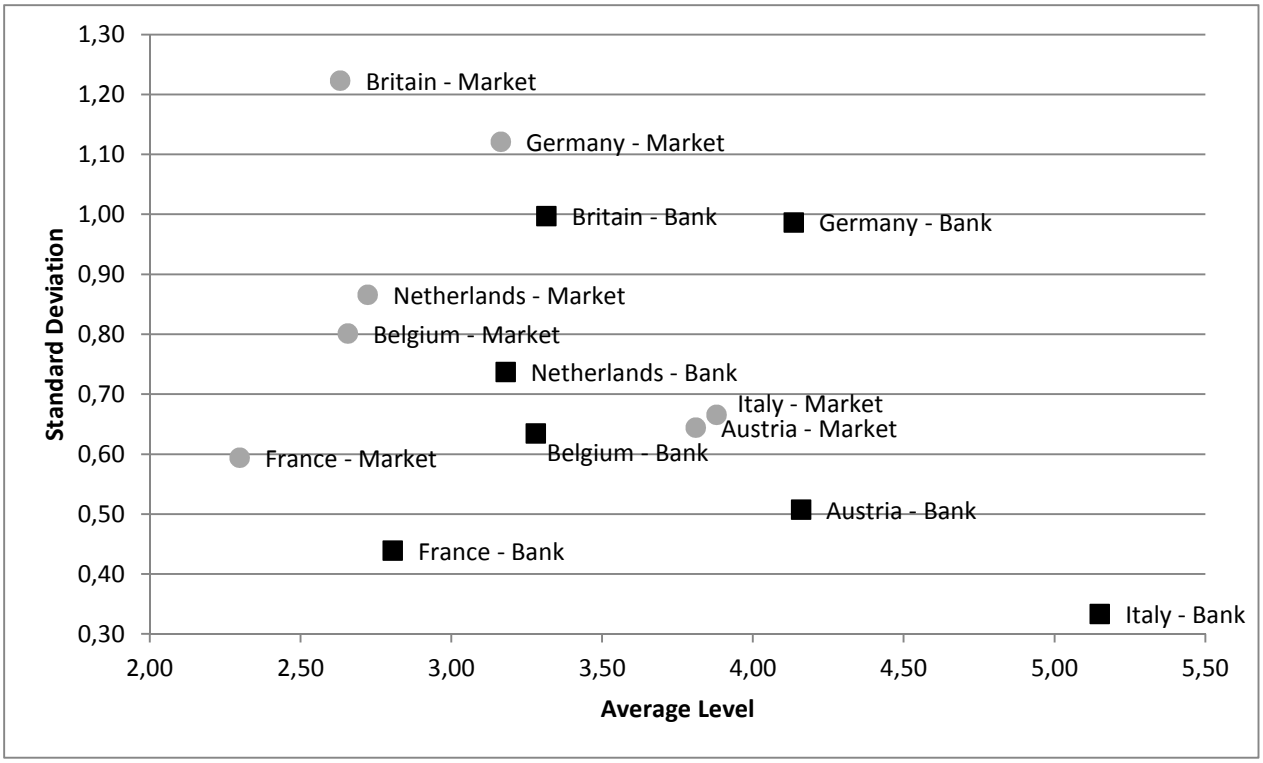

Figure 6: Central bank and market interest rate average level (horizontal axis) and volatility (vertical axis) in a number of European countries (monthly data, 1889-1910). Source: author's computation on data from Jobst and Ugolini (2014).

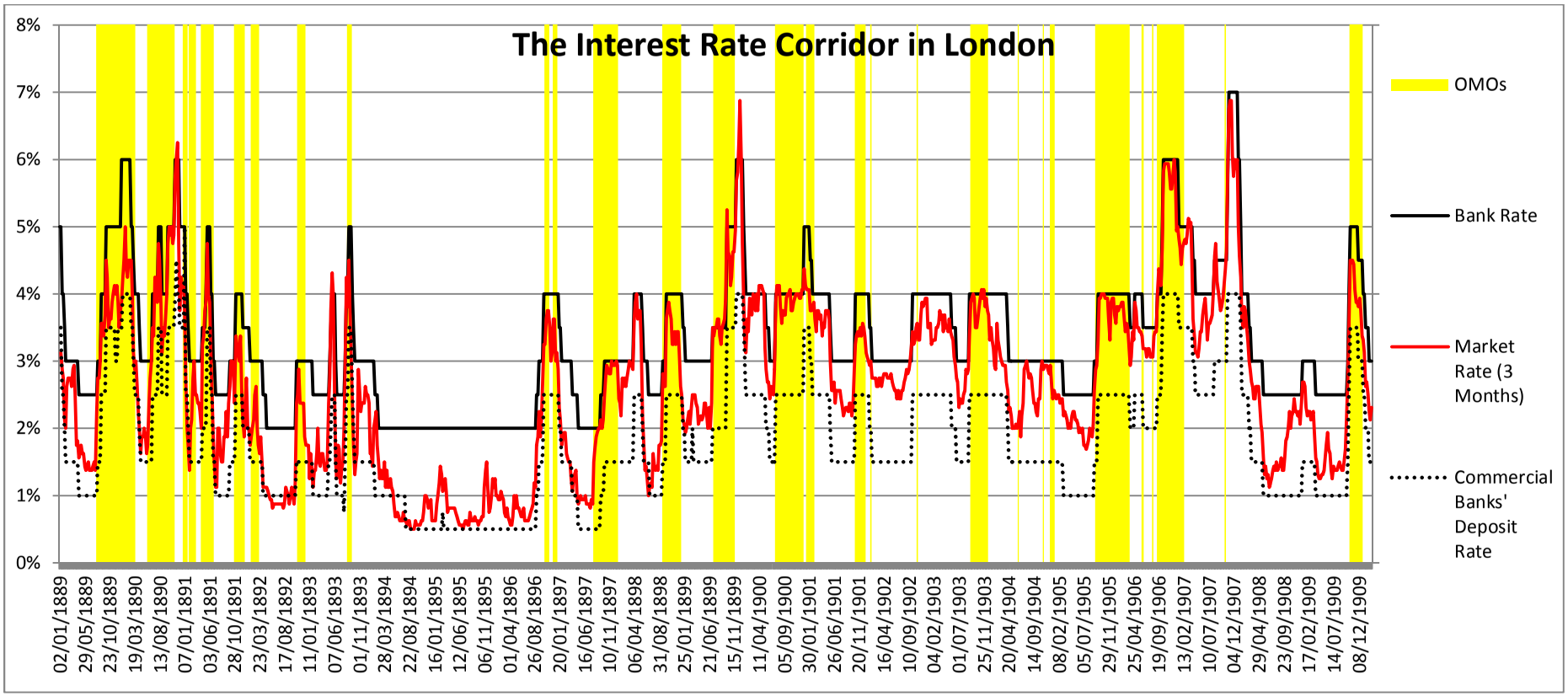

Figure 7: Interest rates in London and Bank of England's "borrowing" periods (weekly data, 1889-1910). Source: *The Economist* (1889-1910); Bank of England Archive.

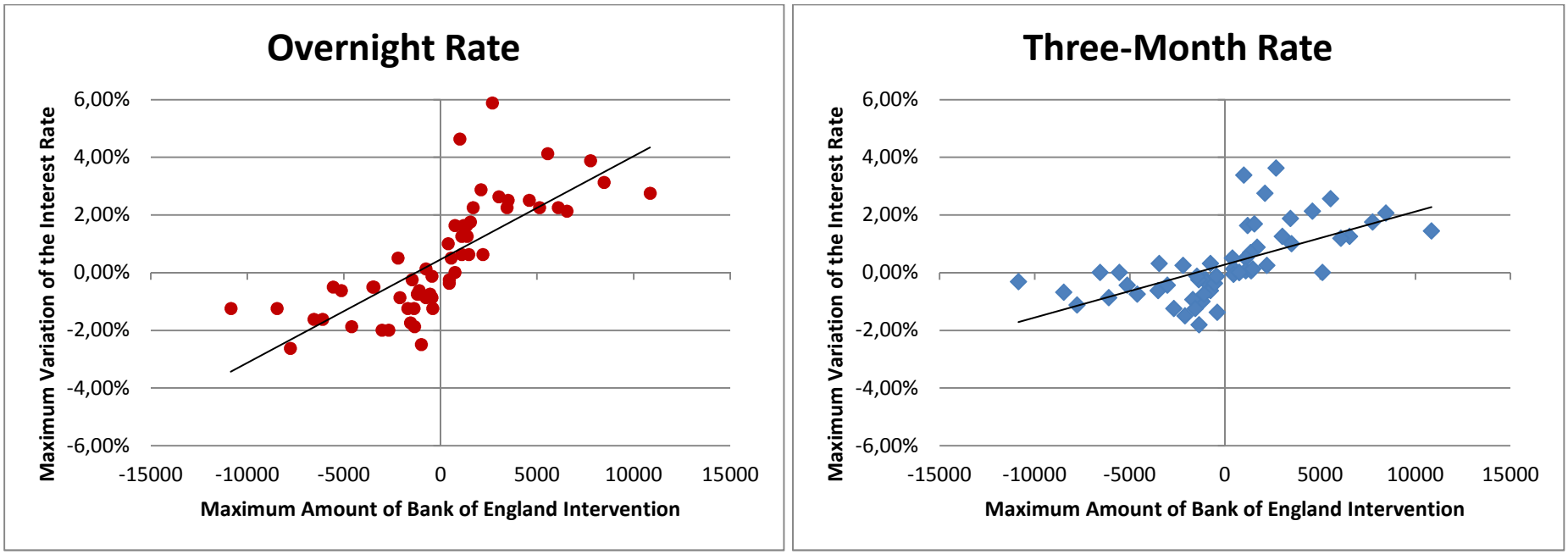

Figure 8: Maximum amount of Bank's "borrowing" (thousand pounds, horizontal axis) and maximum variation of interest rates (vertical axis) for all intervention episodes (weekly data, 1889-1910). Source: *The Economist* (1889-1910); Bank of England Archive.

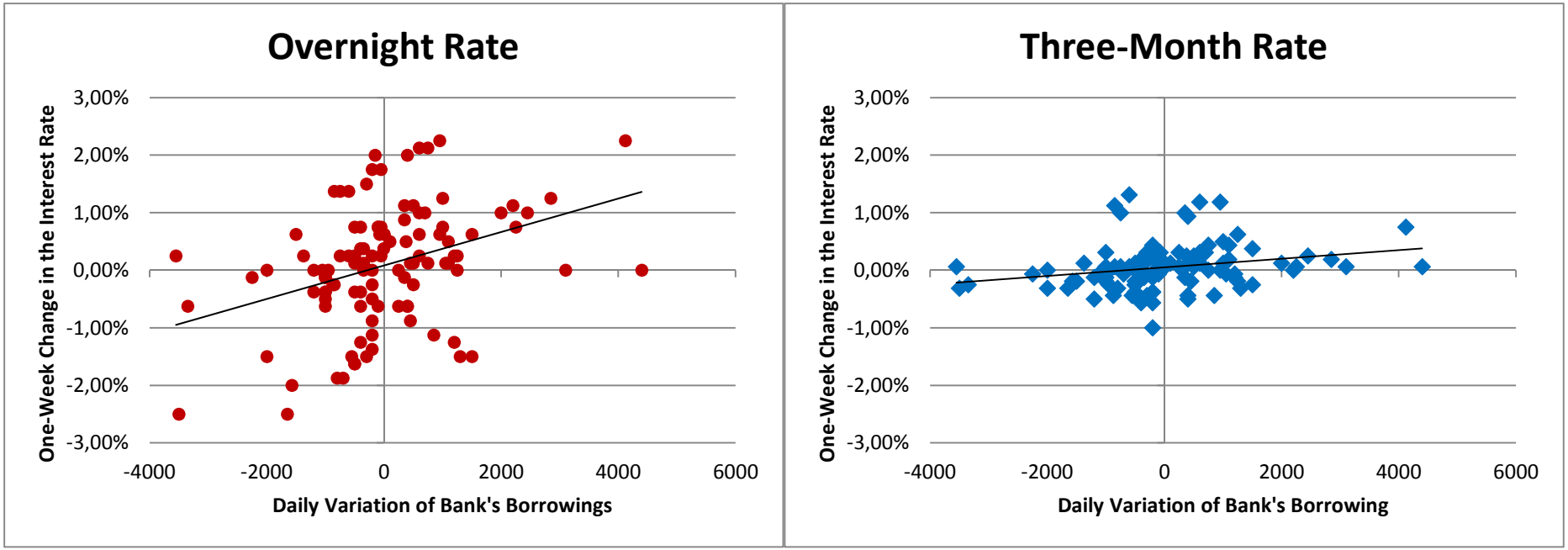

Figure 9: Daily variation of Bank's "borrowings" (thousand pounds, horizontal axis) and one-week variation of interest rates (vertical axis) for all intervention days (daily data, 1905-1910). Source: *The Economist* (1889-1910); Bank of England Archive.

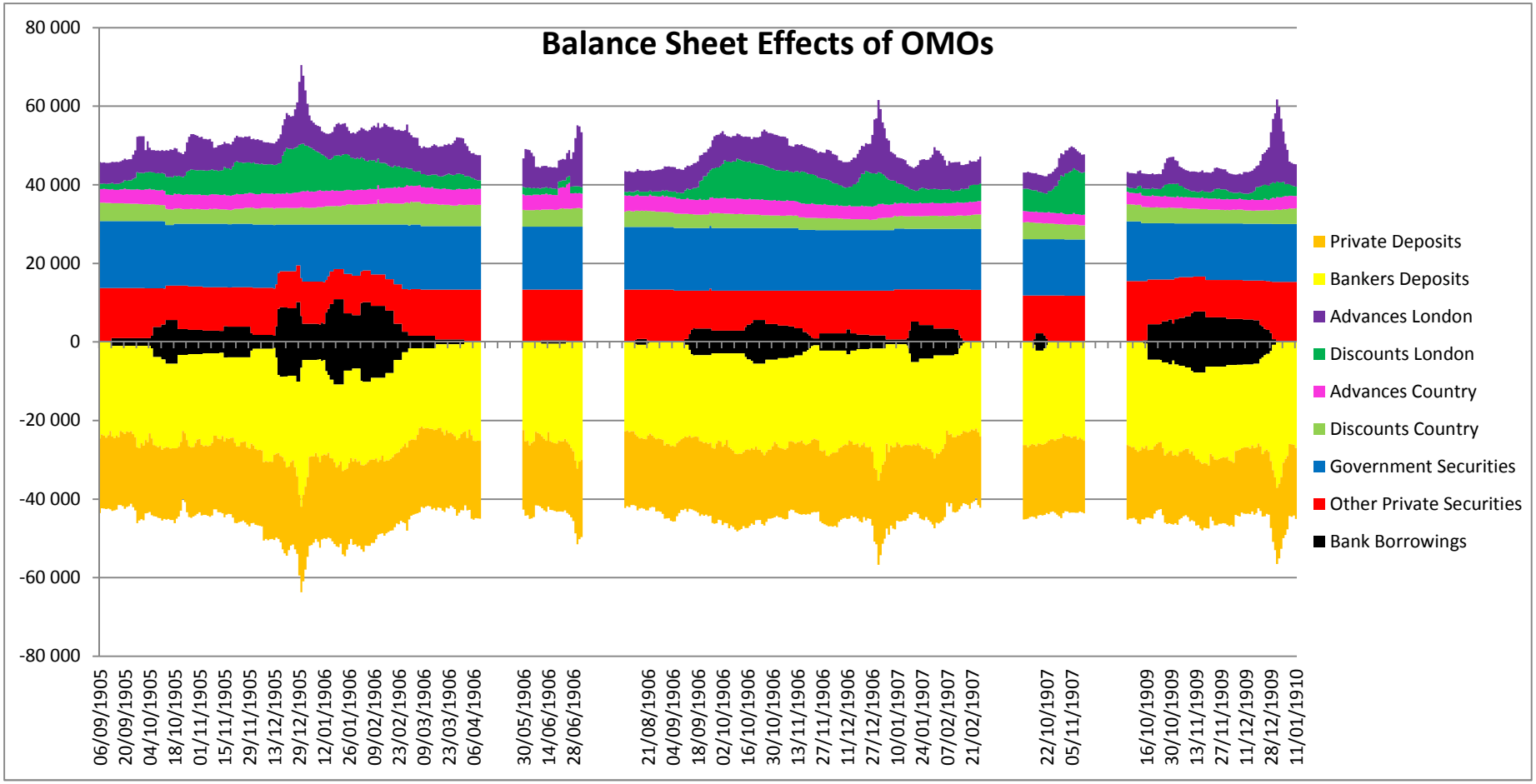

Figure 10: Effects on the assets side (positive numbers) and liabilities sides (negative numbers) of the Bank of England's balance sheet (selected items) of Bank's "borrowing" (thousand pounds) (daily data, 1905-1910). Source: Bank of England Archive.