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**The Bank of England as lender of last resort:
New historical evidence from daily transactional data**

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Abstract:

We use daily transactional ledger data from the Bank of England's Archive to test whether and to what extent the Bank of England during the mid-nineteenth century adhered to Walter Bagehot's rule that a central bank in a financial crisis should lend cash freely at a high interest rate in exchange for 'good' securities. The archival data we use provides granular, loan-level insight on the price and quantity of credit, and information on its distribution to particular counterparties. We find that the Bank's behaviour during this period broadly conforms to Bagehot's rule, though with variation across the crises of 1847, 1857 and 1866. Using a new, higher frequency series on the Bank's balance sheet, we find that the Bank did lend freely, with the number of discounts and advances increasing during crises. These loans were typically granted at a rate above pre-crisis levels and, in 1857 and 1866, typically at a spread above Bank Rate, though we also find some instances in the daily discount ledgers where individual loans were made below Bank rate in 1847. Another set of customer ledgers shows that the securities the Bank purchased were debts owed by a geographically and industrially diverse set of debtors. And using new data on the Bank's income and dividends, we find the Bank and its shareholders profited from lender of last resort operations. We conclude our paper by relating our findings to contemporary debates including those regarding the provision of emergency liquidity to shadow banks.

Keywords: Bank of England, lender of last resort, financial crises, financial history, central banking

JEL Classification: E58, G01, G18, G20, H12, N2, N4, N8

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Section 1: Introduction

I Motivation for research

During the financial crisis of 2007-09, policymakers looked to the past for guidance. According to former Bank of England Governor Lord Mervyn King (2016: 90), “During the crisis, I found that the study of earlier periods was more illuminating than any amount of econometric modelling.” In particular the recent crisis bears striking resemblance to crises that occurred in the UK during the nineteenth century.¹ The key institutions at the heart of those crises were discount houses. These institutions were so named because, when they bought securities, they did not pay their full face value but instead purchased them at a discount, equivalent to charging an interest rate. Like modern money market mutual funds (MMMFs) or banks’ off balance sheet special purpose investment vehicles (SPVs) that lay at the heart of the 2007-09 crisis (Brunnermeier 2009), nineteenth century discount houses issued short-term debt to fund a portfolio of financial assets. These debts were primarily held at that time by banks and other institutional investors. Financial crises in the nineteenth century therefore occurred when these wholesale institutions demanded *en masse* and at short notice that the discount houses honour their obligations to pay out cash. In order to meet this demand, the discount houses would either have to liquidate their assets at fire-sale prices or default; a similar dilemma faced by MMMFs and SPVs when wholesale investors withdrew funding for repos and asset-backed commercial paper during the recent financial crisis (Gorton and Metrick 2012; Gorton and Ordonez 2014).²

Then, as now, risks to the financial system and the broader economy arguably justified intervention. During the mid-nineteenth century, the Bank of England started to act as a ‘lender of last resort’, buying assets from discount houses in exchange for either Bank of England notes or deposits at a time when others might not lend because of market-wide uncertainty. These operations parallel those, such as quantitative easing (QE), which the Bank undertook in the recent crisis. Indeed, per Lord King, they provided a model for them. These early operations therefore warrant careful analysis because of the lessons we might learn from studying them.

¹ Quinn and Roberds (2015) similarly argue for a parallel with the 1763 crisis in northern Europe.

² Sales and repurchase agreements (repos) are like demand deposits in that the cash lender ‘deposits’ funds with another institution, secured by collateral, with the promise to receive the funds back with interest, usually the next day or within a year. If these transactions are not rolled over, this is equivalent to the cash lender running on the institution (Gorton 2012). Asset-backed commercial paper refers to short-term debt issued by banks’ off-balance sheet special purpose investment vehicles and conduits. In the lead up to the financial crisis of 2007-09, this short-term commercial paper often financed the purchase of mortgage-backed securities from the conduits’ sponsoring bank (Shin 2009).

II Key research questions and findings

In this paper we analyse the Bank of England's lender of last resort operations during the 1847, 1857 and 1866 crises. Those crises shaped Walter Bagehot's conception of the Bank of England's lender of last resort responsibilities which he set out in his seminal book *Lombard Street* published in 1873. Bagehot's conception in turn has provided a template for managing financial crises followed by central banks around the world ever since (Sayers 1957; Fetter 1965). In particular, Bagehot argued that a central bank during a crisis ought to (i) lend cash freely (ii) at a high/penalty rate (iii) in exchange for 'good' securities.³ These three aspects of the 'Bagehot rule' provide a useful organising framework and benchmark in our paper for assessing how and to what extent the Bank acted as a lender of last resort during the mid-nineteenth century.

To briefly sum up, we find that the Bank did lend cash freely in that the volume of its discounts increased during crises relative to the period immediately before. However, these loans were made unevenly to a few key counterparties – typically the top fifth of borrowers received over three-fourths of the amounts lent. On the issue of high or penal rates of interest, Bank Rate increased during all three crises relative to the rate that prevailed before. During the 1857 and 1866 crises, Bank Rate was also typically above contemporaneous market rates. However, in 1847, Bank Rate remained below market rate. In fact, we find some transactions where the actual rate at which the Bank lent was *below* Bank rate. So far as we are aware, ours is the first paper to document that Bank Rate was not an absolute minimum rate below which the Bank would not lend (cf. Scammel 1968: 176). Coupled with evidence showing an uptick in loan application rejection rates, this implies the Bank rationed credit in 1847. Finally, there is the issue of 'good security.' Perhaps the most compelling piece of evidence that the securities were good is that write-offs and arrears remained relatively low during and immediately after crises, and the Bank's profits and dividend payments to shareholders increased as a result of its lending more at higher rates. While the 'goodness' of securities was in part determined by rules pertaining to their tenor, the Bank also exercised discretion, as the names of the ultimate debtor, plus all those including the discounter who had endorsed them, mattered. We find some evidence that the Bank's definition of a 'good' counterparty

³ These rules have prompted an enormous debate in the literature about whether Bagehot actually stated these rules explicitly, what he meant by them if he did, and whether they are necessary and sufficient for a lender of last resort to follow (e.g. Martin 2009; Bignon et al. 2012). In fact, this pithy triadic formulation is not Bagehot's but a conventional summation of Bagehot's conception by later commentators. Here is what Bagehot (1873) actually wrote: "Theory suggests, and experience proves, that in a panic the holders of the ultimate Bank reserve...should lend to all that bring good securities quickly, freely and readily." A little later on he writes: "The [goal of such lending] is to stay the panic...And for this purpose there are two rules: First. That these loans should only be made at a very high rate of interest. This will operate as a heavy fine on unreasonable timidity, and will prevent the greatest number of applications by persons who do not require it. The rate should be raised early in the panic, so that the fine may be paid early...Secondly. That at this rate these advances should be made on all good banking securities, and as largely as the public asks for them. The reason is plain. The object is to stay alarm, and nothing therefore should be done to cause alarm. But the way to cause alarm is to refuse some one who has good security to offer."

was much more geographically and industrially expansive than most historians have described.

III Related literature and data

Former Bank of England Deputy Governor Sir Paul Tucker (2014) recently opined that “the relative neglect of LOLR [lender of last resort] in the core literature on central banking over the past twenty years is a tragedy.” Indeed many of the best contributions to the literature remain those published during the first half of the twentieth century (Hawtrey 1932; King 1936; Sayers 1936; Clapham 1944).⁴ We have found these sources invaluable in our own research. However, these histories tend to be heavy on narrative but light on data. Usually, when specific figures about the Bank’s lender of last resort operations are provided in these sources, they are partial, detailing a few transactions. They do not give a holistic view. Moreover, the detailed data, to the extent given, come mostly from secondary sources.⁵

Our contribution to the literature is in exploiting primary archival data, especially the rich transactional information available in the Bank’s daily discount ledgers from 1847, 1857 and 1866. These ledgers include the names of all counterparties that approached the Bank’s discount window during crises; information on whether their requests for assistance were accepted or rejected; and the value and volume of assets they exchanged for cash, as well as the price (interest rate) at which they did so. To analyse these data, we transcribed these ledgers into Excel files from digital images of the originals.⁶ We are publishing the Excel workbook containing these transactions alongside this paper.⁷

⁴ Thornton (1802) also made a seminal early contribution. See Congdon (2009) for an excellent and provocative contribution which looks at the role from a modern perspective. Good surveys of the key issues are a volume edited by Goodhart and Illing (2002) and a paper by Grossman and Rockoff (2015).

⁵ For example, King (1936:145), in his analysis of the 1847 crisis, notes that the most prominent money market institution at that time, Overend Gurney, sold £80,000 worth of securities at a 9 percent discount in late October. His source is a Bank official’s testimony before Parliament ten years after the 1847 crisis. The problem with relying on interview data to establish financial facts, especially given the long lag, is that there is no independent way to corroborate the claims. In this case, an inspection of the Bank’s daily discount ledgers on 19 October 1847 shows that, while the Bank did indeed discount securities from Overend Gurney at 9 percent, their face value was actually £68,460. The fact that there were 80 securities probably caused the confusion, leading to the erroneous reporting of their value as £80,000.

⁶ The Bank’s Archive has digitised these ledgers from 1847 to early 1919. The Archive’s C28 series runs from 1702 to 1965, though there is a large gap between 1710 and 1846 where the material has not survived. The format of the records changed in 1965. These have not survived.

⁷ The 1847, 1857 and 1866 crises had different durations, therefore the number of observations transcribed and analysed varies from year to year. For 1847 we transcribed and analysed the whole calendar year (310 business days) amounting to 9,209 transactions given that there were two phases of the crisis in April and October 1847. For 1857 and 1866 we transcribed and analysed four months of data around the peak of each crisis: from September to December (103 business days) for the 1857 crisis (3,004 transactions); and for 1866, our dataset contains 2,842 transactions running from March through June (104 business days). In addition to the raw data, the Excel workbook contains various metrics we have constructed on a daily and monthly basis. These include the proportion of debts accepted and rejected by the Bank for discount; the number of loans made that day; the number of unique counterparties who came to the Bank to discount debt; the mean, median and standard

Figure 1.1 : Example of a page from the Bank of England's daily discount ledgers

This page shows the Bank's discount activities on 23 October 1847. From left to right the column headings are: number of bills brought in for discount; the discount rate; the name of the discounters; the monetary value of bills brought; the monetary value of bills rejected; and the total number of bills brought in rejected.

Saturday 23rd Oct 1847

Amount going off.....£ 164,300
Total amount discounted, Bills and Notes.....£ 226,676,11,5

N ^o of Bills.	Rate per Cent.	Discounters.	Bills brought in.			Bills rejected.			N ^o of Bills rejected.
(1847)			£	s	d	£	s	d	
19	9	Spicer Bros	4841	5	1	507	7	5	3
4	5 1/2	Stewart & Watson	2000	-	-	-	-	-	-
1	5 1/2	Stewart & Watson	1820	2	4	-	-	-	-
3	9	C. J. Mace & Co	2528	17	6	1105	17	6	2
4	9	Edwards & Co	1582	5	5	700	-	-	1
6	8 1/2	Edwards & Co	444	15	5	28	15	4	1
9	9	D. Harris & Co	1550	1	6	387	-	11	3
8	9	Brown & Co	590	17	-	120	3	8	1
11	7 1/2	Brown & Co	2525	3	-	100	-	-	1
14	9	C. P. & Co	4037	4	-	1936	1	10	3
58	8 1/2	Morrison & Co	6671	3	7	-	-	-	-
14	9	W. & Co	5205	7	6	149	9	6	1
5	7 1/2	Roberts & Co	878	-	-	-	-	-	-
4	9	Edwards & Co	4579	16	2	1000	-	-	1
7	9	Edwards & Co	2556	-	6	1000	-	-	4
1	7 1/2	Edwards & Co	500	-	-	-	-	-	-
12	7 1/2	Edwards & Co	1054	4	6	-	-	-	-
10	9	Edwards & Co	2770	2	10	388	5	7	1
1	-	Edwards & Co	2000	-	-	2500	-	-	1
14	7 1/2	Edwards & Co	3416	8	2	250	-	-	2
3	8 1/2	Edwards & Co	3300	-	-	-	-	-	-
3	8	Edwards & Co	1037	12	3	-	-	-	-
5	7 1/2	Edwards & Co	1489	2	-	-	-	-	-
2	7 1/2	Edwards & Co	165	4	6	-	-	-	-
13	9	Edwards & Co	2786	2	7	10714	6	9	7
2	7 1/2	Edwards & Co	2000	-	-	2500	-	-	1
7	4	Edwards & Co	5346	2	10	3350	-	-	2
6	9	Edwards & Co	4509	6	9	347	15	9	1
10	9	Edwards & Co	4176	14	11	-	-	-	-
3	9	Edwards & Co	2700	-	-	-	-	-	-
12	7 1/2	Edwards & Co	6125	4	4	2925	4	4	4
60	9	Edwards & Co	61821	10	6	-	-	-	-
80	9	Edwards & Co	68460	5	1	-	-	-	-
29	7	Edwards & Co	19848	11	6	6626	10	11	10
628	-	-	262366	16	2	57240	4	6	57
577	5 1/2	Edwards & Co	37260	4	6	-	-	-	-
	-	-	225676	11	5	-	-	-	-

A B C D E

Few researchers have made use of the Bank's daily ledgers before, though we are not the first to do so. In particular, our paper was inspired by exceptional research previously done by Tessa Ogden (1988), and Vincent Bignon, Marc Flandreau and Stefano Ugolini (in a number of papers).⁸ In some ways, Ogden's PhD thesis comes closest to our own project. Hers is the only prior research we know of which produced and analysed an extended series of Bank discount data. However, our research differs from Ogden's thesis and more closely follows that of Bignon, Flandreau and Ugolini in two ways. First, the data we use is more granular. We analyse

deviation of the volume and monetary value of debt brought in for discount; the mean, median and standard deviation of the discount rates charged; the mean, median and standard deviation of the amounts lent to counterparties. We have also transcribed data from a fourth crisis (1914) not discussed in this paper. We are planning a future research project exploiting these data. We invite expressions of interest via email from other scholars interested in working on this project.

⁸ White (2016) and Bignon and Jobst (2017) have also recently done research that parallels our own.

daily loan-by-loan data. By contrast, Ogden looked at weekly totals. The additional insight we provide from having analysed the loan-level data is that we are able to draw more detailed conclusions about the profile of the Bank's customers during crises. Second, our paper differs from Ogden's thesis in its time frame. We focus on the mid-nineteenth century, while Ogden focused on the period from 1870 to 1914. While both periods are worth studying, ours is arguably more relevant to understanding how the Bank of England's lender of last resort function first developed. As Ogden (1991: 309) herself wrote in another publication, "the established view in the literature is that the Bank of England accepted its role as lender of last resort sometime around 1870." Recall, for example, that Bagehot published *Lombard Street* in 1873. Bagehot's argument was not that the Bank of England should start acting as a lender of last resort. Rather, he claimed that the Bank was already acting this way but had not publicly and permanently acknowledged its lender of last resort role. Bagehot advocated that the Bank explicitly acknowledge its tacit function, in order to lessen the likelihood and severity of financial crises. For Bagehot (1873: 31), there was nothing 'constructive' in any ambiguity:

"though the Bank of England certainly do make great advances in times of panic, yet as they do not do so on any distinct principle...in 1847, even in 1866... there was nevertheless an instant when it was believed that the Bank would not advance...To lend a great deal, and yet not give the public confidence that you will lend sufficiently and effectually, is the worst of all policies."

While Bagehot asserted that the Bank made "great advances in times of panic," he did not empirically evidence his assertion. So by looking at the Bank's transactional data before 1870, we are able to fact check whether Bagehot was correct in his assessment of the Bank's behaviour, and analyse the extent to which the Bank had accepted its role as a lender of last resort before Bagehot wrote his book (O'Brien 2003; c.f. Wood 2003).

Since Ogden, the richest empirical research on the history of the Bank's lender of last resort operations has been done by Bignon, Flandreau and Ugolini. In a series of important papers, they examine samples of the Bank's daily ledgers (Flandreau and Ugolini 2011; Bignon, Flandreau and Ugolini 2012; Flandreau and Ugolini 2014). Some important findings from their research include quantifying the predominance of non-bank recipients of Bank of England loans; the skewed distribution of these loans, with a few counterparties receiving the bulk; and the centrality of foreign securities in these exchanges, reflecting British imperial trade patterns. Our research findings further support to their conclusions.

At the same time, we extend their research in a couple of directions. First, the daily discount data they analyse pertains to the crisis of 1866, namely one month (May 1866) when Overend Gurney defaulted. That default sparked a wider financial crisis in much the same way the collapse of Lehman Brothers did in 2008. To the extent that Bignon, Flandreau and Ugolini analyse other crises, they do so by looking at annual figures. So we follow up their analysis by using daily data, including looking at the 1847 and 1857 crises in more detail. Data on these

crises add insight because, rather than viewing the 1866 crisis in isolation, it might be better conceptualised as the conclusion of a nearly twenty year journey over the course of which the British financial system and the Bank of England matured, assuming many features that endure to this today (Kuttner 2010). Indeed the details of each of the financial crises of 1847, 1857 and 1866 do not concern us in this paper.⁹ Instead, what we care to stress are the similarities in the lead up to them, and the lead up to the 2007-09 financial crisis. For example, as in the early 2000s, it was believed by many in the nineteenth century that monetary and price stability would also guarantee financial stability (Constancio 2015). However, as in 2007, this belief proved mistaken.

Besides adding more daily discount observations into the mix, our paper also exploits new, higher frequency data on the Bank's balance sheet. The utility of these data lie in their helping us to identify how the Bank's balance sheet changed during the crises we study, in particular, how these moments differed from 'normal' periods (cf. Ferguson, Schaab and Schularick 2015).¹⁰ We have also constructed a new series showing the Bank's profits and dividend payments to shareholders. These financial statement data are also contained in the Excel workbook we are publishing alongside this paper.

IV Outline of the paper

The rest of this paper is organised into five sections, with further splits within them, plus several annexes at the end. The next section gives institutional detail on how the Bank executed lender of last resort operations in the nineteenth century. Those familiar with the Bank's history may wish to skip ahead to the following section which evaluates the evidence as to whether the Bank's Discount Office lent freely during financial crises. This is followed by sections assessing whether the Bank lent at high interest rates, and purchased good securities, respectively. The final section brings our findings to bear on contemporary issues. We explain how our research contributes new insights to, and to some extent recasts, longstanding and contentious academic and policy debates about whether central banks should lend only to illiquid, but not insolvent, institutions; about the relevance of moral hazard, specifically, whether central bank lending should support individual institutions or the financial system as a whole; and the appropriate institutional perimeter, if any, for lender of last resort operations.

⁹ Though we recommend recent blog posts by some of our Bank colleagues which give brief overviews of those crises and refer to a number of detailed accounts of them (Huang and Thomas 2016a; Neumann 2016; Lewis 2016). For a general overview of British banking in the nineteenth century we recommend Collins (2012). On the 1847 crisis, see Evans (1848). On the 1857 crisis, see Hughes (1956). On 1866, see Chubb (1872).

¹⁰ The weekly balance sheet series we have constructed starts in 1844 and extends to the present. Daily balance sheet data is available for the 1857 crisis (September to December) and 1866 crisis (March to June).

Section 2: The institutional mechanics of the Bank as a lender of last resort

I The nineteenth century money market and the bill of exchange

A recurring theme in the post-crisis financial history literature is that the recent crisis had much in common with those in the past (Reinhart and Rogoff 2009; Calomiris and Haber 2014; Morys 2014; Turner 2014; Eichengreen 2015).¹¹ If so, this implies that there are enduring aspects of the financial system that makes it structurally fragile. One of the core fragilities stems from debt promising repayment of a fixed amount, backed by assets that fluctuate in value (Goodhart 1995). This fragility, inherent in debt contracts (Turner 2016), is aggravated when debts are short maturity (one year or less tenor). These debts are called ‘money market instruments’ by financial analysts or ‘cash equivalents’ by accountants (Ricks 2016). The accounting terminology is especially telling. It indicates that these debts function as alternatives to holding cash.¹² Holding cash can be costly because it typically bears little or no interest.¹³ Short-term debt is therefore an attractive alternative because it typically offers a higher rate of interest, while at the same time promising instant or near instant redemption in cash.¹⁴ An often observed pattern is that during financial booms, the value and variety of cash equivalents expands, while financial busts are often triggered by their contraction and conversion to cash (Mehrling 2011).

In the nineteenth century, the key money market instrument/cash equivalent was the bill of exchange. A bill of exchange is a written instruction ordering one party to pay another.¹⁵

¹¹ According to the Parliamentary Commission on Banking Standards (2013), “Had the warnings of past failures been heeded, this Commission may not have been needed.” In response to a Parliamentary Commission on Banking Standards’ recommendation, the Bank of England started a regular series of seminars titled ‘Learning from Previous Financial Crises’ organised by Peter Barrett. In recent years, Bank staff have also produced a steady stream of financial history research (Hills, Thomas and Dimsdale 2010; Bholat 2014; Button et al. 2015; Sowerbutts et al. 2016).

¹² We call notes, coins and deposits with central banks ‘cash’. Cash typically refers to physical currency only i.e. notes and coin. However, deposits with central banks serve the same purpose i.e. they are used as a means of final settlement.

¹³ Accounts with the central bank sometimes bear a low rate of interest. Also, some notes historically paid interest (Burdekin and Keskinel 2013).

¹⁴ Bank deposits are a good example of a cash equivalent. They are typically low interest-bearing, nominally fixed, short-term debts, backed by longer-term, higher risk/reward assets that fluctuate in value. Banks organise their books this way because it is profitable. They earn the spread between the yield on higher yielding assets, and lower yielding deposits. In the twentieth century, prior to the introduction of deposit insurance, financial crises often started if depositors came to doubt that their banks’ assets were valuable enough to repay the cash they were promised. In extreme, depositors might then demand redemption of their deposits *en masse*. Demand for cash equivalents contracted while demand for cash proper rose. In these crises, banks either had to liquidate their assets at fire-sale prices or enter insolvency.

¹⁵ The bill of exchange originated in the Arab world in the early Islamic era (Geva 2011). It was subsequently adopted in Continental Europe during the Middle Ages. Through trade with the Continent, it gradually appeared as an instrument used in English commerce during the fifteenth century (Elliot et al. 2013: 4). Given that the bill

While many readers today may have no practical experience with a bill of exchange, most will be familiar with cheques, which are legally a special kind of bill of exchange (Elliot et al. 2013: 304). A cheque is 'drawn' (written) by a person on their bank to pay a third party. Similarly, a bill of exchange is 'drawn' by one party (called a 'drawer') on another (called a 'drawee') instructing them to pay either the drawer or a third party (called a 'payee').¹⁶ Unlike a cheque, a bill of exchange is not necessarily 'drawn on' a bank. It can be a payment instruction to anybody.¹⁷ In fact, in the nineteenth century, a bill of exchange was most often literally a bill following the sale of goods and services. For example, a manufacturer might supply goods to a merchant on credit perhaps because the merchant was unable to pay cash for the goods until after they had been sold to consumers. In this example, the bill acted like an invoice tangibly documenting the trade credit that had been extended in the transaction between the two parties. The manufacturer (the drawer) would send a bill to the merchant (the drawee). If the merchant 'accepted' that they owed a debt to the manufacturer, they would sign their name on the bill. Legally, they were now referred to as the 'acceptor' of the bill instead of the drawee.

Rather than holding the bill to maturity, the manufacturer might cash in the debt before maturity in either one of two ways. One way was for the bill of exchange to be used directly as currency when paying for goods and services, or discharging debts. Indeed, in some areas of Britain during the nineteenth century, bills of exchange circulated as extensively as other types of currency such as Bank of England notes and Royal Mint coins (Ashton 1953). When a person or institution holding a bill transferred it to another, they had to sign their name on the back of the bill just as the acceptor had done. If the original acceptor did not pay in full or in part, all endorsers (including the original drawer of the bill) were liable to pay whoever currently held it. There was thus a 'bandwagon' effect at play as bills of exchange circulated. The more frequent a given bill circulated, the more endorsers it had. Since there were then more guarantors, the bill of exchange became an increasingly safer asset, more closely approximating cash (Santarosa 2015). The negotiable nature of bills of exchange,

of exchange arrived in England through her participation in international trade, it is perhaps unsurprising that foreign bills of exchange ended up playing the dominant role in London money markets, in contrast to domestic or 'inland' bills of exchange, which were of secondary importance.

¹⁶ Like cheques, bills of exchange are negotiable instruments. This means two things. First, it means they can be transferred from one party to another without explicit consent from the drawee/acceptor i.e. the debtor. Second, it means that any subsequent holders of the bills (transferees) are "capable of obtaining a perfect title to the instrument in spite of any defects in the title of the prior parties" (Holden 1955: 314).¹⁶

¹⁷ Furthermore, while a cheque is a written instruction payable on demand, bills of exchange ordered payment on or after a wide range of future dates, though, as we note below, they tended to be money market instruments with short maturity. In the nineteenth century, it was conventional that if a bill ordered payment in three months, a three days grace period was added at the end of the term for drawees/acceptors to make payment (Moxon 1894:15).

underpinned by multiple endorsements, resulted in their emerging as *the* key cash equivalent in the first half of the nineteenth century.¹⁸

Figure 2.1 : Trade transaction using bills of exchange

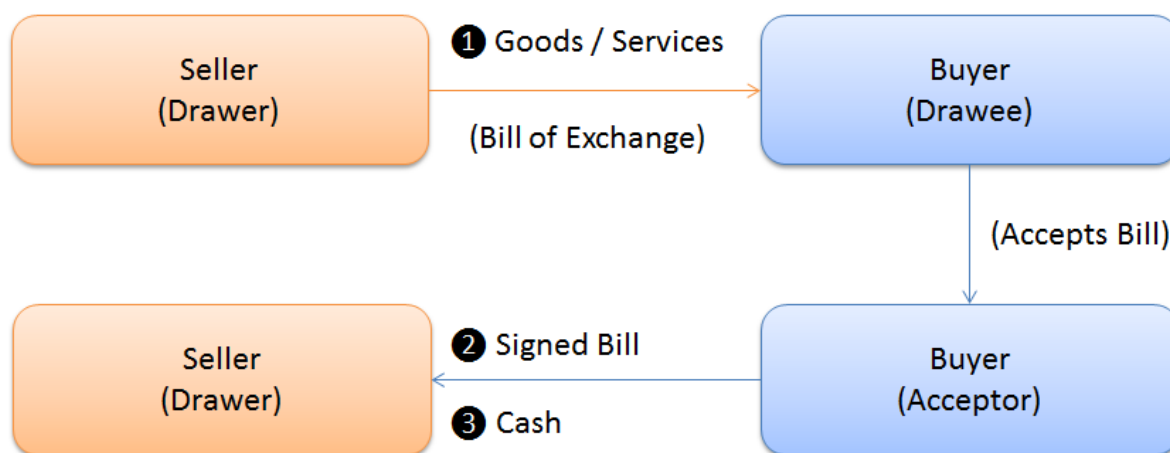
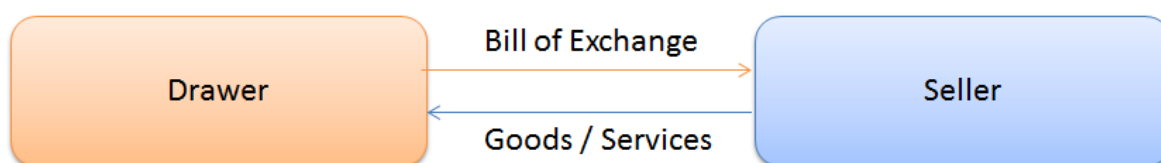
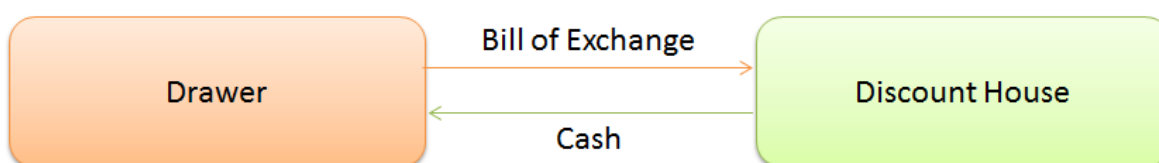


Figure 2.2 : Techniques for trading a bill of exchange before maturity

Option 1: Payment



Option 2: Discount



The other way to encash the bill before maturity was for the holder of the bill to sell it to a financial firm. In the eighteenth and early nineteenth century, holders of bills of exchange often arranged sales of their bills through bill brokers. Bill brokers initially acted as financial

¹⁸ Furthermore, they were a financial security appropriate to the productive structure of the economy at that time. Capital market securities and multi-year bank loans were still relatively rare financial instruments because most firms during this period financed themselves from retained earnings (Chandler 1994). When firms needed external finance, it was typically to invest in what we now call 'working capital' as opposed to long-term real capital investments. So the short-term bill of exchange was an appropriate instrument given the short horizon. While overdrafts were already a well-established financing mechanism in Scotland, they were less established in the rest of the United Kingdom.

intermediaries between buyers and sellers of bills of exchange. Like banking, bill brokering developed in Britain during the late seventeenth century spurred by real economic growth and the need for new financial channels to finance it (Presnell 1956). Indeed bill brokering was an important supplement to the limitations of banks as they were structured at that time. In this period, the vast majority of banks were single shops (unit banks) without branches. Therefore, bill brokers acted as conduits for the buying and selling of bills of exchange across different geographical areas. Thus banks holding bills of exchange who wanted cash before maturity would send their bills to bill brokers, who then arranged for their discount by banks in other parts of the country with surpluses of cash looking for investment in cash equivalents (Banks 1999: 31). For this service, bill brokers earned income from commission.

However, by the 1830s, many bill brokers transitioned from intermediaries of bills of exchange to investors in them. This shift in business model occurred in response to the 1825 financial crisis. According to most historians, many banks, particularly in the City, felt unnerved by the fact that, during the 1825 crisis, the Bank of England was perceived as having belatedly responded to their demands for liquidity via rediscounting of bills of exchange (Fletcher 1976: 9). The demand from London banks for a cash equivalent stimulated the introduction of new facilities by bill brokers, akin to how the rise of institutional cash pools in the early 2000s spurred the creation of shadow banking services (Pozsar 2014). Rather than stockpile zero yielding Bank notes, London banks began to deposit their money 'at call' (on demand) with bill brokers, many of whom, spotting a market opportunity, started to offer demand deposits. As a result, many bill brokers evolved into so-called discount houses which financed their own portfolio of bills with funds borrowed from banks. The viability of discount house demand deposits to function as a cash equivalent increased when the Bank announced rediscounting facilities for London discount houses in 1833 (Fletcher 1976: 99), providing assurance to banks that discount houses would be able to honour their commitments to pay Bank notes on demand.¹⁹

By the 1830s, a dense money market network had emerged structured through bills of exchange. At the core of this network were three key institutions: (1) 'clearing' banks²⁰, (2) discount houses and (3) the Bank of England.²¹ **Figure 2.3** illustrates how these institutions

¹⁹ Call loans from banks to discount houses also became increasingly popular in the 1830s as alternatives to Exchequer bills, whose market became less liquid in the 1830s as investors substituted them with railway securities (Fletcher 1976: 15).

²⁰ The qualifier 'clearing' in front of banks indicates that the institutions we are referring to are mostly London-based institutions who 'cleared' or settled claims on behalf of correspondent banks located elsewhere in the country.

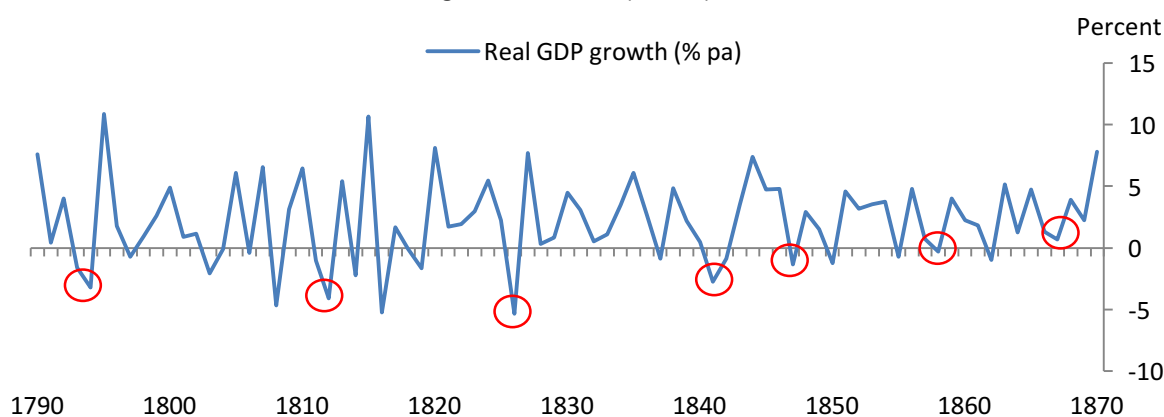
²¹ In the second half of the nineteenth century, the spread of branch banking and overdraft lending led to a decline in bills of exchange as a means of financing domestic trade, while at the same time bills of exchange became the primary instrument financing international trade. The outbreak of World War 1 led to Treasury

were interlinked through simplified versions of their balance sheets. Banks funded themselves mostly by notes and deposits. While they used some of these funds to buy bills directly, by the 1830s, a growing percentage of their assets were call loans to discount houses. The discount houses used banks' deposits to fund their portfolios of bills of exchange. The discount houses in turn might rediscount these bills for cash from the Bank of England. The importance of these rediscounting operations became evident during the crises of 1847, 1857 and 1866. In acting as a lender of last resort, the Bank arguably made the impact of those financial crises on the real economy much less severe than those that had preceded it (**Figure 2.4**).

Figure 2.3 : Connections in the London Money Market through simplified balance sheets
Highlighted balance sheet items show how banks, discount houses and the Bank of England were connected.

Banks		Discount Houses		Bank of England	
Liabilities	Assets	Liabilities	Assets	Liabilities	Assets
Deposits	Bills	Call Loans	Bills	Bank notes	Bills
Notes	Call Loans	Equity	Bank notes	Equity	
Equity					

Figure 2.4 : The impact of financial crises on real GDP growth, 1790-1870
This chart shows that hits to GDP following financial crises (circled) lessened over time.



Source: Thomas and Dimsdale (2017)

bills replacing bills of exchange as the main London money market instrument (Bank of England 1967; Nishimura 2010).

II The Bank of England's Discount Office

Figure 2.5: The Bank's Discount Office

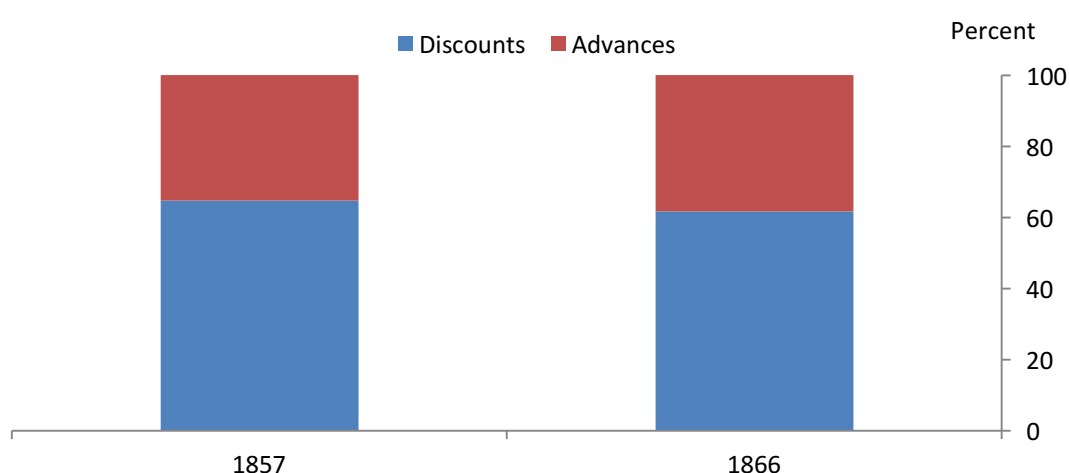


Images above come from sketches of the Bank's Discount Office drawn by Sir John Soane. Soane built the Discount Office in 1810. The left hand panel shows the lobby of the Discount Office. The right panel shows the Office itself (pictured without furniture). Before the construction of the Discount Office, the Bank's discount business had been done in the main Pay Hall. However, the Bank's increasing discount business from the Restriction period (1797-1821) on, prompted the construction of a specific office where this business could be done.

The Bank of England's lender of last resort operations during the nineteenth century were exercised through the Discount Office at the Bank's London headquarters on Threadneedle Street. Though a large responsibility, the Discount Office was physically small. The Office was headed by the Principal of the Discount Office who, perhaps significantly we have discovered, was the same person throughout the period of our analysis. John Green Elsey started at the Bank in 1830 and was in charge of the Discount Office between May 1839 and July 1878. The link between the Bank's response to the crises of 1847, 1857 and 1866 was thus a very personal one. Mr. Elsey was in charge of, on average, seven staff throughout the period. In terms of headcount, this made the Discount Office a relatively small part of the Bank. The Office was open six days a week, or roughly 305 trading days per year, but was open only from 11 am to 2 pm (Ogden 1988: 198). It is not known whether these hours were extended during financial crises.

The Discount Office lent in two ways: discounts and advances. Discounts involved the Discount Office purchasing bills of exchange at discount on their face value. Advances were loans by the Bank secured on debt, akin to modern day repos. The discount houses would temporarily sell debt securities to the Bank with an agreement to buy them back at a future date prior to maturity. The debt securities used as collateral included government bonds and railway stocks. In general, discounts were much more numerous than advances. For example, in the data we have analysed, discounts represented 65% and 62% of transactions in 1857 and 1866, respectively.

Figure 2.6: Proportion of discounts and advances in 1857 and 1866



All bills brought in for discount to the Discount Office were recorded in daily discount ledgers. The ledgers recorded information on the name of the person bringing in the bill, the number and value of bills brought in, and the rate for discount on those purchased, or the number of bills rejected otherwise. Drawing Office customers (those who held deposit accounts with the Bank) were marked as “DO.” By 1866, the ledgers also included the amount and rate charged on advances. **Figure 2.7** is a snapshot of the daily discount ledger from 11 May 1847. Each discounter typically brought in a number of bills for discount. These bundles of bills were known as ‘packets’ or ‘parcels.’ For example, Cooks Sons and Co brought in a packet of 60 bills on May 11 (transaction boxed in blue). These packets were like modern day mortgage backed securities (MBS) or collateralised debt obligations (CDOs) in that they were debt bundles containing different types of bills. The Discount Office would first decide which, if any, of the bills in a packet it would accept, and which it would reject. Intriguingly, the Bank kept detailed records on all bills it had rejected in a separate “Bills Rejected” ledger (**Figure 2.8**). Those bills that were accepted were discounted typically at a single rate of interest. However, on occasion, a packet would be discounted at two rates. For example, in the 11 May ledger, the first packet with 7 bills was discounted at a rate of 5 and 6 percent (transaction boxed in red).

In 1847, around 13 percent of packets had dual rates. A glance through the ledger books after 1847 reveals that the Bank gradually decreased the number of packets which were given dual discount rates. The practice stopped in 1856.²²

On a “normal” business day, the number of discounters the Discount Office would serve was small. For example, the average was 26 customers during non-crisis weeks²³ in 1847 (**Figure 2.9**). The list of these discounters would fit easily on to one ledger page. However, in the midst of a financial crisis, the footfall could be tremendous, and more than four times as large. **Figure 2.10** compares the peak day in a crisis with the same day a year earlier.

²² It is unclear why the Bank didn’t record the packets with bills coming from the same discounter on the same day but at different rates as separate transactional lines. It may simply have been a bookkeeping custom. There is no way to know the weighted average rate. In our analysis of discount rates, where a packet is given a dual rate, we use the lower rate. This means our discount rates in 1847 are systematically biased downward.

²³ We define crisis weeks throughout the paper as those weeks where the level of notes and discounts recorded and/or the note reserve in Banking Department are more than two standard deviations from the mean.

Figure 2.7: Daily discount ledger from 11 May 1847

[illegible]

The ledger recorded the details of bills that the Bank had rejected including (left column to right) the discounter, the drawer, the acceptor, the acceptor's address, when the bill was due, and its monetary value. This seems to us a costly exercise to undertake for securities the Bank wasn't going to purchase. One possibility is that the Bank used this information to keep track of activity in the financial system e.g. to get a sense of the overall indebtedness of highly levered acceptors.

16

Figure 2.9 Average customers per day in crisis and non-crisis weeks

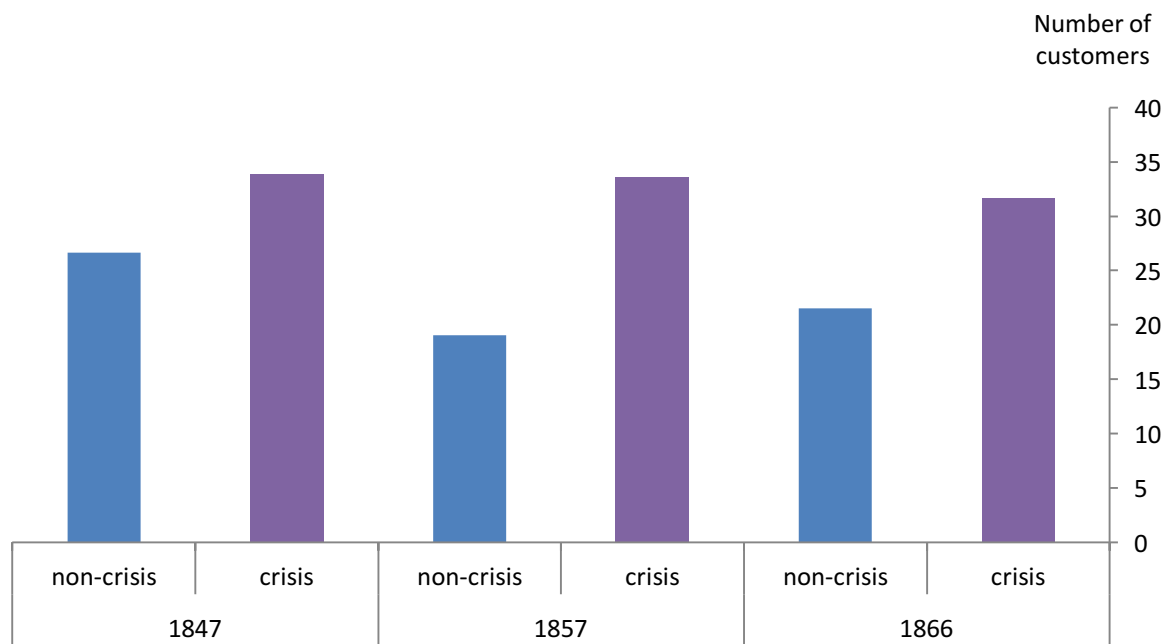
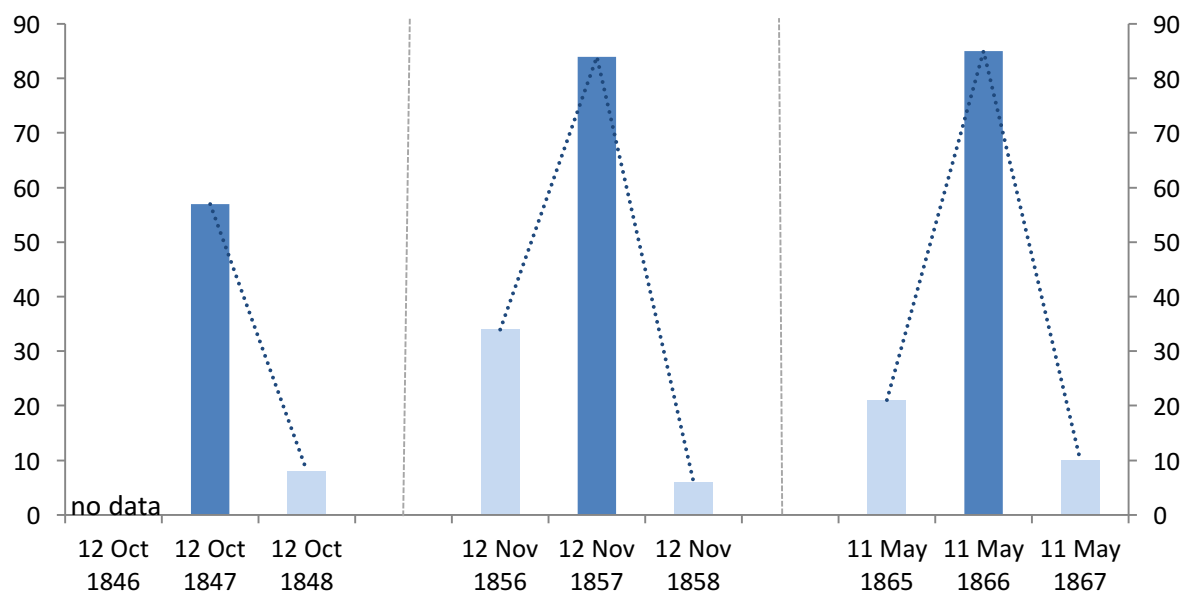


Figure 2.10: Peak crisis transaction day compared with the year before and after

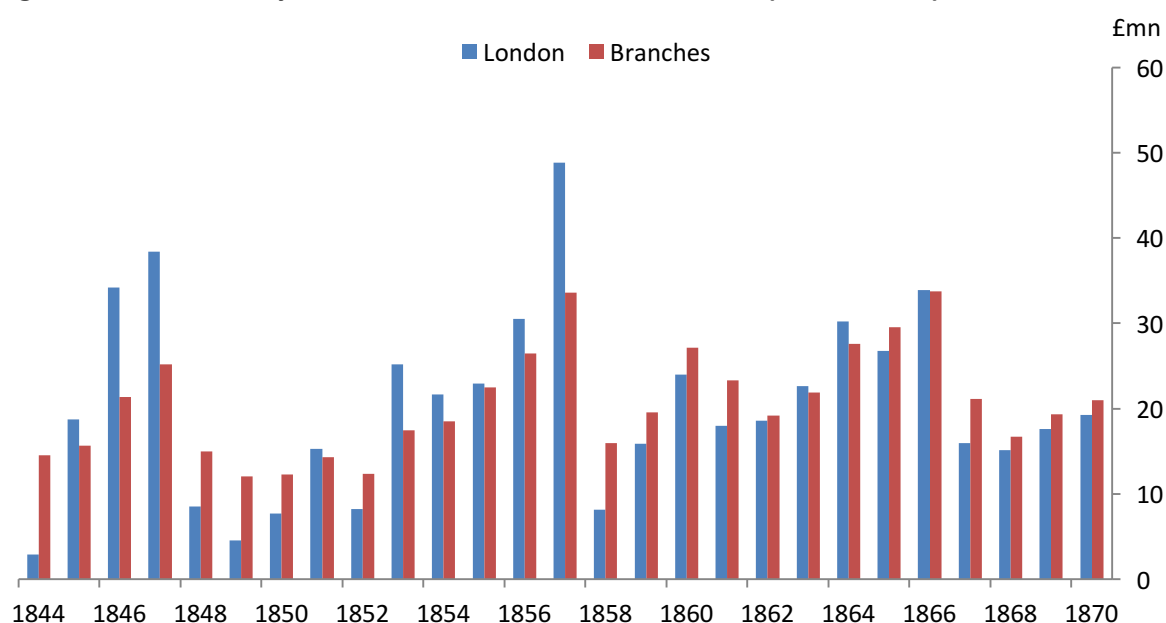


Returning to the ledger on May 11, we see it was a busy day with 53 transactions, though this was by no means the peak of the 1847 crisis. Assuming the Discount Office was only open its standard 3 hours, it would have had to process over 17 packets per hour, or one packet roughly every five minutes. Each of these packets contained multiple, sometimes hundreds of, bills of exchange. On 11 May the total number of bills was 702. Again assuming the Discount Office was only open its standard 3 hours, it would have had to assess credit quality

at a rate of close to 8 bills per minute. This suggests the Discount Office either had well-developed discounting rules, were operationally very efficient, or had scrutinised at least some of these bills in advance (more on this third possibility later).

Besides the Discount Office at Head Office in London, it's worth bearing in mind that the Bank of England's branches outside of London would have also been discounting bills.²⁴ Unfortunately, these branch ledgers no longer exist. This means these ledgers and the activities they chronicled are missing from our analysis.²⁵ However, we do have a sense of the aggregate value of these transactions from the annual reporting of the Bank's branches' activity to Court.²⁶ **Figure 2.11** shows their significance. **Figure 2.12** shows differences in the monetary value of these transactions. During the 1847 and 1857 crises, roughly 40% of the Bank's business discounting bills by value was done through its branches. In 1866 it was 50%.

Figure 2.11: Monetary value of bills discounted in London (Head Office) versus branches

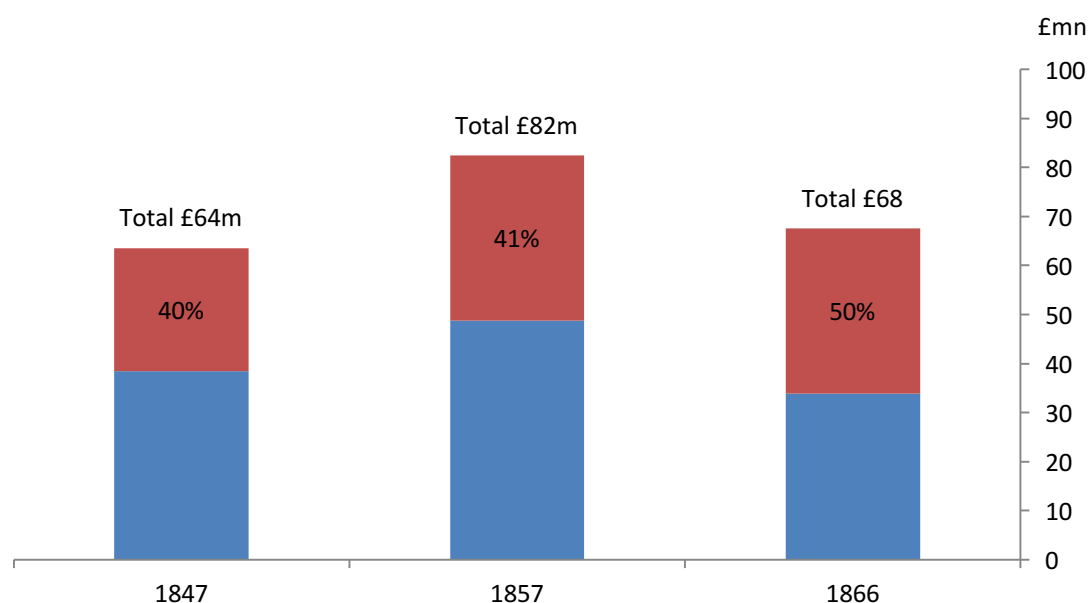


²⁴ The Bank was permitted by law to establish branches outside of London from 1826.

²⁵ This is a key limitation in our analysis. Two other limitations should be noted. First, we make no adjustment for seasonality even though there is reason to believe that the volume of discounts and advances probably varied depending on the time of the year (Ogden 1988: 201). Second, the full extent of the Bank's credit easing may not be reflected in the ledgers. For example, there is some evidence that during the 1847 crisis, the Bank changed the mix of assets on its balance sheet to help the London money market, swapping out gilts in return for illiquid assets held by market counterparties. These transactions were similar in form to those undertaken by the Bank in 2008 when it swapped UK Treasury bills for banks' loans (Domanski, Moessner and Nelson 2014: 70). These transactions do not appear in our ledgers.

²⁶ Reports were made to the Special Discount Committee, BoE C35 and the annual data can also be found in Bank of England Archives, Discount Office Analyses and Summaries, BoE C30/3.

Figure 2.12: Monetary value of bills discounted in branches (in red) during crisis years



£64 million pounds discounted in branches in 1847 would be worth £6.1 billion in 2016

£82 million pounds discounted in branches in 1857 would be worth £8.5 billion in 2016

£68 million pounds discounted in branches in 1866 would be worth £7.4 billion in 2016

Calculated using Bank of England Inflation Calculator:

<http://www.bankofengland.co.uk/education/Pages/resources/inflationtools/calculator/default.aspx>

III How the Discount Office operated— rules versus discretion

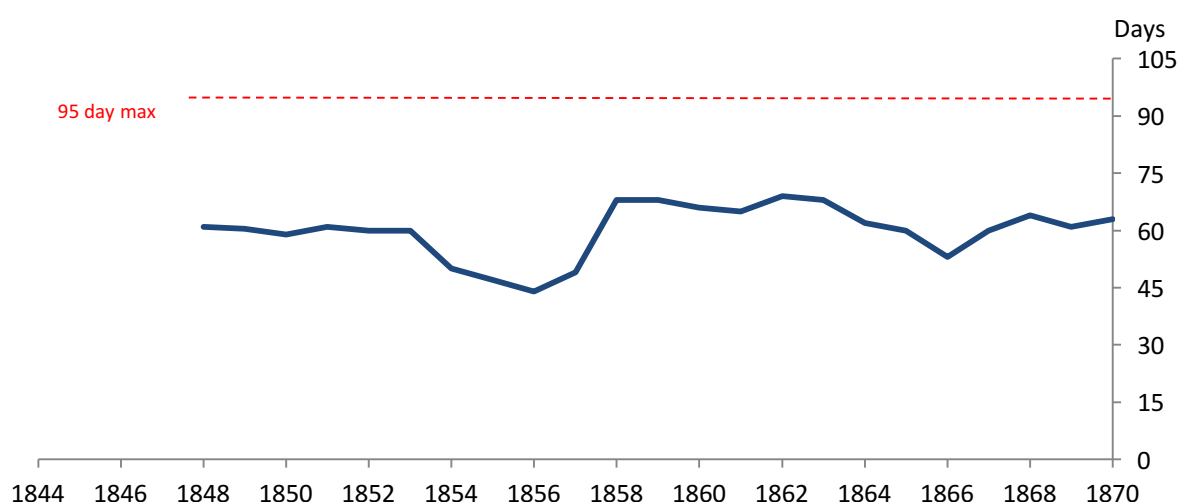
Although the Discount Office retained immaculate records of the bills it discounted, very little documentation remains that sheds light on how it operated. This has led to a debate in the literature between those who argue that it operated by applying a few, simple, definitive rules well-known to market participants (Capie 2007), and those who argue that the Bank and the Discount Office exercised a much greater degree of discretion when lending (Flandreau and Ugolini 2011). There exists evidence for both sides of the argument.

On the one hand, most historians agree that the Bank had some general rules of eligibility for bills it discounted. One of these rules had to do with the maturity of the bill, though the exact criteria may have changed over time. For example, a report by the Special Committee on the Discount Department dated 8 August 1844 proclaimed that “no Bill be discounted having more than 6 months to run.”²⁷ Other historians have claimed that the Bank preferred to discount bills at around 65 days and did not deal in bills of more than 95 days’ tenor (Scammel

²⁷ Bank of England Archive, BoE G15/62.

1968: 176). The Discount Office's own calculations of the average maturity of bills it discounted corroborate this claim.²⁸ **Figure 2.13** displays a new time series we have constructed, from 1849, when the data started to be recorded, up to 1870, marking the end of the period we have investigated. In general, the average maturity of bills discounted hovers just above 60 days (two months) and never comes close to exceeding 95 days' tenor. Still, at times the Bank appears to have extended the maturity of the bills it discounted. For example, in the aftermath of the 1857 crisis, the average maturity of bills discounted was closer to 70 days. However, this followed a period when the maturity of bills discounted had been declining. In 1866, the maturity of bills discounted by the Bank also fell during the crisis. This might be interpreted as the Bank tightening its lending eligibility criteria. However, it could just be a reflection of demand, given the paper prevailing in the market. Whatever the case, the average maturity of bills discounted by the Bank did not reach its lowest point, observed in the mid-1850s.

Figure 2.13: Average maturity of bills 1849-1870



At the same time, there is some archival evidence that discretion played a role when the Bank discharged its lender of last resort responsibilities. **Figure 2.14** is an excerpt from the diaries of Bonamy Dobree, Deputy Governor of the Bank at the time of the 1857 crisis. On 30 October he records a meeting with Mr Barnett (of Barnett Hoare and Co.) who brought in a packet of bills for him and the Principal of the Discount Officer, the aforementioned Mr. Elsey, to look over, with the aim of securing a possible advance should the need arise. The wording in the diary may be significant. The Deputy Governor notes that both he and Mr. Elsey gave their opinion as to the quality of the bills, implying the exercise of judgment rather than mechanistic application of a rule. A look at the ledgers shows £194,000 worth of advances (in two batches) was made over the next two weeks. This episode also provides at least one

²⁸ Bank of England Archive, Discount Office Analyses and Summaries, BoE C30/3.

example that the Discount Office may have operated some system of informal pre-pledging of collateral in advance of actual loans, an antecedent to the formal pre-pledging of collateral that counterparties currently do in order to gain access to Bank of England discount facilities.

Figure 2.14: Evidence of discretion and “informal pre-pledging” of collateral

“Mr Barnett of Lombard Street called to show a parcel of bills brought up by the Clydesdale Bank Corporation, to know if the Bank of England in case of necessity would make an advance to the Clydesdale Bank corporation of.....£150- £200,000 on the said bills. Mr Elsey [a cashier at the Bank] looked over them and gave it as his opinion that the Bills are, on a cursory view of them, of them of excellent character and I gave Mr Barnett my own opinion that the Bank would make the advance.”

Excerpt from the diaries of Deputy Governor Bonamy Dobree, 30th October 1857, BoE M5/454

Ledger entry from 9 November 1857

10	Barnett, H. & Co on acct of the Clydesdale Bk Co	49797	-	5	40	85908	11	10	242300	940450
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Ledger entry from 12 November 1857

1046	10	do	116244	10	15				
74	10	do	67650	18	9				
45	10	do	37928	9	8				
101	10	do of Willesden & Co	114273	10	2				
115	10	do of H. & Co	103966	9	1				
10		Barnett & Co on acct of the Clydesdale Bk Co							100,000
10		Overend, Gurney & Co							111,000
10		Overend, Gurney & Co							72,000
10		Nat'l Dis Count Co Ltd							85,000
10		London Discount Co Ltd							8,000
10		A. Cunliffe Son & Co							20,000

If discretion was exercised when the Bank lent, this raises further questions as to the level within the organisation where that discretion was exercised. Perhaps, as in the diarised episode, it was exercised both by the Discount Office and the Bank’s most senior directors. For example, while we know that during this period senior members of the Bank’s Court through the Committee of Daily Waiting monitored the Bank’s discounts each day, they did so ex post, after the Discount Office had made its lending decisions.²⁹

²⁹ The Committee of Daily Waiting existed until 1914.

Indeed the mid-nineteenth century was a period of increasing autonomy for the Discount Office. From its founding to the mid-nineteenth century, the Bank's policy had been to discount all bills at a single fixed (Bank) rate irrespective of the term to maturity of the bills, and irrespective "the standing of the parties to them or of the applicants for accommodation" (King 1936: 81). Credit limits existed, but they were typically implemented by restricting the quantity of loans rather than varying their price. This changed in the 1840s. While Bank Rate was still fixed weekly by the Court of Directors, starting in March 1845, the Discount Office no longer applied it uniformly to all bills but applied a range, as we show later in this paper.³⁰

The greater discretion the Discount Office had to set loan prices was an unintended consequence of the 1844 Bank Charter Act. That Act had sought to prevent the over-issue of private banknotes that many contemporaries felt was the source of financial crises in 1825 and 1837.³¹ To that end, the Act gave the Bank of England an effective monopoly on the issue of new bank notes. With the exception of an initial £14 million fiduciary issue, new Bank notes had to be backed one-for-one with gold. To facilitate this, the 1844 Act split the Bank into two departments for accounting purposes.³² The "Issue Department" of the Bank was to look after the note issue and the issuance of new notes was tied to the amount of gold it held in reserve. The framers of the Act believed this would ensure monetary and price stability.³³ Meanwhile, the rest of the Bank – the "Banking Department," including the Discount Office – could operate for profit like any other private bank. Importantly, the Banking Department held part of the

³⁰ As King (1936: 110) notes, "Thus the applicant for discount accommodation, unless he held absolutely first-class and short-dated paper (bearing at least two undoubted names, one of which had to be a London acceptor), could never know in advance precisely what rate he would be charged, for the Bank did not make a general practice of fixing and announcing differential rates for the various eligible usances."

³¹ For example, the 1825 financial crisis was widely blamed by contemporaries on private country banks, who were accused of having over-issued small denomination notes (Bagshaw 1920: 197). In response, two Banking Acts were passed in 1826. The first of these prohibited the issue of notes with face values of less than five pounds (Fletcher 1976: 9). The second Act permitted joint stock banks to issue notes (Tuptil 1936: 60). Previously, only banks with fewer than six partners were allowed to issue notes, with the exception of the Bank of England. This legal restriction had been designed to protect the Bank's market position in note issuance by limiting the equity funding options of potential competitors. However, the downside of this restriction manifested itself in the 1825 crisis when the banks who had issued notes were too poorly capitalised to absorb losses. In order to improve the solvency of country banks, the Banking Act of 1826 removed the upper bound on number of partners, but only for banks operating outside a 65 mile radius of London. Again, this was to protect the Bank's market position in note issuance. The Act also permitted the Bank to open branches in the countryside, with the apparent goal of getting its notes to replace those issued by country banks, blamed for the 1825 crisis.

³² This partition still exists today as a Bank of England accounting convention, but without the operational implications it had back then.

³³ The logic was that if gold flowed out of the country due to an overheating economy and a balance of payments deficit, the stock of notes in circulation would automatically decline as people cashed in their notes for gold to pay for imports. It was also envisaged that the Bank would respond to this outflow by raising interest rates to attract more gold from abroad, and by reducing lending to protect its existing reserves. The combination of higher interest rates and a falling money supply, it was believed, would lead to slowing economic activity and falling prices, which would improve the balance of payment, providing an automatic stabilisation mechanism.

total stock of Issue Department notes as its own reserve and the growth if its deposit liabilities were not tied to gold. This gave it some flexibility to meet demands for credit.

With monetary and price stability assumed to be guaranteed by the Issue Department's backing of Bank notes with gold, the Discount Office started to compete more aggressively with other banks. In the two years that followed the passing of the 1844 Banking Act, the Banking Department's holdings of private securities expanded markedly, following a cut in Bank Rate from 4% to 2.5%. More generally the discretionary lending activity of the Banking Department could in part offset or 'sterilise' the automatic stabilisers built into the rules for the Issue Department.³⁴

The discretion the Discount Office could exercise, however, had its limits, which were most clearly manifest during financial crises. **Figures 2.15** and **2.16** illustrate. While the general technique whereby the Bank created new notes to buy bills has long been understood at a high-level, these diagrams detail the precise institutional mechanics typically glossed over. In a crisis, there would be an increased demand for Bank of England notes (cash) by the financial system which could be obtained by discounting short-dated bills (cash equivalents) with the Discount Office. Banking Department would typically pay this out of its note reserve. Alternatively, if the discounter was also a Drawing Office or banking customer with an account at the Bank, the Discount Office might initially just credit the customer's deposit balance. But in a crisis these deposits could easily get cashed into notes. So typically a crisis would lead to a change in the asset mix of Banking Department's balance sheet, with more discounts and fewer notes held in reserve. On the Issue Department's balance sheet, all that would happen in the first instance is that notes in circulation would increase at the expense of notes held by the Banking Department. The size of the Issue Department's balance sheet was unchanged and there would be no breach of the Bank Charter Act's provisions as no new notes were printed. There was merely a shift in composition of the total notes stock.³⁵

However, if the crisis deepened, and the demand for discounts continued, the Banking Department's note reserve might start to dry up. This created the possibility that the Discount Office might no longer discount bills. This could cause additional panic in money markets. In response, the Government at this point might provide the Bank with an indemnity allowing it to breach the 1844 Act. This would allow the Issue Department to create additional notes.

³⁴ For example, if there was an outflow of gold, the Banking Department could offset the impact on notes in circulation and the money supply by lending more of its reserve notes to the private sector or by creating additional deposits for the borrowers in their accounts held with the Banking Department. Banking Department accounts were akin to modern day Reserve Accounts.

³⁵ It was of course possible that the total note stock could decline if some of the notes drawn from the Banking Department reserve were either immediately or subsequently cashed into gold coin.

These would be given to the Banking Department in exchange for some of its bills and securities. These notes could then be used by the Discount Office to discount additional bills. In 1847 and 1866, the mere existence of the indemnity stopped the panic and this transaction never took place. It did, however, get carried out in 1857.

Figure 2.15: Bills would come into the Bank for discount which it would pay out of the note reserve in Banking Department

Banking Department Balance Sheet		Issue Department Balance Sheet		Banking Department Balance Sheet		Issue Department Balance Sheet	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
New Bills & Securities				New Bills & Securities			
Bills and Securities	Bankers' Deposits	Bills and Securities	Notes in BD	Bills and Securities	Bankers' Deposits	Bills and Securities	Notes in BD
Notes in BD	Other	Bullion	Notes in Circulation	Notes in BD	Other	Bullion	Notes in Circulation
Other		Other	Other	Other		Other	Other

Figure 2.16: The only way Banking Department (BD) could restore the note reserve was to swap bills for notes with Issue Department (ID) once the Bank Charter Act was suspended

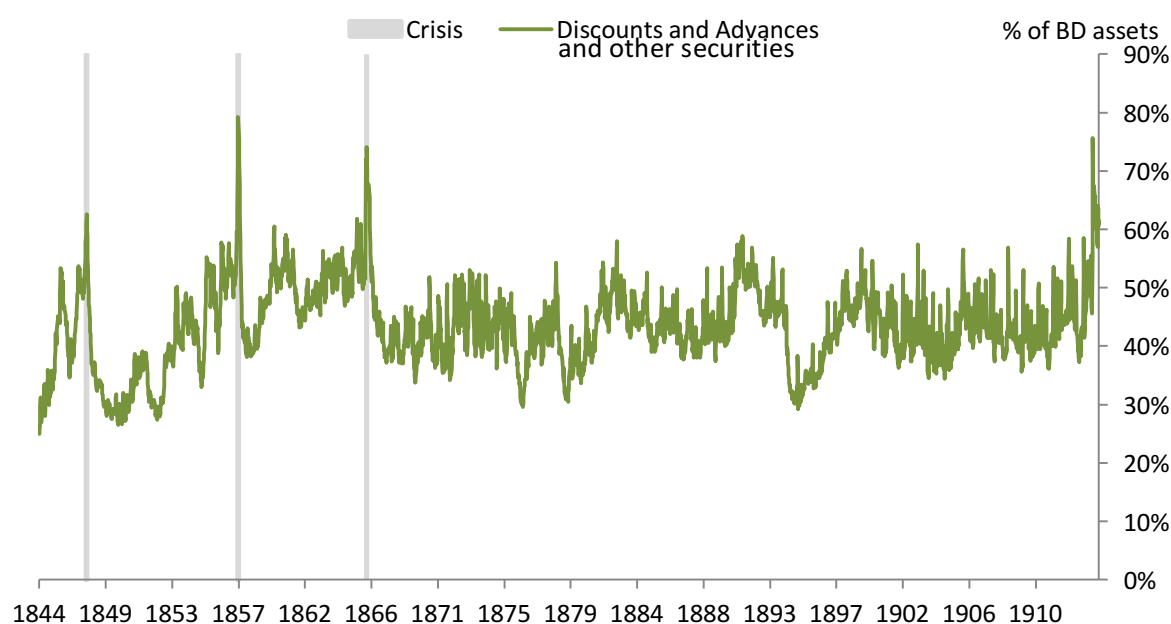
Banking Department Balance Sheet		Issue Department Balance Sheet		Banking Department Balance Sheet		Issue Department Balance Sheet	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
Stage 1: Notes in BD were insufficient for the exchange of new bills				Stage 2: ID issues more notes to buy these new bills			
More Bills & Securities			More notes	More Bills & Securities		More notes	
Bills and Securities	Bankers' Deposits	Bills and Securities	Notes in BD	Bills and Securities	Bankers' Deposits	Bills and Securities	Notes in BD
Notes in BD	Other	Bullion	Notes in Circulation	Notes in BD	Other	Bullion	Notes in Circulation
Other		Other	Other	Other		Other	Other
Stage 3: ID's bills and securities stock increased and notes in circulation increased							
Bills and Securities	Bankers' Deposits	Bills and Securities	Notes in BD	Bills and Securities	Bankers' Deposits	Bills and Securities	Notes in BD
Notes in BD	Other	Bullion	Notes in Circulation	Notes in BD	Other	Bullion	Notes in Circulation
Other		Other	Other	Other		Other	Other

Section 3: Lending freely

I Evidence on aggregate lending

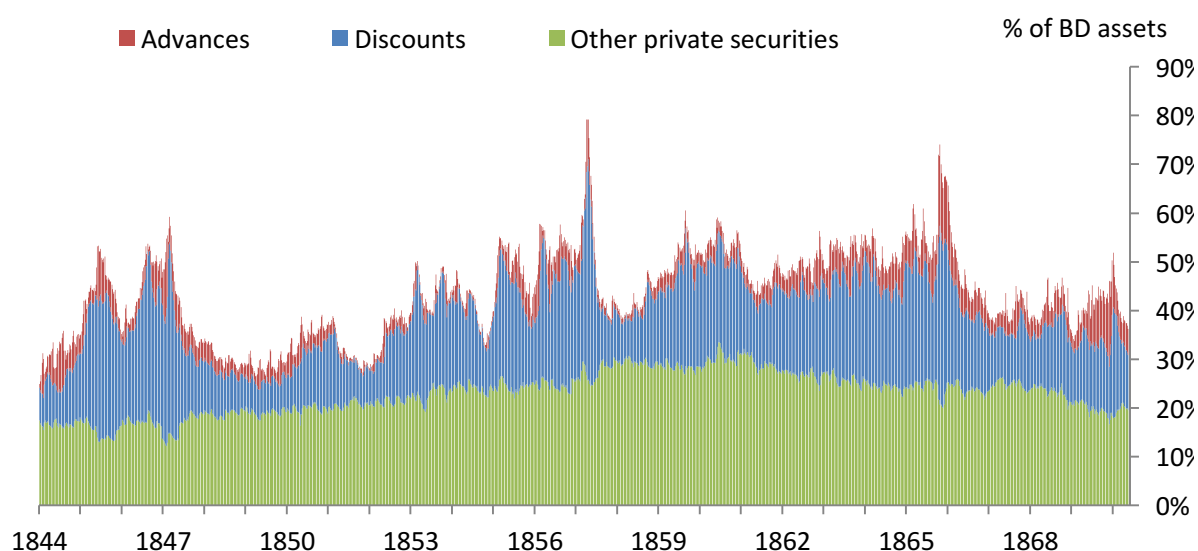
The charts that follow are based on a newly available weekly series of the Bank's balance sheet historically (Huang and Thomas 2016b). **Figures 3.1 and 3.2** shows the weekly total of the Bank's private discounts, advances and security holdings during the crises of 1847, 1857 and 1866. This is based on the weekly dataset of but has been extended by the current authors to include a breakdown of discounts and advances. The Bank appears to lend substantial amounts during these crises, at least relative to non-crisis periods. Private sector discounts, advances and other securities expanded between 60 and 80 percent of the Banking Department's balance sheet during each crisis. Discounts and advances rather than purchases of longer-term securities were the key form via which the Bank lent to the private sector during a crisis.³⁶

Figure 3.1 : Private discounts, advances, and other securities 1844-1914



³⁶ Later crises, such as 1878 and 1890, exhibited no obvious “lending freely” on the same scale. Part of that has to do with the fact that those crises centred around two specific institutions i.e. the City of Glasgow Bank and Barings, respectively. However, equally important may have been the memory of the Bank's actions in 1847, 1857 and 1866. Once it was understood by the public that the Bank would intervene, the mere *ex ante* expectation of this response, together with greater pre-emptive moves by the Bank, were sufficient to nip a more serious crisis in the bud. It was not until the special circumstances surrounding the outbreak of war in 1914 that the Bank stepped in on a massive scale again, and, even then, Government played the leading role.

Figure 3.2: Breakdown of private sector assets 1844-1870



The counterpart to the increased lending was a fall in the note reserve in the Banking Department (**Figure 3.3**). Bankers' deposit balances did not show an increase, except perhaps during the 1857 crisis, implying that even if the extra discounting by the Bank was initially credited to deposit accounts, these were soon withdrawn in notes (**Figure 3.4**). **Figure 3.5** shows that, despite the note drain from the Banking Department, not all of these notes were then converted into gold coin and overall bullion reserves remained relatively adequate, at least by the Bank's historic levels. Only in 1857 did the coin and bullion reserve ratio to total liabilities dip below 20%

Figure 3.3 : Notes in Banking Department, 1844-1914

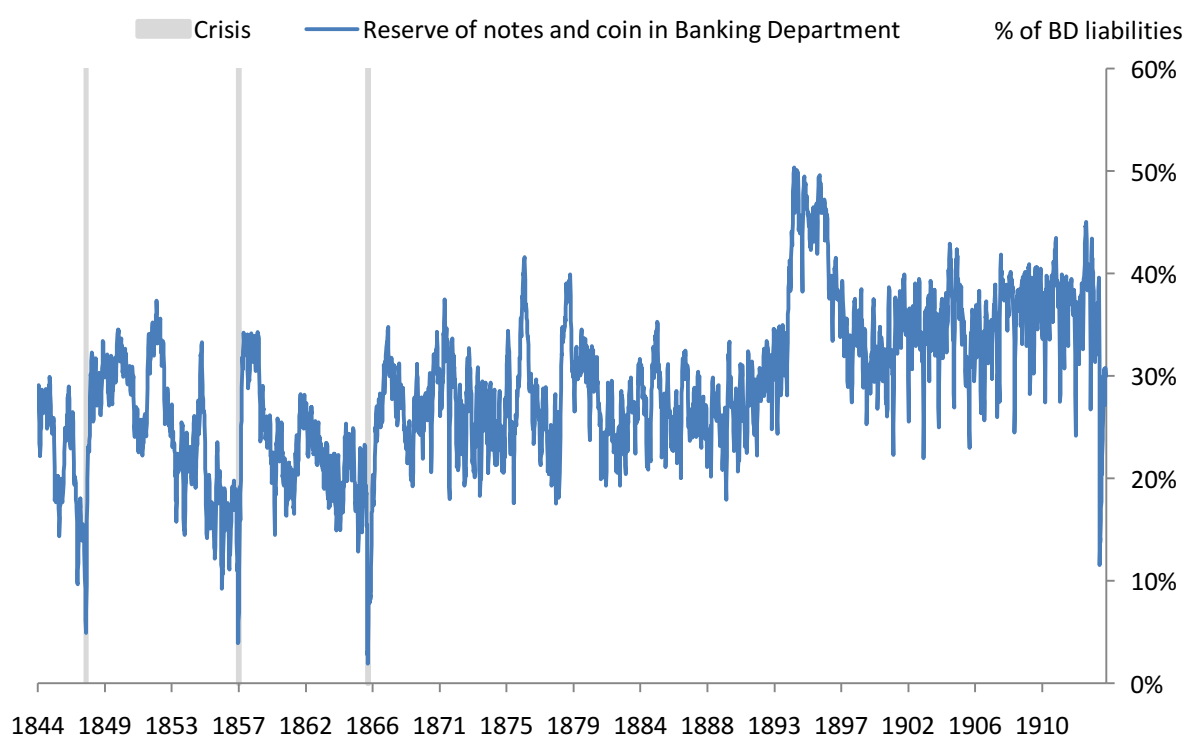


Figure 3.4 : Bankers' balances (reserve accounts) in Banking Department, 1844-1914

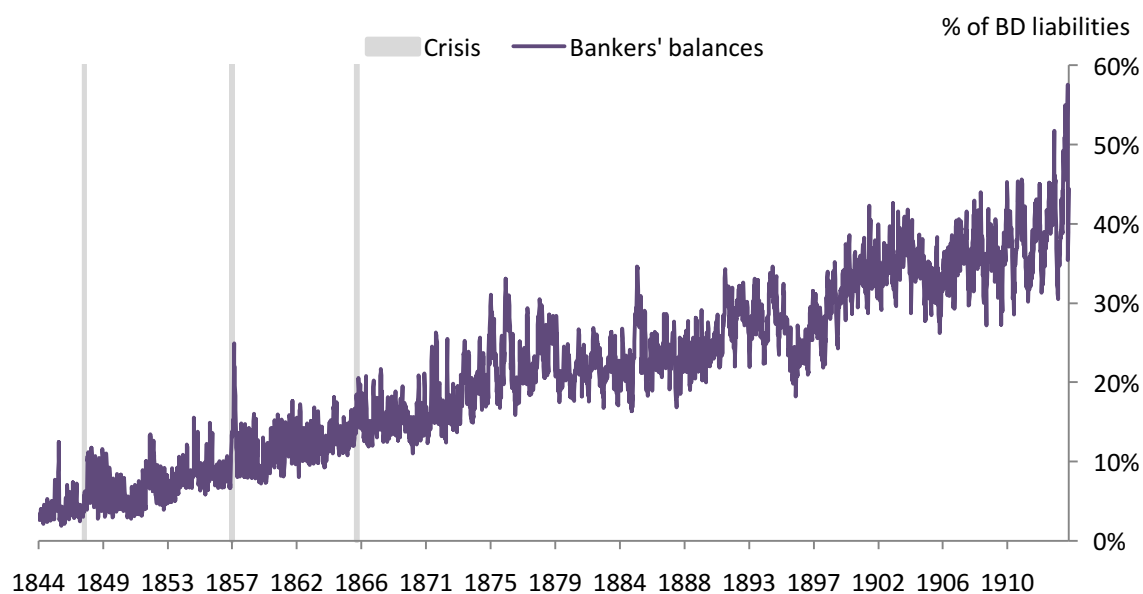
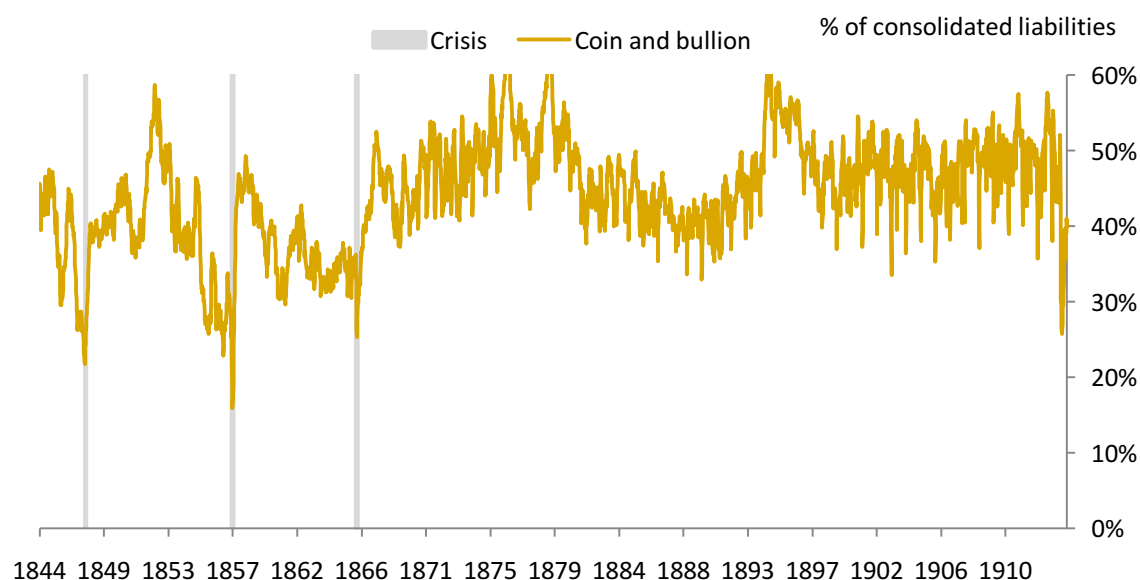


Figure 3.5: Coin and bullion reserves of the Bank relative to consolidated liabilities, 1844-1914



Information from the Bank's daily discount ledgers corroborates the balance sheet view. **Figures 3.6 to 3.8** show a significant increase in the average number of discount transactions, the number of bills per packet, and the monetary value of discounts, respectively, made in crisis weeks compared to non-crisis weeks in 1847, 1857 and 1866. In all years, the averages are elevated during crises. This provides some evidence that the Bank was at least providing significant support to the market during crisis weeks.

Figure 3.6: Average number of discounts made per day 1847, 1857 and 1866

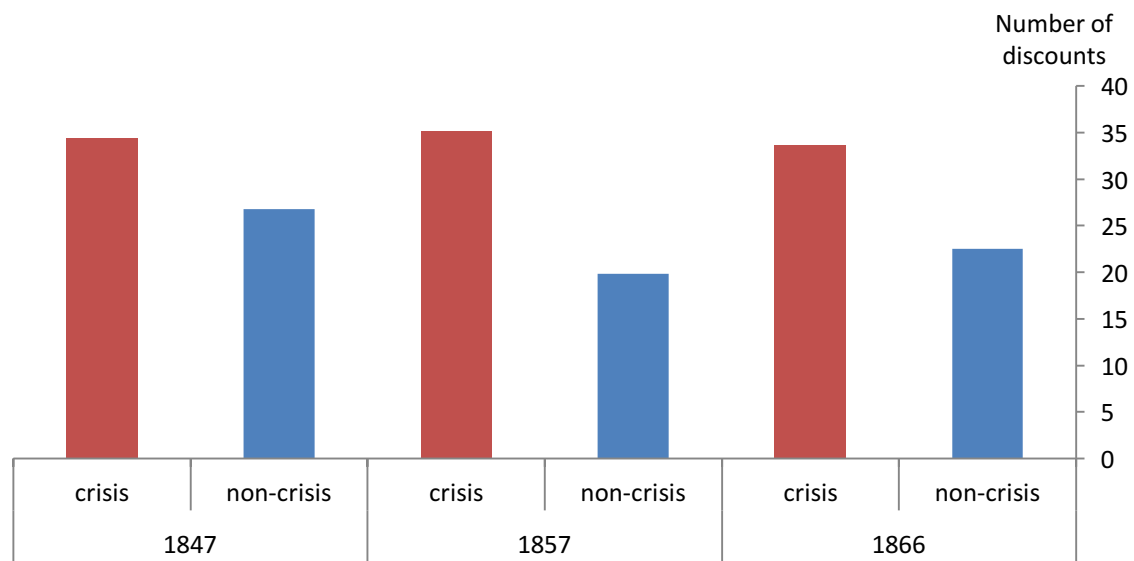


Figure 3.7: Average number of bills per packet in a day in 1847, 1857 and 1866

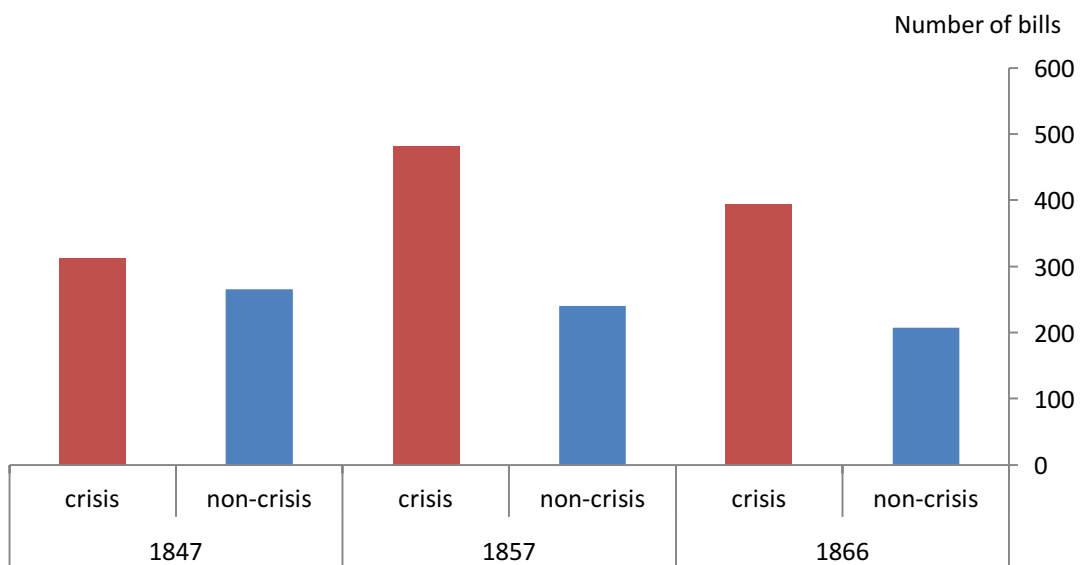
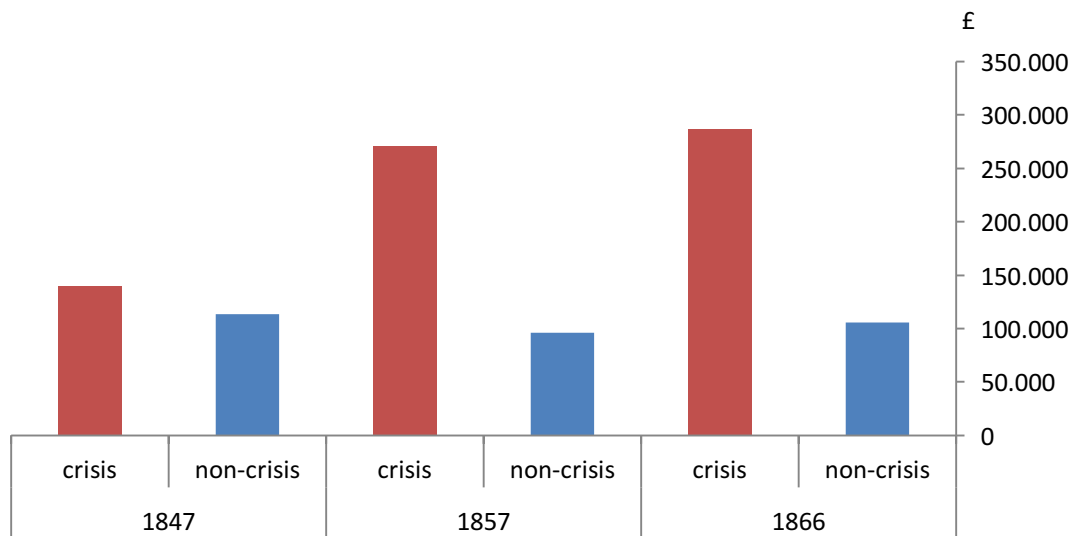


Figure 3.8: Average monetary value of discounts done per day in 1847, 1857 and 1866



II Evidence on lending distribution

Looking at the ledgers allows us to dig deeper into aggregate lending figures and describe its distribution. In particular, we extend work by Flandreau and Ugolini (2011) on the crisis of 1866, with analysis of the earlier crises of 1847 and 1857. **Figure 3.9** lists the top discounters in each crisis. Discerning connoisseurs of financial history will note that our figures for 1866 are slightly different from those of Flandreau and Ugolini. This is because they focus their analysis on May 1866, whereas our analysis focuses on the period both before and after Overend Gurney's failure on 10 May.

Interestingly, we observe that some of the top discounters in 1847 defaulted, but appear again as top discounters in 1857. For example, Bruce Buxton & Co and Sanderson & Reid suspended payments to depositors in 1847. Having defaulted, these firms then reconstituted themselves with slightly different partners, becoming Bruce Wilkinson & Co, and Sanderson Sandeman & Co, respectively. Both firms then defaulted again in 1857. Yet, as discussed in greater detail later, such defaults did not result in financial losses for the Bank, at least in aggregate. So long as the underlying bills purchased by the Bank were good and were repaid by the ultimate acceptors, the solvency of the counterparties with whom the Bank transacted did not necessarily matter.

The daily discount ledger data reveals a contrast between the crises of 1847 and 1857, on the one hand, and the crisis in 1866, on the other. First, the crises of 1847 and 1857 are dominated

by purchases from three to four major counterparties in each case. By contrast, in 1866, the number of discounters more than two standard deviations from the mean is more evenly spread. Second, in 1847 and 1857, the top counterparties are mostly bill brokers, whereas in 1866 commercial and merchant banks are more prevalent. This is because the 1857 crisis was partly blamed on bill brokers for recklessly lending, aided and abetted by resort they had to the Bank's rediscounting facilities. As a consequence, in March 1858, the Bank issued a statement announcing its willingness to shut down re-discounting facilities to brokers in 'normal' circumstances (Calomiris 2010). While bill brokers and discount houses were not denied emergency liquidity assistance in 1866, the provision of liquidity was now equally channelled to banks, symbolic of their growing ascendance in the hierarchy of financial firms in London.

Figure 3.9: Top Discounters, counterparties with total loans by value more than two standard deviations from mean

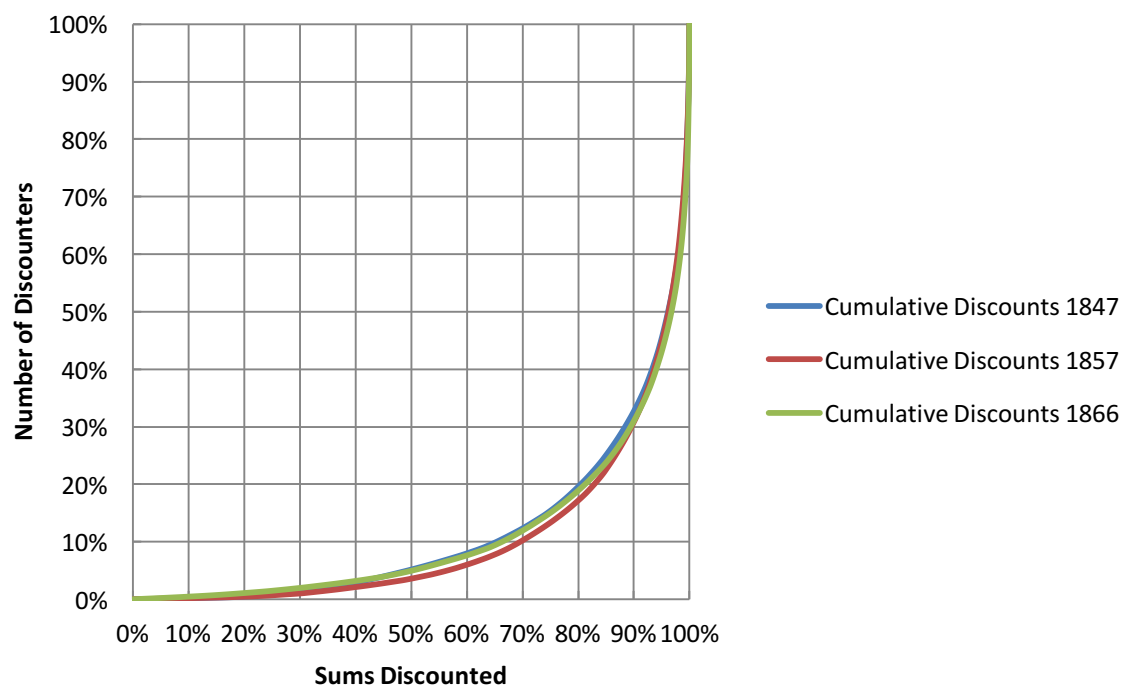
1847			1857			1866		
Counterparty Name	Sector	Percent of all loans	Counterparty Name	Sector	Percent of all loans	Counterparty Name	Sector	Percent of all loans
A & G N Alexander & Co	BB	6.83%	Overend Gurney & Co	BB	9.1%	Alexander Cunliffes & Co	BB	5.45%
Bruce Buxton & Co	BB	5.58%	Bruce Wilkinson & Co	BB	8.07%	Oriental Bank Corporation	BA	5.22%
N M Rothchild & Son	MB	5.47%	A and G W Alexander and Co	BB	6.97%	The London County Bank	BA	4.76%
Sanderson & Reid	BB	2.52%	George Peabody and Co	MB	3.20%	National Discount Co Ltd	DH	3.89%
Overend Gurney & Co	BB	1.82%	Glyn and Co	BA	2.80%	Barclay & Co	BA	3.45%
Robert Lawes & Co	BB	1.35%	Sanderson Sandeman & Co	BB	2.23%	Harwood Knight & Allen	MI	3.01%
Morrison D & Co	MB	1.34%	Glyn and Co o/a Union Bk of Scot.	BB	1.85%	The City Bank	BA	2.23%
F Huth & Co	MB	1.27%	Durant & Co	BA	1.69%	Drake, Kleinwort & Cohen	MB	2.08%
Magniac J & Co	MI	1.20%	Kraeutler and Mieville	MB	1.65%	Brightwen Gillet and Co		2.03%
			Mc Calmont Brothers and Co	MB	1.58%	Smith Fleming & Co	MB	1.99%
						F Huth & Co	MB	1.78%
						Finlay Campbell & Co	MB	1.74%
						London Asiatic & American Ltd	MI	1.63%
						Colonial Company Limited	MI	1.56%
						Samuel Montagu & Co	MB	1.50%
						Bank of Hindustan Limited	BA	1.40%

Notes: BB = Private bill broker, BA = Bank, MB = Merchant/Merchant Bank, DH = Discount House, MI = Missing. Firms in red defaulted during the crisis.

Figure 3.10 gives a sense of the overall skew in discounts made by the Bank. These Pareto curves show that in 1847, 1857 and 1866, roughly 80% of discounts went to 20% of the Bank's

top counterparties.³⁷ **Figure 3.11** shows a comparison during non-crisis periods, the Pareto curves were less skewed in these normal times, especially after 1857 when, as noted above, bill brokers were denied access to regular discount facilities.

Figure 3.10: Distribution of Discounts during crisis weeks in 1847, 1857 and 1866



³⁷ Hence the name of the chart, which refers to the Pareto principle that roughly 80% of effects come from 20% of the causes (Kiremire 2011). Again, we are indebted to Flandreau and Ugolini (2011) for the inspiration to create these charts.

Figure 3.11: Distribution of Discounts in non-crisis weeks 1847, 1857 and 1866

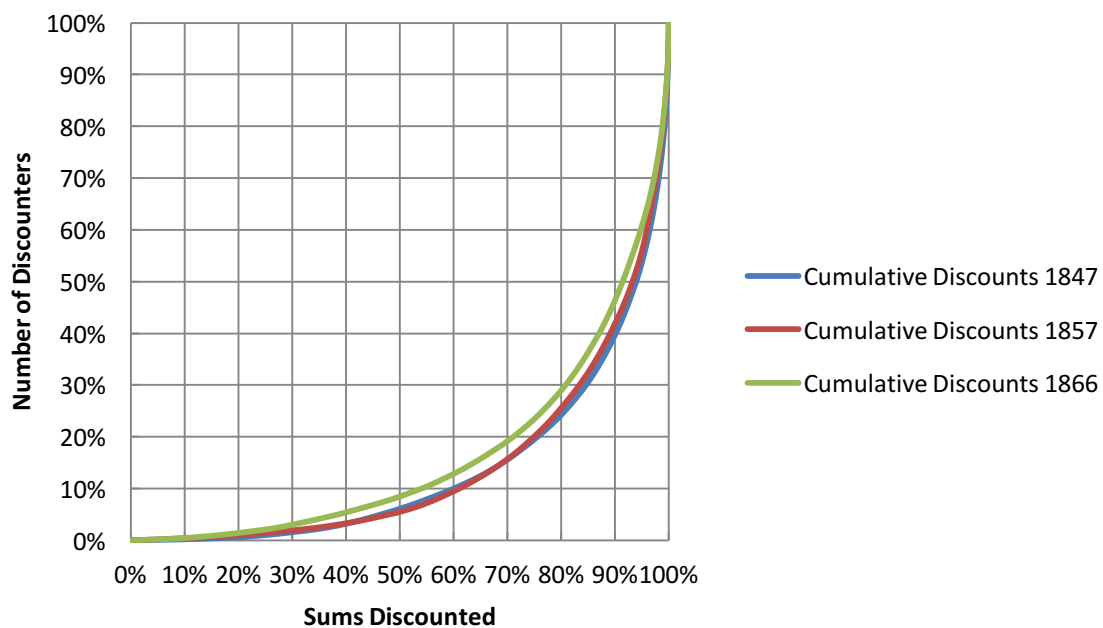


Figure 3.12 shows similar curves for advances made by the Bank of England in 1857 and 1866. The pattern is the same as above, with the top 20% of counterparties receiving 78% and 88% advances in 1857 and 1866, respectively. In 1857, the top counterparties are bill brokers. However, in 1866, as **Figure 3.13** shows, the top counterparties are more varied. For example, the counterparty that received the largest advances cumulatively during the crisis was a bank, Agra & Mastermans. Despite receiving assistance from the Bank, it eventually defaulted.

Figure 3.12: Distribution of Advances in 1857 and 1866

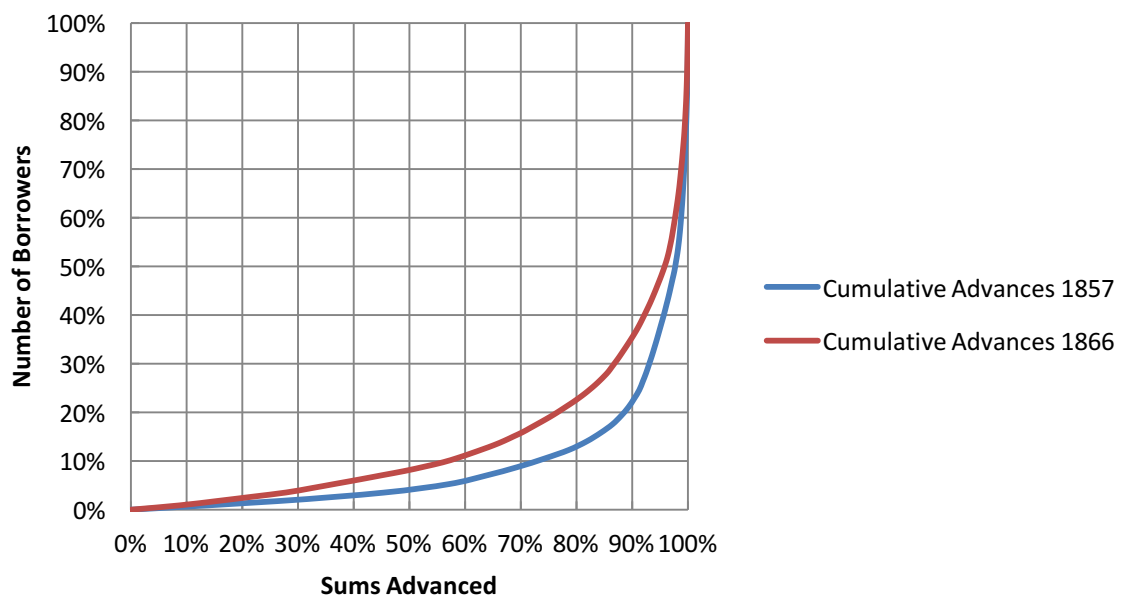


Figure 3.13: Top advances, with total loans more than two standard deviations from mean					
1857			1866		
Overend Gurney & Co	BB	2291000	Agra & Mastermans Bank Limited	BA	75000
A and G W Alexander and Co	BB	1662250		M	0
Sanderson Sandeman & Co	BB	980000	Frith Sands & Co	B	71000
Robert Lawes and Co	BB	608000			0
National Discount Corporation	DH	558000	Alliance Bank Limited	MI	52000
Bruce Wilkinson & Co	BB	413000		M	0
Frith Sands and Co	B	256000	Smith Fleming & Co	B	49050
Cunliffes and Co	BA	180000			0
London Discount Corporation	MI	174000	Harwood Knight & Allen	MI	49000
					0
			Bank of London Limited	MI	43000
					0
			Discount Corporation Limited	MI	37500
					0
			London Westminster Bank	MI	30000
					0
			Robert Lowes & Co	BB	25600
					0
			The London County Bank	MI	20000
					0
			National Discount Co of Limited	DH	20000
					0
			Barclay & Co	BA	20000
					0
			Sheppard Pelly & Co	MI	16950
				M	0
			Haarbleichen Schumaum	B	16490
				M	0
			Gledstones & Co	B	16300
					0
			Colonial Bank	MI	16000
					0
			Barnett & Co	MI	14400
					0
			R. Cunliffe Son & Co	BB	14000
					0
			The Bornes Co Limited	MI	12550
					0
			Robert Smith & Co	MI	10270
					0
			Bank of Hindustan Limited	MI	10000
				M	0
			Blogg & Martin	B	94000
				M	
			J. F. Pawson & Co	B	90200
			Metrop Provincial Bank Limited	MI	87000
Notes: BB = Private bill broker, BA = Bank, MB = Merchant/Merchant Bank, DH = Discount House, MI = Missing. Firms in red defaulted during the crisis.					

Notes: BB = Private bill broker, BA = Bank, MB = Merchant/Merchant Bank, DH = Discount House, MI = Missing. Firms in red defaulted during the crisis.

Section 4: Interest rate evidence

I Bank Rate and market rates

We now consider how the Bank priced loans. Bagehot stated several reasons the Bank should lend at a high or penal interest rate during crises. The first reason was to ensure that only those that really needed loans would come to the Bank. Second, a high level of Bank Rate would penalise those who, with “unreasonable timidity,” refused to lend, raising their opportunity cost for not doing so. Finally, a high Bank Rate would protect the Bank’s gold reserve and entice gold from abroad at a moment when it might otherwise flow away.

For much of its history, it would have been impossible for the Bank to follow Bagehot’s prescription because of usury laws. These laws prohibited interest rate charges on short-term bills and promissory notes higher than 6%, between 1660 and 1714, and 5% between 1714 and 1833 (Temin and Voth 2008). As a result, the Bank’s discount rate was at this maximum limit for almost the entire eighteenth century. This meant that Bank Rate effectively operated as a ceiling on market rates. Normally, when market rates were lower than Bank Rate, few people would come to the Bank to discount bills. **Figure 4.1** compares the Bank’s discount rate with two proxies of market rates in the eighteenth century– the yield on 6-month East India Company bonds, and the yield on consols which were not subject to usury limits. During crises, as market rates rose towards the usury limit, more people might come to the Bank to discount bills, but the Bank was restricted from raising rates to a level that might simultaneously preserve its bullion reserve, and reflect the increasing demand for cash. Instead, the Bank rationed credit and would generally only lend to its regular private merchant customers in London.³⁸

However, in 1833, the usury laws relevant to bills were repealed. As a result, Bank Rate could now be increased above 5%. **Figure 4.2** shows that after 1833, the Bank started to charge rates above 5%. It also shows that the Bank started to change Bank rate more frequently. As the chart shows, during crises, Bank Rate spiked, giving some indication that a penalty rate was being applied, as Bagehot would have approved.

³⁸ Lovell (1957) notes that, prior to the restriction period of 1797, private banks had no direct access to rediscounting facilities and it was rare for merchants outside London to be given direct access the Bank’s facilities, though this could be arranged indirectly via a London counterparty known to the Bank.

Figure 4.1: Bank Rate and market rates 1715-1833

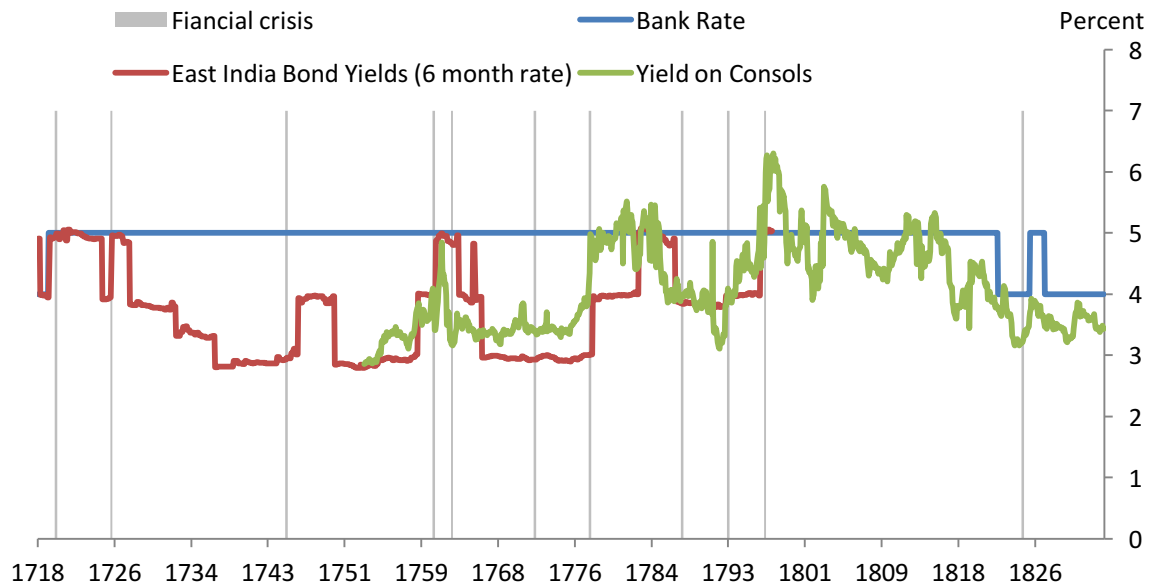
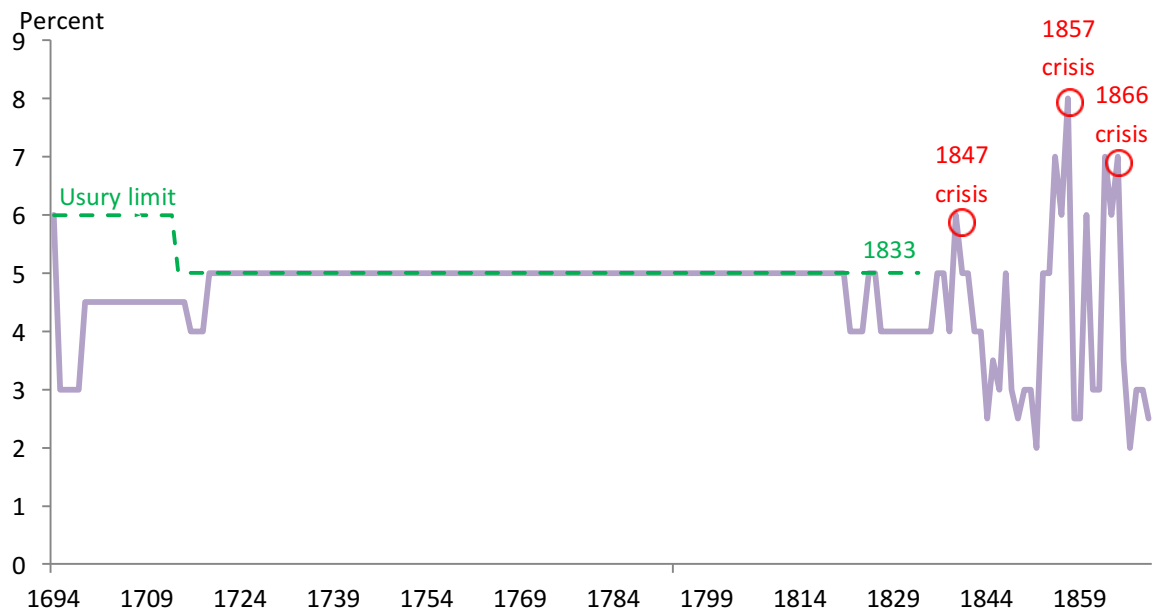


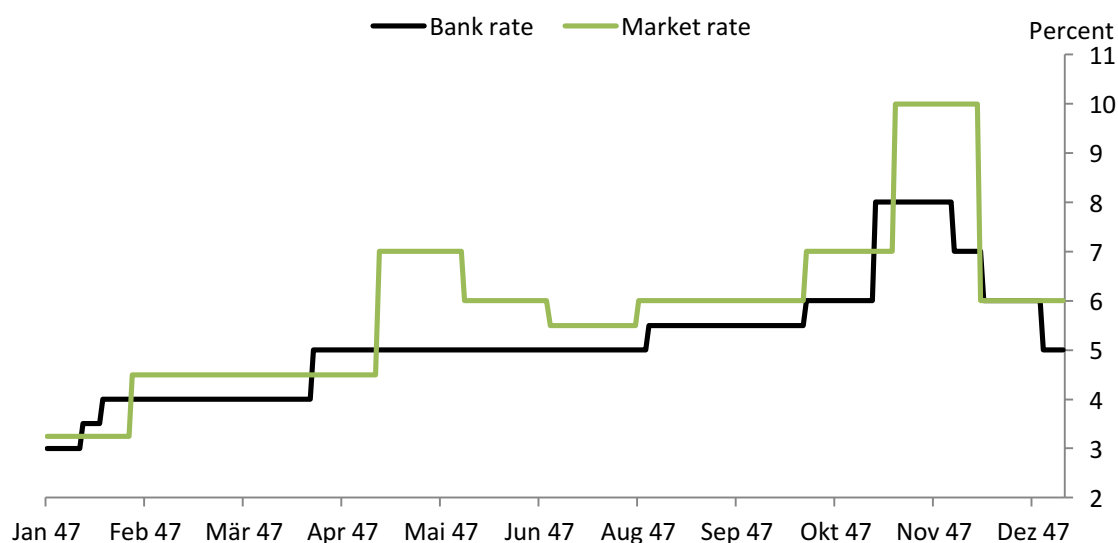
Figure 4.2: Bank Rate before and after 1833



The freedom implicitly granted to the Banking Department to compete for discount business by the Bank Charter Act of 1844 meant that Bank Rate was typically below market rates in the lead up to the 1847 crisis. This carried over into the crisis period. **Figure 4.3** compares Bank rates to the *monthly average* of three month bill rates in the market, derived from *The*

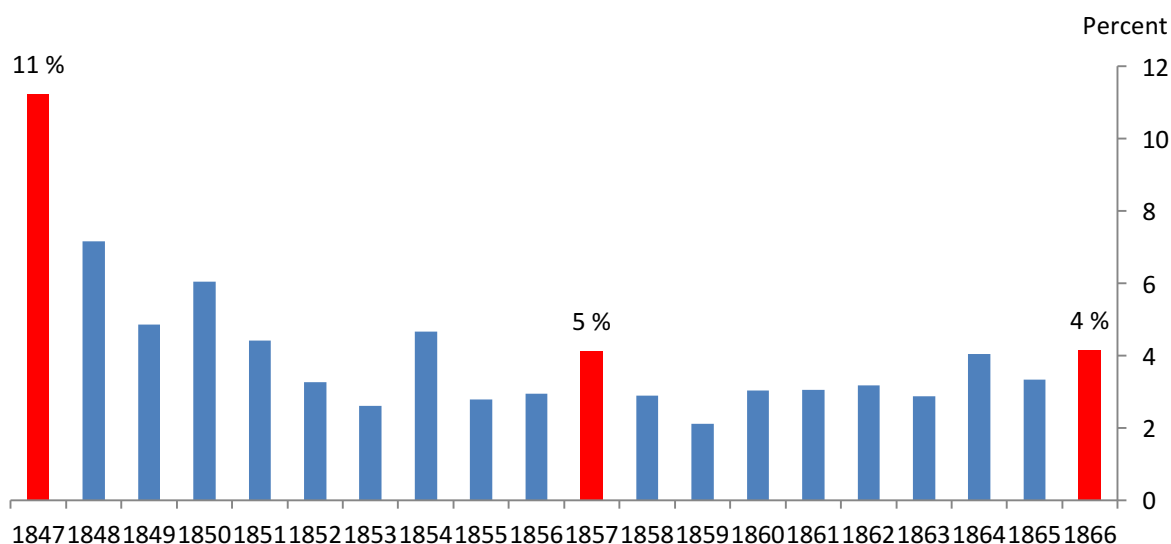
Economist's Bankers' Gazette.³⁹ Market rates rose to 10% in October 1847 whereas Bank Rate only increased to 8%.

Figure 4.3 Bank Rate versus market rates in 1847



Bignon and co-authors (2012) have argued this suggests the Bank was rationing credit during the 1847 crisis. This hypothesis is partly supported by the rejection rate on bills in **Figure 4.4**. Around 10% of bills were rejected in 1847 compared to 5% in 1857 and 4% in 1866. Also, in the 1857 and 1866 crises, Bank Rate was typically above those prevailing in the market (**Figure 4.5 and 4.6**).

Figure 4.4 Percentage of bills rejected by value with crisis years in red



³⁹ Market commentary in the *Economist* indicates that the maturity of a bill was a key determinant of the discount rate. Whether the bill was drawn on a banker (a bankers' bill) or drawn on a merchant (a trade bill) also seems to have made a difference. In general, a trade bill with a longer maturity was discounted at a higher rate.

Figure 4.5 Bank Rate versus market rates in 1857

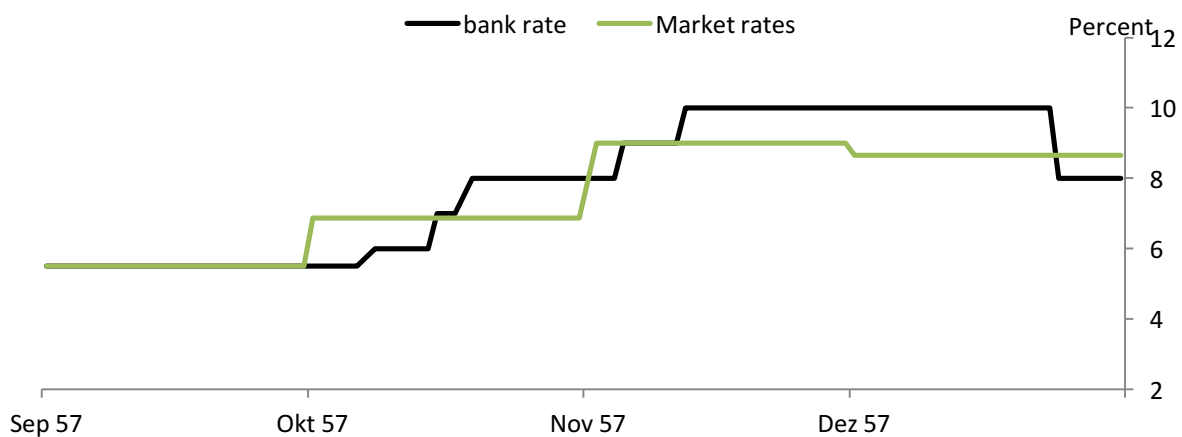
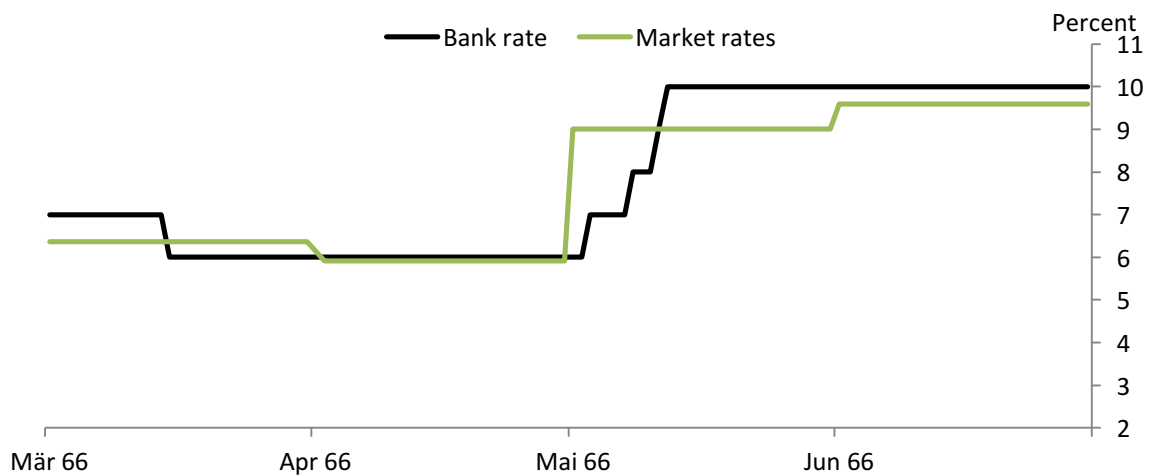


Figure 4.6 Bank Rate versus market rates in 1866



II Transactional rates

We now turn from the quantity of lending during crises to its price. As noted earlier, the 1844 Act marked a significant change in the way the Bank of England set its interest rate. Before 1844, the Bank set a uniform rate (Bank Rate) on all bills it discounted. However, after 1844, Bank Rate was usually the *minimum* rate charged for discounting the very best bills of short maturity. For bills of lower quality or longer maturity, the Bank would charge a premium on top of headline Bank Rate.

Figures 4.7 to 4.9 show the spectrum of rates charged by the Bank during 1847, 1857 and 1866 based on data from the daily discount ledgers. So far as we are aware, ours is the first paper to show this spectrum of transactional rates for 1847 and 1857. Crisis weeks are shaded. In 1847 we find some instances where the Bank discounted at a rate below the

apparent 'minimum' Bank Rate. These are plotted as red diamonds. This happened notably in October, at the peak of the crisis, when some bills were discounted at 5 or 5.5 percent at a time when headline Bank Rate stood at 6 percent. After 1847, transactions where the Bank charges a counterparty a rate below Bank Rate become rarer, and cease to occur in the data by 1866. This happens alongside Bank Rate becoming a penalty rate above the rate prevailing in the market once the crisis occurs, in accordance with the 'Bagehot rule.'

Figure 4.7: Spread of discount rates in 1847

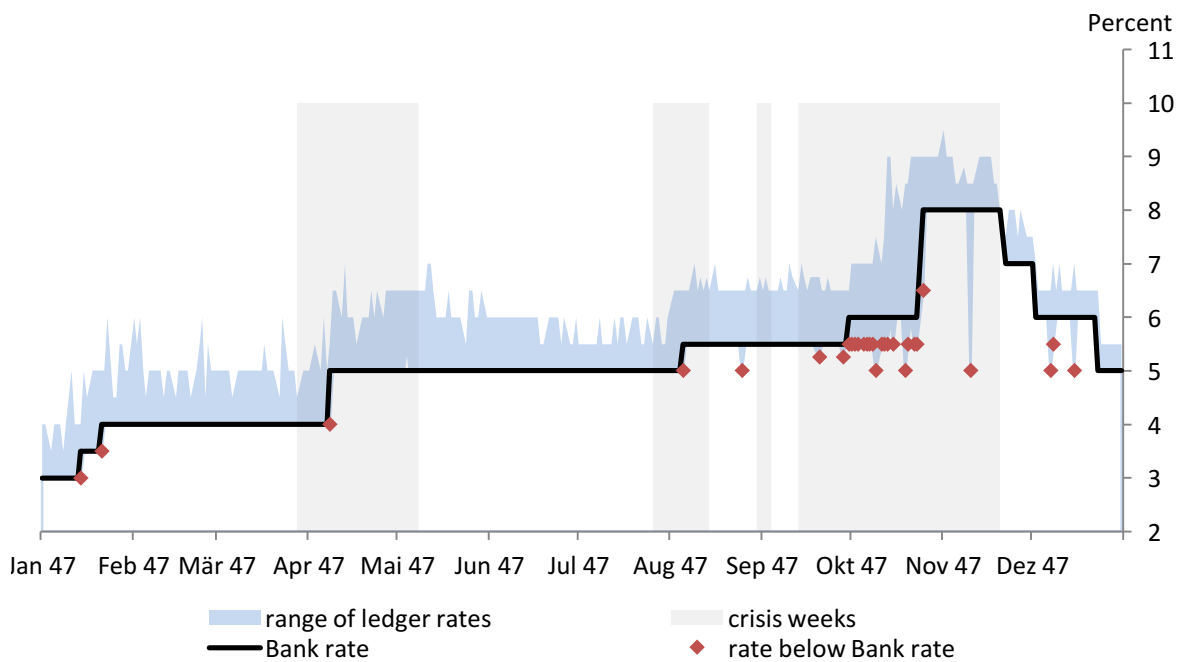


Figure 4.8 : Spread of discount rates in 1857

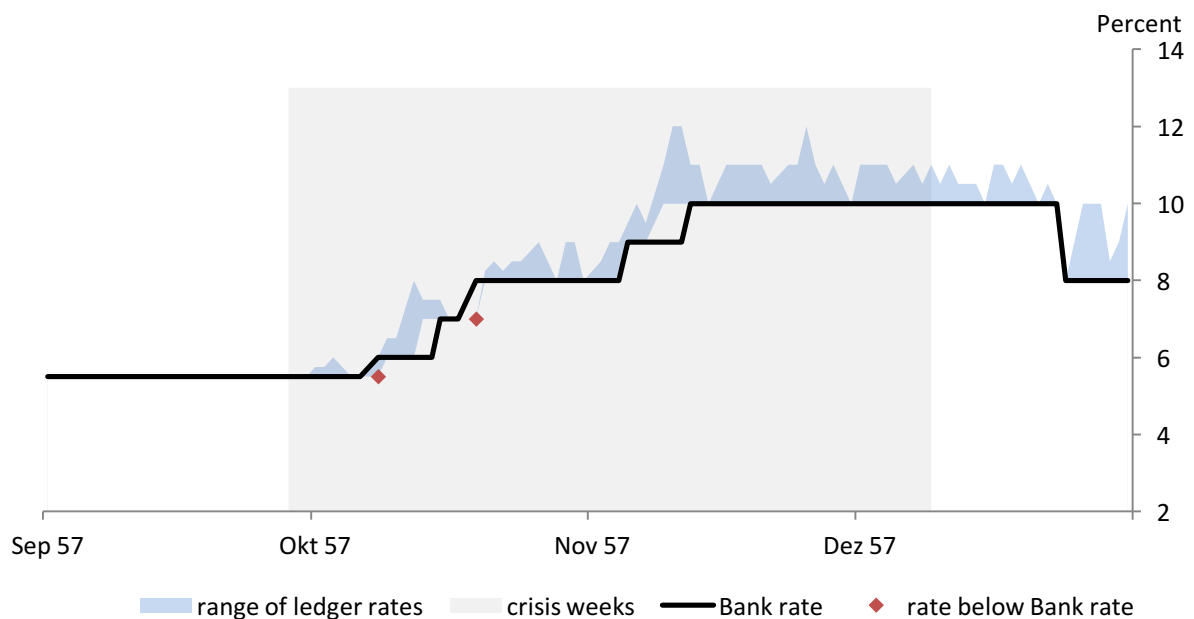
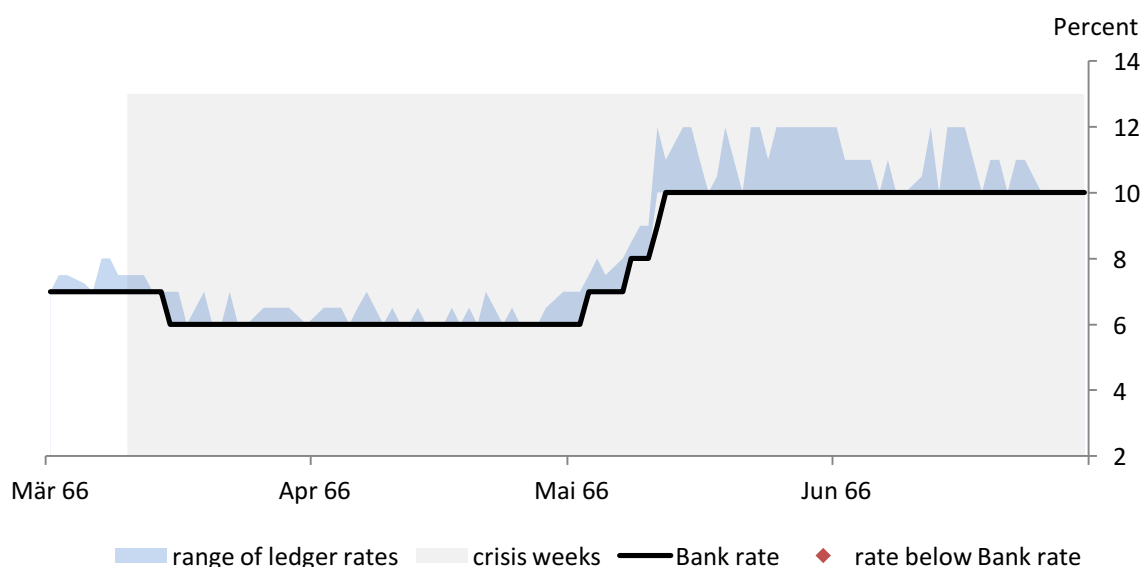


Figure 4.9 : Spread of discount rates in 1866



The 1847 crisis stands out from the 1857 and 1866 crises in another respect too. **Figures 4.10 to 4.12** compare Bank Rate to the average discount rate calculated from the daily discount ledgers weighted by the value of discounts. In 1847, the weighted average discount rate series is volatile and does not neatly coincide with advertised Bank Rate. Moreover, during crisis weeks in May, August and October that year, the effective weighted average discount rate is around 1 to 2 percent above Bank Rate. By contrast, in 1857 and 1866, the weighted average discount rate series is smoother. It more neatly conforms to Bank Rate, with no discernible differences between crisis and non-crisis weeks.

Figure 4.10: Daily average rate vs. Bank rate and market rate for 1847

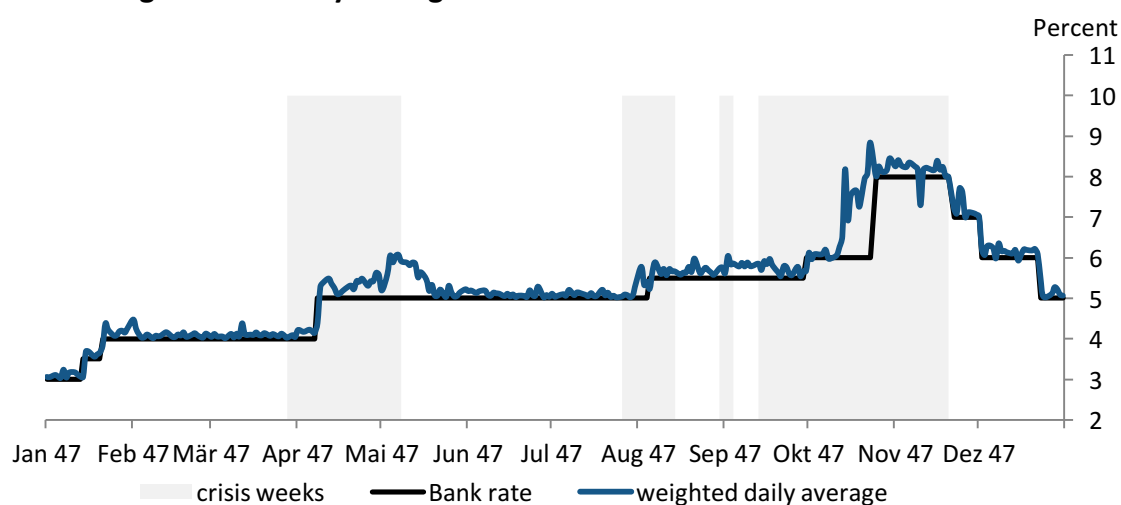


Figure 4.11: Daily average rate vs. Bank rate and market rate in 1857

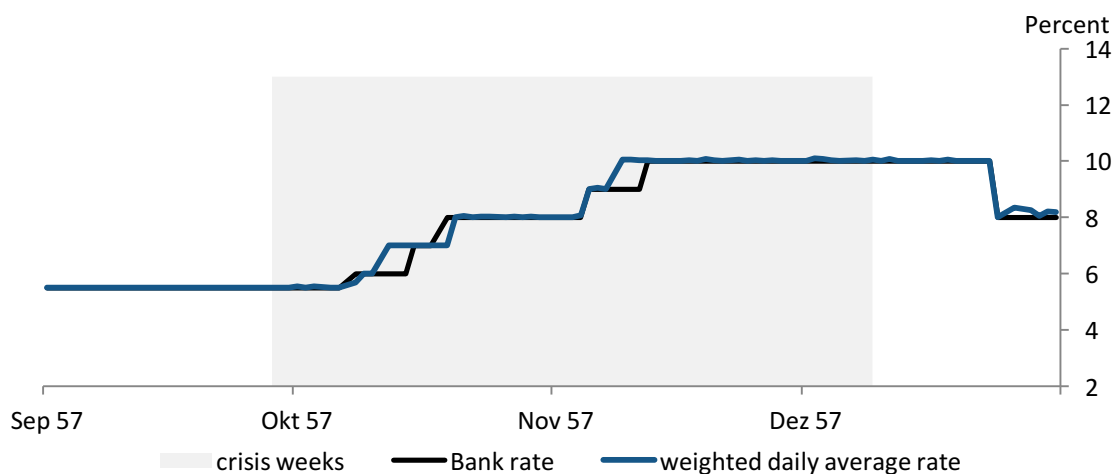
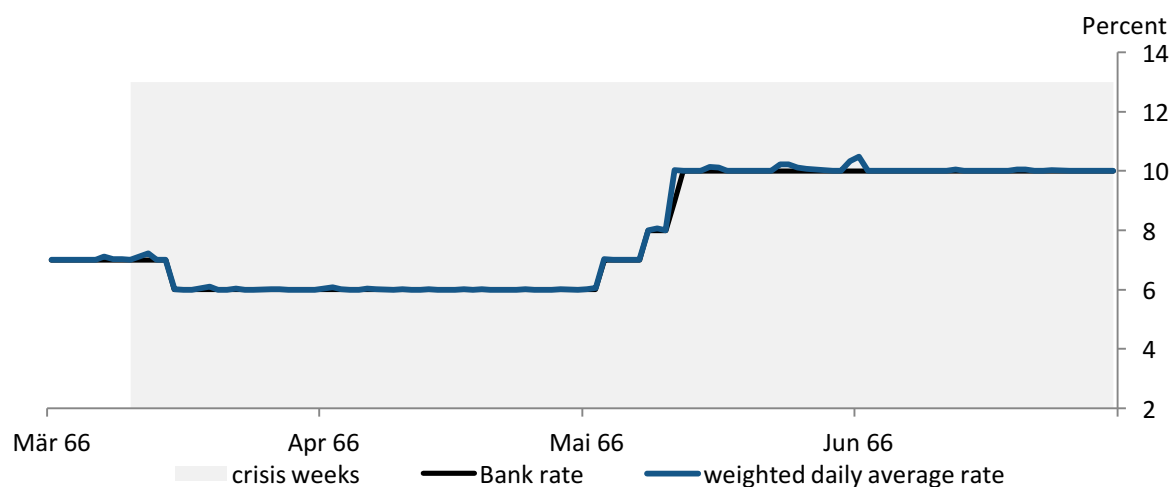


Figure 4.12 : Daily average rate vs Bank rate and market rate in 1866



Section 5: Good security

I Eligibility

The bills of exchange purchased by the Bank of England were unsecured debts. Although these bills might document the exchange of economic goods, they did not give the Bank recourse to them.⁴⁰ Therefore, the quality of a bill of exchange was based on the Bank's judgment of the creditworthiness of the acceptor and subsequent endorsers of the bill. According to most historians, in order for a bill of exchange to be eligible for discount at the Bank's Discount Office, it had to be endorsed by two 'good' British counterparties, one of which had to be the acceptor (Ogden 1988: 185; Scammel 1968: 87). Getting an endorsement on a bill of exchange from a 'good name' in the nineteenth century was somewhat akin to receiving a triple A rating from a credit rating agency today. In fact, it meant even more, in so far as those who endorsed bills of exchange were liable for payment of the debt if the acceptor defaulted. However, who exactly qualified as a 'good name' is unclear as this was not codified in any systematic way, at least as far as we know. Most historians have assumed that 'good names' meant prominent merchant banks in London (annex E). Their knowledge of particular trades meant that their judgment about the financial health and business prospects of other firms could be trusted by the Bank. However, as we discuss in detail below, we challenge that 'good names' and therefore 'good security' was defined so narrowly.

The daily discount ledgers do not provide any detail about the names underwriting the bills of exchange purchased by the Bank. However, this detail can be found in a different set of customer "with and upon ledgers." These ledgers contain two kinds of information on the Bank's counterparties. First, the ledgers detail each of the individual bills that a particular counterparty discounted "with" the Bank. Second, the ledgers detail all bills discounted by the Bank which were drawn "upon" that particular counterparty. These were bills where the counterparty was the acceptor of the bill. Annex E describes the customer "with and upon" ledgers in more detail. **Figure 5.1** is an example of an entry from these ledgers. It relates to Bieber and Co. The entry shows all the bills which Bieber and Co either discounted with the Bank, or which were purchased by the Bank from another counterparty that named Bieber and Co. as the acceptor. While the firm was first added to the customer ledgers on 5 January 1865, this page shows bills of exchange discounted with and upon Bieber & Co. in 1866. In

⁴⁰ Bills of exchange could be collateralised with real property if they circulated alongside additional legal documentation. This often occurred in the market for international bills of exchange. For example, an exporter might draw a bill on a foreign importer. When the exporter shipped their goods, they would receive a bill of lading from the shipping company. The exporter might then discount the bill drawn on the importer with a banker, handing over the bill of exchange, the bill of lading and other documents associated with the export of the goods. The bill of lading and associated documents gave the banker title to the goods shipped (Leaf 1926; Banks 1999).

particular, the bills in the boxed areas are those purchased by the Bank from Bieber & Co on 11 May 1866, the day after Overend & Gurney failed. The customer “with and upon” ledgers can therefore be linked to the daily discount ledgers. In the customer ledger, we see that Bieber & Co brought in 20 bills collectively valued at £13,921 on 11 May. This corresponds to the circled entry in the daily discount ledger in **Figure 5.2**, showing Bieber and Co brought in a packet of bills, which were discounted at a rate of 10%.

Figure 5.1: An excerpt from Bieber & Co's ledger— transactions on 11 May 1866 boxed

[illegible]

Figure 5.2: Bieber & Co's corresponding daily discount ledger transaction on 11 May

Friday, 11th May 1891

Amount of Bills Discounted going off.....£		Amount Discounted.....£	
34,000		1,697.678	
Amount of Advances going off.....£		Amount Advanced.....£	
Nil		1,697.500	

N ^o of Bills Brought in for Discount.	Rate % Cent.	For whom Discounted, or To whom Advanced.	Amount of Bills Brought in for Discount.	N ^o of Bills rejected	Amount rejected.	Amount advanced.	Remarks.
2	10	Dr J. S. Warren	1111 12 8				
23	10	Geo. Hamb. Co	10400 9 9				
20	12	Stirling & Co	2199 9 6				
6	10	W. L. & Co	1900 5 9				
34	10	J. L. & Co	33400 13 5				
6	10	J. & S. R. & Co	2001 4 5				
2	11	W. L. & Co	3000 1 1				
5	10	Bank of India	400 9 5				
10	10	Bank of India	9000 16 2				
15	10	J. L. & Co	2600 1 1				
6	10	J. & S. R. & Co	4700 17 5				
10	10	W. L. & Co	400 1 1				
15	10	Spalding & Co	23700 6 8				
5	10	W. L. & Co	1000 1 1				
5	12	Bank of India	1200 1 1				
11	10	W. L. & Co	1700 2 2				
6	10	Bank of India	4700 14 1	1	400 7 1		
6	10	J. & S. R. & Co	4000 1 1				
1	11	W. L. & Co	60 10 1				
6	10	Bank of India	29600 17 5				
5	10	Thomas Walker	1500 15 4				
6	10	Bank of India	9000 1 1				
5	12	George Smith	4700 10 5				
1	11	James Smith	2500 1 1				
1	11	James Smith	2000 1 1				
11	10	Smith & Co	32200 10 6				
6	10	Tagliani & Co	2700 1 1				
17	10	Bank of India	15700 17 5				
5	10	J. & S. R. & Co	5000 1 1				
90	10	Bank of India	8700 1 1	2	4000 1 1		Withdrawn
20	10	J. & S. R. & Co	1000 4 9				
6	10	J. & S. R. & Co	500 1 1				
25	10	Bank of India	32200 17 5				
25	10	Bank of India	24 12 5				
65	10	Bank of India	90700 2 10				
4	10	Bank of India	800 1 1				
9	10	Bank of India	2220 2 2				
10	10	Bank of India	27000 10 1				
5	10	J. & S. R. & Co	4000 1 1				
5	10	Bank of India	1100 6 6				
10	10	J. & S. R. & Co	5000 1 1				
24	10	Bank of India	10000 17 5				
10	10	Bank of India	11000 17 5				
10	10	Bank of India	10000 17 5				
5	10	Bank of India	1100 1 1	5	1000 1 1		Withdrawn
7	10	J. & S. R. & Co	23600 1 1				
11	10	Bank of India	3420 5 16				
17	10	Bank of India	8000 11 2				
12	10	Bank of India	1600 1 1				
16	10	Bank of India	5420 1 6				
22	10	Bank of India	10000 17 5				
1100		Carried over	112200 7 0	5	4000 1 1		

Bank of England Archive (C28/26)

The value add from looking at the customer “with and upon” ledgers is that they allow us to ‘unpack the packet’ of bills to understand, in granular detail, each bill of exchange contained within. In this one packet alone, we see that the drawers of these bills are located in a multitude of places including Singapore, Hamburg, New York, Madras and Rio. This speaks to the fact that the foreign bill of exchange was the debt *de jure* in an increasingly globalised London money market. Equally diverse was the number of acceptors of the bills. This diversity suggests that ‘good acceptors,’ and therefore ‘good names’ and ‘good security,’ for the Bank was not narrowly limited to meaning a handful of City firms but encompassed a wider set of eligible counterparties.

Figure 5.3 on the following page gives a sense of the occupational diversity of the acceptors acceptable to the Bank. This information comes from another archival source, the Discount Office's 'list of acceptors.'⁴¹ The figure lists firms which first appear in the Bank's list of approved acceptors during the crisis years of 1847, 1857 and 1866. In order for a debt to be discounted, an acceptor had to be 'introduced' (the discount of their debt supported) by a Bank director or member of Court. In the original archival materials, the names of the sponsoring senior member of the Bank appear next to firm's name, occupation and address.

It is worth stressing that the list of acceptors in Figure 5.3 is only a subset of all the acceptors in 1847, 1857 and 1866 whose debt was discounted. The list is limited only to new acceptors 'introduced' to the Bank for the first time that year. Acceptors whose debt had been discounted by the Bank previously, and who may have had more of their debt bought by the Bank during crisis years, are not listed. Even so, this select list reveals that firms in a wide variety of occupations beyond merchant banks could be considered good creditworthy names. The acceptors list includes cabinet makers, flax spinners, publishers, and umbrella manufacturers. This evidence corroborates a statement made by John Clapham, the Bank's first official historian. Reflecting on the Bank's lending activity in the first few years of the nineteenth century, he observed that "the most remarkable features about the discounts at this time are the great number of the Bank's discounting clients and the great range of London business represented" including bakers, china dealers, druggists, ship builders and toy merchants (Clapham 1944: 205). This observation holds true when we look at the Bank's discount activities at mid-century.

The customer "with and upon" ledgers are vast. Because the focus of our research was on the Bank's daily discount ledgers, we have only scratched the surface of the wealth of information contained within them. In this paper it was therefore not possible to quantify the Bank's relative exposure to merchant banks versus other types of firms. However, in the spirit of Flandreau and Ugolini (2011), we did scan the "with and upon" ledgers and identified customers who appeared to be the largest acceptors during the 1847, 1857 and 1866 crises. These are listed in **Figure 5.4**. Looking across time, there appears to have been a shift in the nature of the largest acceptors. In 1847, there is a roughly even split between merchant banks and other types of financial firms. However, by 1866, we see commercial banks becoming more important acceptors of bills. These are bolded. This is a somewhat surprising finding given the previous literature, though it adds to the evidence presented in in this section that 'good security' was not a synonym for merchant banks.

⁴¹ Bank of England Archive, Discount Office, List of Acceptors, 1809-72, BoE C29/7-9.

Figure 5.3: Select list of acceptors and their occupations in crisis years

1847		1857		1866	
Name	Occupation	Name	Occupation	Name	Occupation
Abel Bros	Greek Merchants	Bell & Sons Alex	Spanish Merchants	Abderden	Iron Company
Arbuthnot Latham & Co	Merchants	Bridgette & Co J	Silk men	Anderson & Sons	Russia Merchants
Begbie, Young & Begbies	Corn Factors	Boyd John	Iron Merchant	Ainsworth Thos	Flax Spinner
Bell & Hughes	Wine Merchant	Coventry Shephard Co	Corn Factors	Benecke Douchay & Co	Concession Merchants
Betts & Co J.J.	Rectifying Distillers and Metallic Capsule Manufacturers	Engelhard J	Merchant	Bell & Grant	Merchants
Brooks Robert	Merchant & Ship-owner	Fowler H & R	Slave Merchant	Blyth Green & Co	Merchants
Bolitho J & W	Merchants & Tin Smelters	Hanson Smiths & Stephens	Warehousemen	Burt Bolton & Haywood	Timber contractors
Cheswright Sheffield Co	Timber Merchants	Henderson & Constable	Wholesale Sugar Dealers	Catelli Brothers	Merchants
Child Coles & Co	Coal Merchants	Joachim Henry	Wool Broker	Caldecott Sons & Co	Warehousemen
Cockburn & Co	Merchants	Laird W&H	Coal Merchants	Corry Edwards	Copper Merchant
Comber Richard	Silk Broker & Agent	Locke Lancaster & Co	Lead Merchants	Crosier & Pettigrew	Warehousemen
Condell Geo. Smith	W.J. Merchants	Morgan Brothers	Wine Merchants	Dickson's Ferguson & Co	Manufacturers
Drakeford & Co D	Silk Brokers	Neville & Co	Who. Hosiers	Duncan & Co	Umbrella Manufacturers
Forster & Smith	Merchants	Nicholls & Sons	Warehousemen	Evans & Co Richard	Trimming Manufacturers
Henkel Du Buisson Co	Merchants	Oriental Bank		Elder A.L.	Merchant
Le Gros Thompson & Bird	Grape Manufacturers	Palmer & Co	Patent Candle Manufacturer	Enstrom, Browning & Co	Merchants
Lupton Hooton & Co	Manchester Warehousemen	Richard Hy.	America Merchant	Grant Son & Co Alex	Gravel Manufacturers
Poland & Son	Fur & Skin Merchants	Pirie & Co	Ship & Insurance Broker	Gibbs & Sons Antony	Merchants
Walkers Parker & co	E. J. Merchants	Powell & Sons	Roan Makers and Manufacturers	Goddard J & J	Russia Brokers
		Ralli Paulaleon	Merchant	Hakim & Co A	Merchants
		Gouslantine		Keeling & Sons	Wine and Spirit Brokers
		Reid & Co	Wine Merchants	Kemp & Sons	Silk Manufacturers
		Sadler Sand	Linen Factor	Kipling Pain & Co	Silk Manufacturers
		Spartali & Co	Merchants	Keill & Co G.M.	Cape Merchants
		Smee & Sons	Cabinet Makers	Koebel Jameson & Co	Merchants
		Swonnell & Son	Maltsters	Langton & Birkwells	Oil Merchants
		Stuart & Sharp	Warehousemen	Lefevre & Co	Merchants
		Scruton Son & Co	Ship & Insurance Broker	Mactaggart Tidman & Co	E. J. Merchants
		Vandes Willigen Simon	Merchant & Comm' Agent	Melas Brothers	Merchants
		White Son & Co	Warehousemen	Mews John	Timber Merchants
				Milne & Co	Merchants
				Mills & Halls	Provision Merchants
				Morata & Co	Merchants
				Noakes & Son	Hop Factors
				Pearce & Co	Blackwell Hall Factors
				Pye Field & Co	Wine Merchants
				Routledge & Sons	Publishers
				Robert Hoar & Co	Mahogany Brokers
				Ross Gustier	Commission Merchant
				Ross & Ash	Merchants
				Spalding & Hodge	Who. Stationers
				Satow H & J. T.	Merchants
				Saunders Lindsay & Co	Australia Merchants
				Snellgrove & Leech	Merchants
				Speyer Brothers	Merchants
				Sescan & Co	Merchants
				Simmonds Hunt & Co	Merchants
				Silber & Fleming	Warehousemen
				Spotten & Co	Linen Manufacturers
				Tagart Bryson & Slee	Timber Merchants
				Whaley F. R.	Colonial Brokers
				William's Overbury & Co	Wool Brokers
				Wilson & Co	Importers and Manufacturers
				Worms G & A	Merchants
				Young Ehlers & Co	Merchants

Figure 5.4: Top Acceptors in the 1847, 57 and 66 crises

October 1847	November 1857	May 1866
Barings Brothers and Co	Baring Brothers and Co	London Joint Stock Bank
Fruhling and Goschen	Bieber and Co	Union Bank of London
Glyn and Co	C Hambro and Sons	The National Bank
Heath Furse and Co	Draper Pietroni and Co	Fruhling and Goschen
F Huth and Co	Finlay Hodgson and Co	Agra & Masterman's Bank
Jones Loyd and Co	F Huth and Co	The City Bank
G Loder	Fruhling and Goschen	North Western Bank
Masterman and Co	H Sillem and Son	London & County Bank
NM Rothschilds	Hava and Co	Baring Brothers & Co
Smith Payne and Smiths	Hoare Buxton and Co	Royal Bank of Liverpool
Schroder and Co	J H Schroder	Drake Kleinwort & Cohen
	N M Rothschild	F Huth & Co
	Sieving and Son	Finlay Hodgson & Co
		City of Glasgow Bank

II Performance

Perhaps the best evidence that the Bank purchased good securities was their *ex post* performance. **Figure 5.5** shows bad debt on the Bank's books. Write-offs were minimal. In 1847, the number of non-performing (late payment) loans spiked close to 6 percent. However, in 1857 and 1866, in spite of the uptick, the overall level remained close to 1%.⁴² Relatedly, while the number of discounters whose accounts were suspended due to unpaid bills increased during each crisis, they were a fraction of the overall number of discounters.

Figure 5.5: Bad debt on the Bank's books

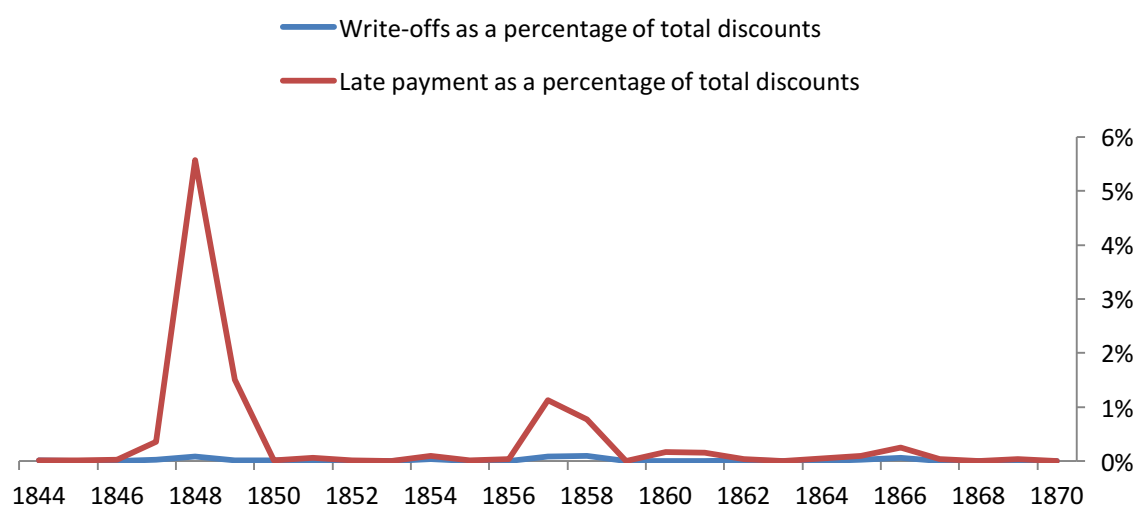
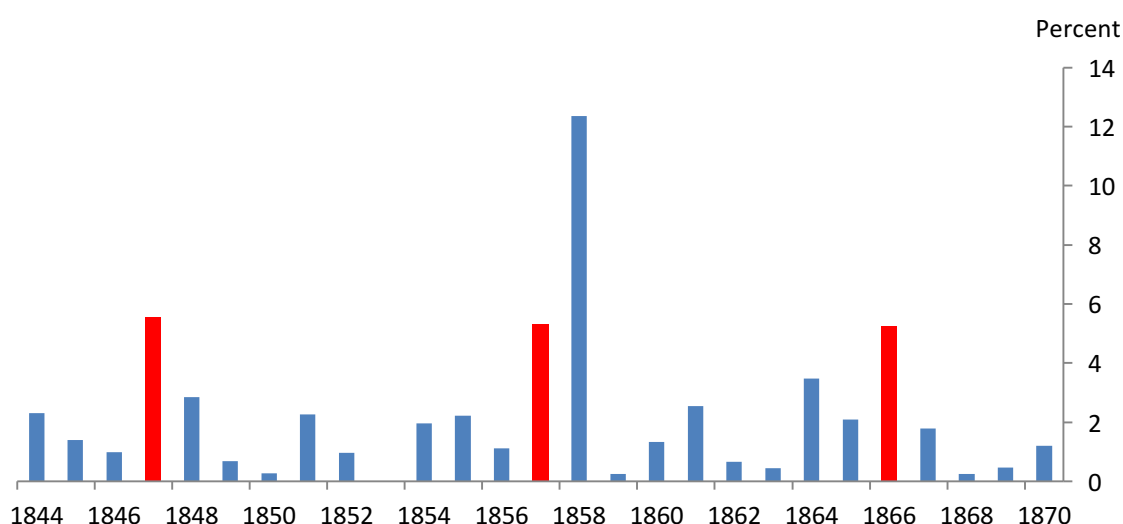
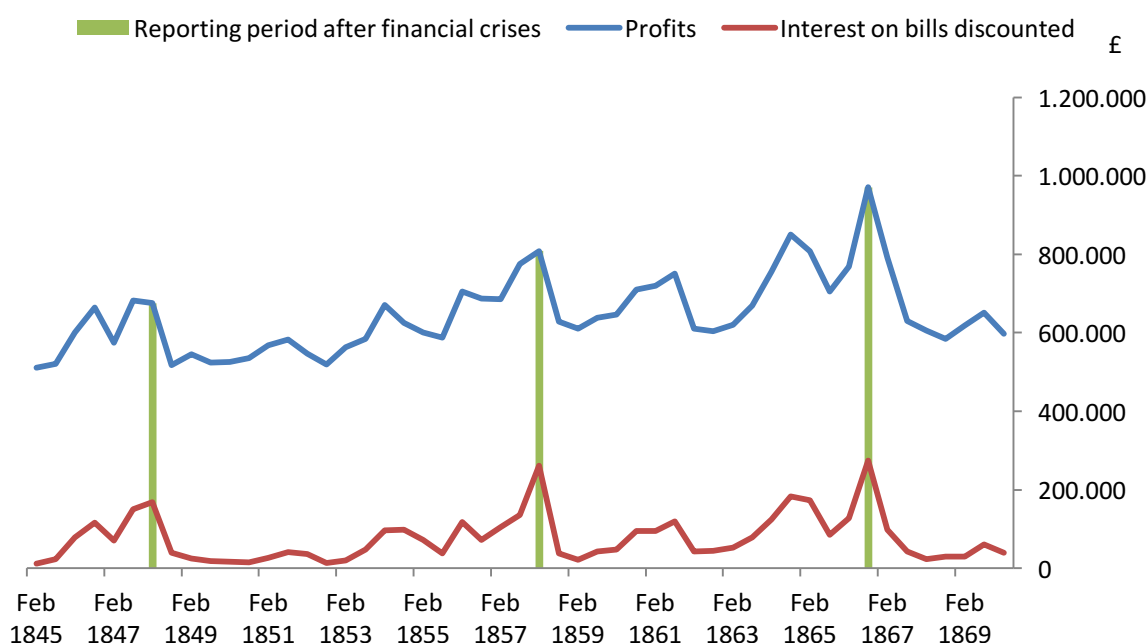


Figure 5.6: Discounters with suspended accounts, crisis years in red



⁴² By comparison, during the nadir of the recent financial crisis, the average NPL rate across UK banks was 3.5 percent (Bholat et al. 2016).

Figure 5.7 Profits and interest income from bills discounted, 1845-1870



In fact, it appears that the Bank reaped rewards from the greater risks it incurred by acting as a lender of last resort during financial crises. **Figure 5.7** reveals, for the first time publicly, the Bank's profits and interest income during this period. Interest income from bills discounted increased in the reporting periods immediately following each of the three crises, reflecting a greater quantity of bills discounted at a higher rate of interest.⁴³ Increases in interest income in turn increased profits. The Bank recorded profits semi-annually, in February and August each year, ahead of paying dividends to shareholders in April and September, respectively. During this period, the Bank paid all of its profits to shareholders each period; the dividend pay-out ratio was 100 percent, irrespective of the state of the economy.⁴⁴ In February 1848, following the 1847 crisis, and in February 1858, following the 1857 crisis, profits and therefore dividends increased nearly 18% year-on-year. In August 1866, after Overend Gurney's crisis in May that year, profits and dividends went up nearly 38% year-on-year. Letters exempting the Bank from note issuance restrictions imposed by the 1844 Bank Charter Act stipulated that the Government did not want the Bank to profit from high rates of interest charged on loans during crises. Indeed the letters set out the expectation that the Bank should recompense the Treasury if the higher interest income exceeded losses on unpaid bills. However, Anson and Capie (n.d.) find no evidence that the Bank ever transferred these profits across to the Treasury. Instead, they seem to have been transferred to Bank shareholders. Like gold today, Bank of England stock was a counter cyclical asset, though it remains an open question as to whether investors back then perceived this to be the case.

⁴³ The reporting periods after the crises are February 1848, February 1858 and August 1866.

⁴⁴ Recall that at this stage the Bank was privately owned. The Bank was nationalised in 1946.

Section 6: Conclusion

I Summary of empirical findings

Our paper has provided new empirical evidence on the origins and mechanics of the Bank of England's role as a lender of last resort historically. We set out to establish whether the Bank acted in the way Bagehot prescribed a central bank should act i.e. (i) to lend cash freely (ii) at a high or penalty rate (iii) in exchange for 'good' security, during the mid-nineteenth century crises leading up to Bagehot's publication of *Lombard Street*. We find that the Bank's behaviour evolved towards the Bagehot rule over this period.

On the first criterion, we find the Bank increased its propensity to lend freely across the crises of 1847, 1857 and 1866. Inspection of the Bank's weekly balance sheet reveals that discounts and advances increased markedly during crises. In terms of the pricing of these loans, specifically whether the Bank charged high or penal rates, the evidence suggests the Bank's attitude evolved towards Bagehot's prescription. During each of the 1847, 1857 and 1866 crises, the Bank increased its rate relative to that which prevailed before. However, while in 1857 and 1866 Bank rate was typically higher than contemporaneous market rates, in 1847 it was lower. Analysis of the Bank's daily ledger data from the 1847 crisis also shows that the Bank lent at rates below its publicly advertised rate in some of its dealings with counterparties. Coupled with the higher loan rejection rates observed in 1847, this suggests the Bank was still rationing credit at this point. So the period between 1847 and 1866 does appear to mark an evolution in the Bank's behaviour during crises.

The final criterion related to 'good security' is the most difficult for us to assess. None of the discounted bills of exchange survive so we are forced to rely on the information the Bank kept in its customer ledgers. And the securities on which the Bank made advances and the haircuts that were applied to that collateral are also unknown. However, we have some indirect evidence that their quality was high. While bad debts did spike following crises, particularly in 1847, their overall level remained reasonable. With the exception of the 1857 crisis, the average maturity of the bills of exchange purchased remained largely unchanged, and well within the Bank's risk appetite of up to 95 days maturity. And financial crises were generally profitable for the Bank suggesting its 'collateral' management was good.

While on balance the empirical evidence we have amassed suggests the Bank's behaviour during these crises evolved towards the actions Bagehot would have recommended, this

conclusion comes with a significant caveat. For Bagehot, it was crucial that the Bank preannounce that it would behave in the way he prescribed before crises happened. By doing so, Bagehot hoped that crises could be prevented, since the conversion of cash equivalents into cash would be preordained, nullifying the rationale for depositors to run in the first place (Humphry 1989). However, like scholars before, we find no evidence that the Bank clearly communicated how it would act during financial crises at this stage in its history. That said, through its repeated actions, the Bank may have done enough to signal to market participants such that they knew *ex ante* roughly how the Bank would respond even if not exactly how. In modern terms, the central bank reaction function was clear if not precisely defined. This might explain why the Bank was not required to increase its discounts to the same degree in later crises such as 1878, 1890 and 1907, although there are naturally other reasons for this that go beyond the scope of this paper.

II Current implications of our findings

In his recent book, former Bank of England Governor Mervyn King (2016: 202) has written that Bagehot's "maxim 'lend freely against good collateral at a penalty rate' is outdated." According to King, this is because banking assets are now more complex and various than in Bagehot's day, and because current disclosure requirements makes borrowing from the central bank at a penal rate prohibitive for banks because of the stigma attached. In lieu of Bagehot's conception of a lender of last resort, King instead proposes a 'pawnbroker for all seasons' willing to lend against 'poor' i.e. riskier, illiquid assets but where banks would preposition these with the central bank so that their quality could be evaluated outside the heat of a crisis and haircuts on those assets established well in advance. While departing from Bagehot, King's proposal in many respects aligns with recent central bank practice. During the financial crisis of 2007-09, central banks across the world lent against a suite of securities beyond those conventionally classified as central bank eligible and at rates lower than those that prevailed before the crisis or in the market (Bholat 2014). As Ian Plenderleith (2012: 14) observed in his review of the Bank of England's provision of emergency liquidity assistance during the recent financial crisis, "the nature of the Bank's lender of last resort function has been fundamentally transformed since 2008." And, it could be added, since the financial crises of 1847, 1857 and 1866. Yet in spite of many changes to banking systems and how lender of last resort operations work today, we think our paper offers insight on several academic and policy issues still current (Le Maux and Scialom 2013).

The first issue relates to the types of institutions who can access lender of last resort facilities. Before the 2007 financial crisis, direct access to Bank of England liquidity was limited to fewer than twenty banks, on the premise that these banks could on-provide liquidity to other

institutions in a crisis if necessary (Winters 2012: 83). However, during the crisis, the interbank market ceased to operate normally, underscoring that, although in theory, the private sector might be able to channel cash to illiquid but solvent institutions, in practice it might not do so in conditions of heightened uncertainty (Freixas et al. 1999). As a result, the institutions able to access regularly standing Bank of England liquidity facilities⁴⁵ is now much broader, and includes a range of non-bank counterparties such as broker-dealers and central counterparty clearing houses (Bank of England 2015; Hauser 2016). Indeed, in exceptional circumstances, subject to approval by the Chancellor of the Exchequer, the Bank can also provide emergency liquidity assistance to institutions outside its regulatory perimeter (Bank of England 2012).

The broadening of access to lender of last resort loans during and after the crisis has occurred across the globe. But it has not been without its critics. Some have argued that the extension of lender of last resort facilities to non-banks is both undesirable and unprecedented (Bordo 2014). Whether it is desirable or not is a normative issue open to debate. But with respect to precedent there can be no doubt (cf. Buiter and Sibert 2007). On the contrary, most of the Bank's lending in the period we have studied was not to banks but to discount houses, whose balance sheets most closely resembled asset managers and other so-called 'shadow' banks. As we have documented, the Bank purchased debt drawn on a range of counterparties, including merchants, manufacturers and other non-financial firms. Indeed it is worth recalling the general preference expressed by monetary theorists in the nineteenth century for the Bank to lend against bills of exchange documenting real economic transactions as opposed to claims secured on land or to pure cash flows (Mints 1945). In sum, Bank of England discounts and advances were neither limited to banks nor to the financial sector but encompassed a broader swathe of the economy.

A second contemporary issue our paper bears on is the credit quality of the counterparties dealing with the Bank. It has long been the conventional wisdom that a central bank should only lend to illiquid but not insolvent institutions. Indeed this is the Bank's current policy (Plenderleith 2012). However, as has often been noted, distinguishing illiquidity from insolvency in crisis conditions can be difficult because of asymmetric information. For example, a run on an institution might reflect underlying insolvency, or it might not. Furthermore, fluctuations in the fair value of financial assets during a financial crisis can temporarily exaggerate losses in a manner out of proportion with the medium to longer term

⁴⁵ The Bank provides three regularly standing liquidity insurance facilities, each of which allow members of the Sterling Monetary Framework to exchange less liquid collateral for more liquid assets. Of these, the Discount Window Facility provides access to bilateral liquidity support to firms experiencing an idiosyncratic shock. It allows participants to borrow highly liquid assets in return for less liquid collateral at scale and on variable terms (Bank of England 2015).

value of future cash flows from them (Haldane 2011). Illiquidity can quickly become insolvency, and vice-versa (Rochet and Vives 2004).

At this point it is useful to recall that Bagehot never specified counterparty solvency as a prerequisite for the Bank of England to grant loans (cf. Castiglionesi and Wagner 2012). Rather, as former Bank of England Monetary Policy Committee member Charles Goodhart (1999) once pointed out, Bagehot required only that the counterparty have ‘good security.’ The focus on the ‘security’ or collateral of the applicant as opposed to their creditworthiness probably had to do with the special nature of bills of exchange. While bills were underwritten by the firms applying to the Bank for their discount, they were not payable by that firm in the first instance. Instead these were debts owed by third-party acceptors. Moreover, the bills were guaranteed by other parties besides the applicant discounter, in most cases requiring that they were underwritten by ‘good names’—firms with specialist knowledge of the geography or product space in which the ultimate debtor operated. Given the safeguards in place back then, distinguishing between solvent and insolvent applicants may not have been the Bank’s central preoccupation, though it still may have been an important factor. Instead, perhaps like Mervyn King’s proposed pawnbroker, what mattered most was a counterparty’s ‘collateral’, not their net worth.

A third issue on which our paper offers fresh insight relates to the purpose of lender of last resort operations. There is a long and distinguished line of thinking dating back to Henry Thornton (1803) which argues for lender of last resort operations on essentially monetary (price stability) grounds. The argument is that if cash equivalents are converted to cash and hoarded, then prices will fall, leading to declines in output, employment and real economic activity, with contractions of bank lending prompted by these conditions further shrinking the money supply in an iterative fashion, leading to a downward deflationary spiral (Friedman and Schwartz 1963). According to this school of thought, this justifies the central bank intervening to prop up broad money to maintain price stability. Since the justification for lender of last resort facilities is essentially macro-economic, it follows that there is little enthusiasm among thinkers in this school for providing bilateral assistance to a firm facing an idiosyncratic liquidity shock. On the contrary, it is argued that to do so would induce moral hazard. Banks will behave less prudently e.g. holding less cash and readily realisable assets if they know they can tap liquidity from the central bank on demand.⁴⁶ As a result, so the argument goes, bilateral liquidity support would induce the very risk i.e. bank illiquidity that

⁴⁶ Instead, it is argued that firms should self-insure against firm-specific liquidity shocks by holding cash and other readily realisable assets, or, failing those, borrowing from other banks.

it is meant to mitigate (Selgin 1989).⁴⁷ Instead, liquidity should be provided to the ‘market’ through channels like anonymous auctions.

However sound many aspects of this line of thinking are, the actions we observe the Bank taking in the mid-nineteenth century lead us to conclude that the finer points of these arguments were still unclear to historical contemporaries. When push came to shove in a crisis, price stability ranked second to preserving financial stability. This is clear from the fact that during mid-nineteenth century crises, the 1844 Bank Charter Act, which anchored the Bank’s note issue to its gold reserves and was believed by contemporaries to be the basis for ensuring monetary stability, was repeatedly suspended.

Moreover, the Bank appears to have been more willing to provide liquidity support to particular firms than later central bank theorists would countenance. This can be deduced from the skewed distribution in discount loans. The Bank was not lending anonymously to the ‘market’ (cf. Capie 2007; Wood 2007). On the contrary, throughout the nineteenth century, it was developing an increasingly elaborate set of ledgers for recording and monitoring its loans to various counterparties, including several large single-name exposures. Coupled with the knowledge and experience of seasoned staff such as the Principal of the Discount Office, Mr. Elsey, and well-connected directors, the Bank would have had some information to draw conclusions on who was ‘good security.’ Still, this is true only up to a point. For example, there is no list we have been able to find summarising to which acceptors the Bank was most exposed. Nor do we have evidence that these exposures were monitored to keep credit exposure to particular geographies or industries within certain limits. We have also found no evidence that the Bank used the ledger information to net off obligations, which could have reduced their cumulative size and the risk of default by the Bank’s counterparties. In the round, this raises doubts about how much monitoring of its credit exposures the Bank actually did.

Finally, at a time when our current phase of globalization is subject to increasing scrutiny (Carney 2016), it is worth emphasising that financial globalization is hardly new. Casual inspection of the Bank’s customer ledgers confirms that the Bank discounted debts originating from all corners of the globe, from Birmingham to Bombay, Canton to Cape Town.

⁴⁷ There is an even more radical line of thinking opposed to lender of last resort lending by central banks, full stop. From this perspective, lender of last resort facilities are a sort of subsidy that benefit banks and their claimholders; central bank support diminishes the likelihood of default, resulting in lower funding costs and higher profits for banks than would otherwise be the case (Ricks 2016). And like all subsidies the existence of lender of last resort facilities is purported to fuel the over-production of the good subsidised (in this case, banking assets), making the banking system bigger and more risky.

The global diversification of the Bank's discounts may have contributed to the low levels of bad debt we observe in the ledger data, though drawing a definitive conclusion would require testing against other candidate explanations. So, viewed from a longer historical standpoint, the Bank's decisions during the most recent crisis to lend against US agency debt, or to lend in dollars, for example, look less like departures from central banking norms than the renewal of an older tradition characterised by the Bank acting not only as a lender of last resort in the UK but as a stabilising force in the wider global financial system.

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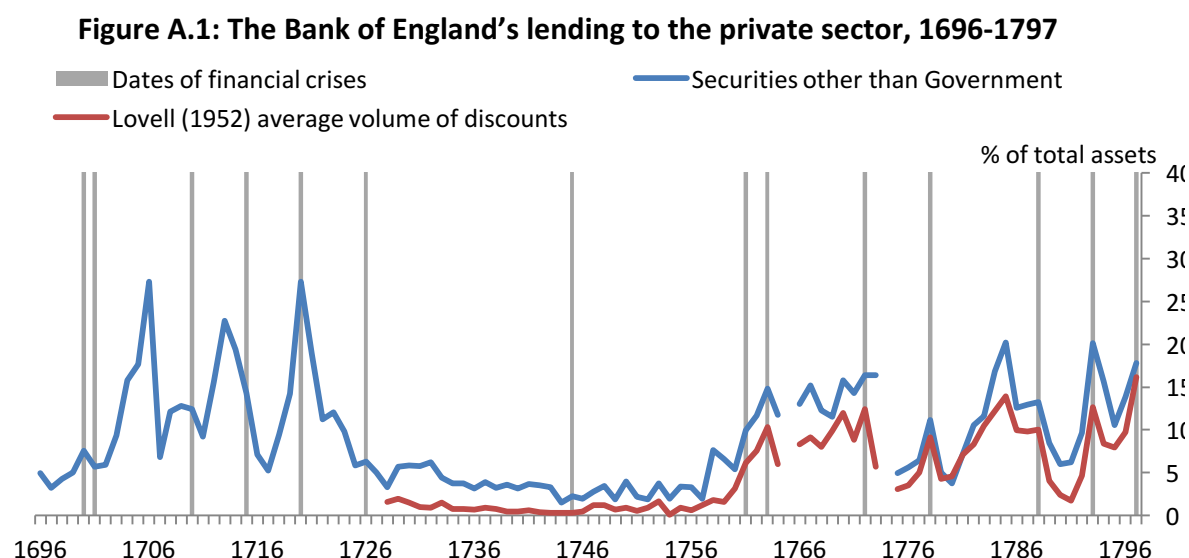
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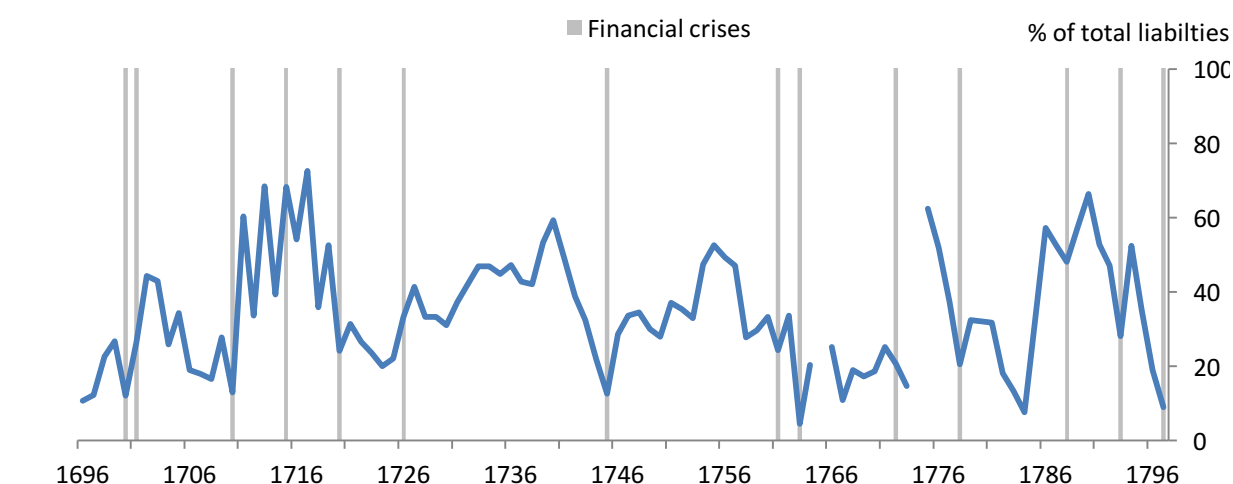
Annex A: The origins of the Bank as a lender of last resort

It is hard to say exactly when the Bank of England started to perform its lender of last resort role. Originally, the Bank was setup in 1694 to manage the government's debt. Lending to the private sector was not its primary purpose. Even so, Lovell (1952) argued that there is evidence that the Bank of England acted as a lender of last resort during some eighteenth century crises (see also Kosmetatos 2014). While there is little high frequency data from this period to validate Lovell's claim, annual data on the Bank's holding of private securities and advances, coupled with Lovell's own calculations based on the average revenue from discounts and advances, drawing on Clapham (1944), does suggest that the Bank increased its lending during some financial crises prior to the French wars (1793 to 1815). **Figure A.1** charts the empirical evidence.



However, the Bank's ability to fully act as a lender of last resort at this stage in its history was constrained because trust in Bank of England notes was still developing. Bank notes circulated alongside other competing currencies including coin, bills of exchange, and notes issued by other banks. Consequently, the conversion of Bank notes into gold happened more frequently than in later periods. This constrained the amount of new notes the Bank could possibly issue to support financial firms in distress because of the commitment to redeem all notes in bullion. **Figure A.2** shows that during several late eighteenth century crises, the Bank's bullion reserve fell to dangerously low levels compared to its liabilities.

Figure A.2: The Bank's bullion reserve, 1696-1797



Note: No balance sheet data are available in 1765 and 1774.

A key turning point occurred in 1797. Following a drain of bullion from the Bank driven by fears of an impending French invasion, the government ordered the Bank to suspend the convertibility of its notes into gold.⁴⁸ Thereafter, the link between Bank notes and gold was broken. Although it was re-established in 1821, a structural break seemed to have occurred from 1797, with the Bank responding to financial crises by lending more freely thereafter.⁴⁹

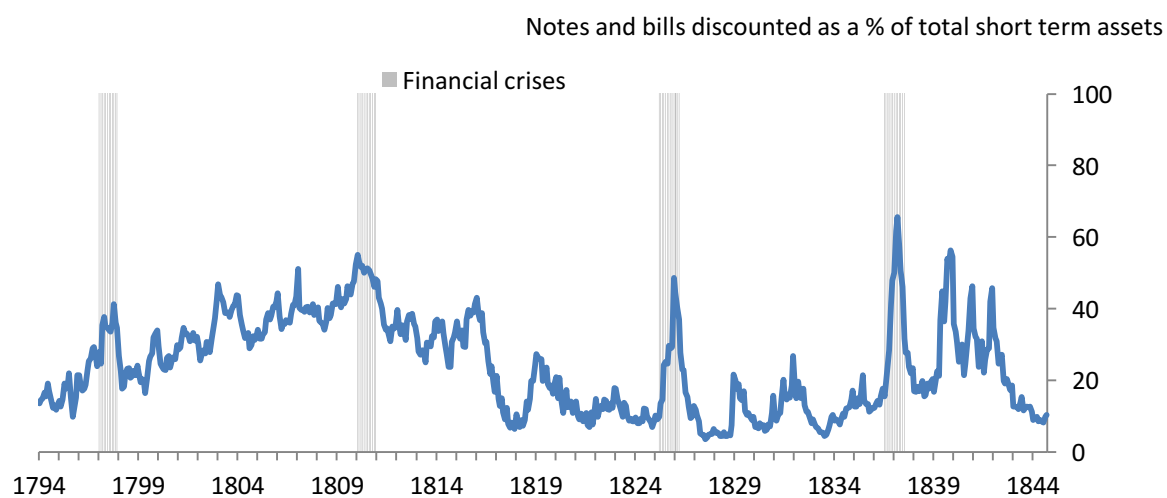
Figure A.3, based on monthly data, shows that the Bank increased its discounting of bills in each of the crises of 1797, 1810, 1825 and 1837.⁵⁰

⁴⁸ The rationale for the suspension was debated at that time and has been debated since by scholars (Bordo and White 1991; Chadha and Newby 2013; O'Brien and Palma 2016).

⁴⁹ The note issue of the Bank increased in the immediate aftermath of the restriction. Lending to the government was entirely short-term and modest compared to the overall increase in government debt. Although there was also an increase in lending to the private sector, much of this was reigned in after 1810, in response to Bullionist critics who argued for a return to the gold standard. At one level, the restriction period (1797-1821) could be viewed as a successful fiat money experiment. The price level and interest rates remained relatively stable, fiat money remained in circulation and the gold standard was resumed in 1821 at the pre-war parity. The government also ran primary surpluses that helped reduce the government debt burden in the post-war period.

⁵⁰ The most serious of these crises occurred in 1825 (Turner 2014). A quote from Jeremiah Harman, a Bank Director, cited in Bagehot's *Lombard Street*, is often adduced to show how freely the Bank was prepared to lend: "We lent it [the public] by every possible means and in modes we had never adopted before; we took in stock on security, we purchased Exchequer bills, we made advances on Exchequer bills, we not only discounted outright, but we made advances on the deposit of bills of exchange to an immense amount, in short, by every possible means consistent with the safety of the Bank, and we were not on some occasions over-nice. Seeing the dreadful state in which the public were, we rendered every assistance in our power..." Even so, later scholars have criticised the Bank for being too sluggish in its initial reluctance to expand lending (Dimsdale and Hotson 2014).

Figure A.3 : The Bank of England's lending to the private sector, monthly series, 1794-1844



Annex B: Definitions of key nineteenth century money market terms⁵¹

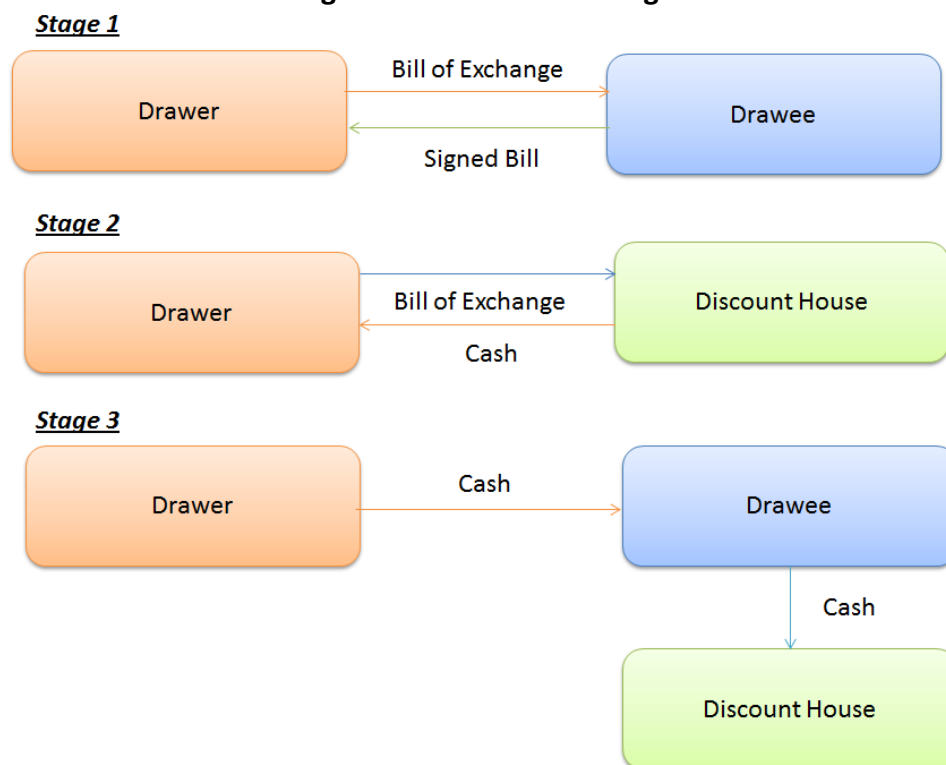
Bill of exchange	A written order requiring the person to whom it is addressed to pay a specific person or the bearer (holder) of the bill of exchange
Order bill	A bill of exchange ordering payment to a specific payee
Bearer bill	A bill of exchange ordering payment to whoever bears the bill
Drawer	The person ordering payment
Drawee	The person required to pay
Acceptor	The legal name for a drawee after they sign their name to a bill
Payee	A person named by the drawer on the bill who the drawee must pay
Transferee	A person receiving a bill e.g. as payment for goods and services
Holder	The person in possession of the bill aka the bearer
Endorser	A person who uses the bill for payment must sign (endorse) the bill thereby incurring liability for its repayment at maturity
Usance	The length of time until a bill of exchange matures
Currency	See Usance
Inland bill	A bill of exchange involving domestic counterparties
Foreign bill	A bill of exchange involving foreign counterparties
Real bill	A bill of exchange arising from a real economic transaction
Accommodation bill	A bill of exchange created for financing purposes
Finance bill	See Accommodation bill
Cheque	A bill of exchange drawn on a banker payable on demand

⁵¹ Sources include Bagshaw (1920), Elliot et al. (2013) and Scammell (1968).

Annex C: Accommodation bills

Bills of exchange could increase the quantity of money in circulation both directly as a supplement to cash, and indirectly when, for example, banks issued new notes in the course of purchasing bills of exchange. This concerned many nineteenth century monetary theorists. The prevailing 'real bills doctrine' held that no economic harm, such as inflation, emanated from bills of exchange, so long as they were trade bills representing real economic transactions (Mints 1945). However, contemporaries were concerned that not all bills were 'real.' This might be so for one of two reasons. First, some bills were 'fictitious' in that the documents had been forged. For example, a person might draw a bill on a fictitious drawee in order to use the bill to obtain cash through its outright sale to a discount house or bank, or through the use of the fictitious bill as collateral for an advance. Alternatively, even if all the counterparties in the transaction were real, not all bills of exchange reflected real economy transactions. Instead, they might be what were known as 'accommodation' or finance bills. For example, a drawee might accept a bill drawn on them, even if that acceptor did not receive goods and services from the drawer. The drawer could then use the bill of exchange as a means for obtaining cash from a financial firm. The drawer could then use that cash for operations and investments over the term of the bill of exchange, remitting an amount equal to the face value of the bill back to the acceptor just before maturity so they could repay the financial firm. The acceptor might 'accommodate' this transaction in exchange for an acceptance fee paid by the drawer. The diagram below illustrates this.

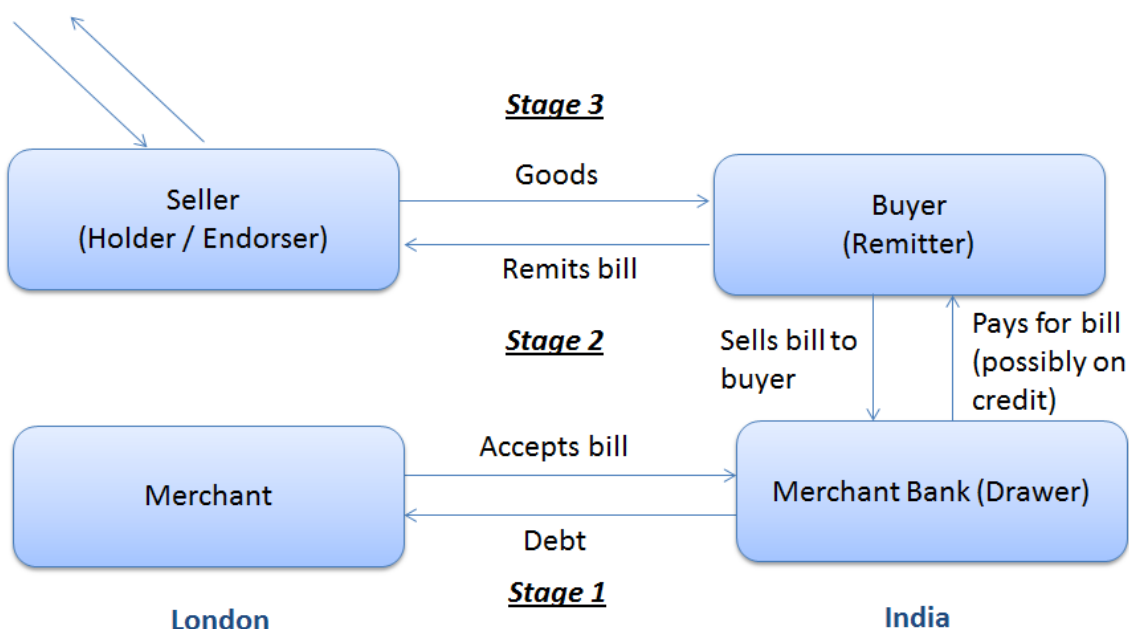
Figure C.1 : Bills of exchange



Annex D: International bills of exchange

Bills of exchange were often used in international finance. In this case, a typical arrangement would involve two prominent merchants in two different locations. The transaction might be structured so that the drawer of the bill would be a prominent merchant in the same location as the buyer (say in India). The merchant would then draw the bill on a correspondent merchant in another location where the seller was based (say London). This ensured the seller received payment in their own country and currency. This four party transaction is shown in **Figure 1**, based on Neal (1990).

Figure D.1 : A four way transaction



Annex E: Loans to Drawing Office customers

Section 3.2 showed the skewed distribution of discounts and advances towards a small number of customers receiving large amounts of money. This begs the question whether there was any preferential lending by the Bank of England during crises to particular types of borrowers. For example, some studies of bank lending in the United States during the nineteenth century have found evidence of insider lending (Lamoreaux 1994).⁵² In our case, we were interested to see if customers of the Bank's Drawing Office received preferential treatment from the Bank's Discount Office. Recall that Drawing Office customers were those who held a current account with the Bank. Given the selective eligibility criteria for a current account, it would not be surprising if Drawing Office customers received loans from the Bank on preferential terms, in much the same way that today a bank's depositor may receive a better deal on a loan from that bank than from another lender because the bank has more information about the ability of that depositor to repay, alongside mechanisms, such as compensating balances, to mitigate the bank's counterparty credit risk.⁵³

In the daily discount ledgers, Drawing Office customers are typically identifiable by an acronym 'D.O.' scribbled in the margins next to their name. The precise reason why the Discount Office kept track of this information is unknown, though we surmise that this helped the Bank keep rough tabs on its net exposure to particular counterparties. **Figure E.1** shows the ledger on 15 May 1866, a few days after the failure of Overend Gurney. Six of the 63 Discount Office customers that day (boxed as an example) have D.O. written in the left-most column in the row pertaining to them, implying they were also Drawing Office customers. However, like any record-keeping procedure, the system of tracking Discount Office customers in the daily discount ledgers was not free from error. For example, the second D.O. entry relates to Philip Levi & Co. All £19,403.68 worth of bills by this apparent Drawing Office customer are recorded as rejected by the Discount Office— the largest value of bills rejected among all customers in 1866. However, the rightmost 'Remarks' heading then states that the reason for rejecting was "A/C not opened," meaning that Philip Levi & Co was, in fact, not really a Drawing Office customer. We have corrected errors such as these in the statistics that follow.

⁵² Insider lending refers to the granting of loans by banks to their staff or close associates on preferential terms.

⁵³ A compensating balance is an amount of money that must be held on deposit during the term of a loan.

Figure E.1 : The daily discount ledger on 15 May 1866

Tuesday, 15th May 1866.

Amount of Bills Discounted going off.....£ <u>55,000</u>	Amount Discounted.....£ <u>813,796</u>
Amount of Advances going off.....£ <u>134,900</u>	Amount Advanced.....£ <u>155,500</u>

N ^o of Bills Brought in for Discount.	Rate Cent.	For whom Discounted, or To whom Advanced.	Amount of Bills Brought in for Discount.	N ^o of Bills rejected	Amount rejected.	Amount advanced.	Remarks.
106	11	W. S. Davis & Co	4241 12 1				
109	11	W. S. Davis & Co	4230 12 4	1	9 11 8		Acceptance Bankrupt.
8	10	The Ebbw Vale Co	80000				
2	10	The Ebbw Vale Co	7810	3			
13	10	J. S. Llewellyn, Beulah Co	4417 12 8				
1	10	Swindell & Matthews & Co	3000				
2	10	Vivanti & Amett & Co	591 2 1				
50	2	J. O. Beeton	1000	2	1000		
11	10	Lloyd & Potters	291 12 4				
3	10	J. Llewellyn & Co	4000				
6	10	H. & C. Edwards & Co	9000				
1	10	Judah Hart & Co	1000				
3	10	Stamps, Jones & Co	2727 12 8				
4	10	Stephen Edmund & Co	5200				
5	10	J. H. & T. Holm	5640 12 8				
5	10	David Taylor & Sons	1790				
7	10	W. & A. Andrus & Co	2560				
15	10	Fred. & Co. Yorks	2822 17 9	1	100 16 2		Only one British security
13	10	Robert Benson & Co	25455 8 3				
2	10	J. R. Saffray & Co	2000				
22	10	Merchant Bank & Co	20372 13 1				
3	10	London & Venezuela Bank	2414				
5	10	Exington & Co	18258 2				
5	10	J. Morris & Co	20400 5 10				
6	10	Swindell & Matthews & Co	2969	10			
50	9	Philip & Co	19403 6 8	9	19403 6 8		After not opened
87	10	Harwood, Wangle & Allen	19493 2 2				

Figure E.2 shows the volume of discount transactions split by Drawing Office and non-Drawing Office customers during crisis and non-crisis periods. Figure E.3 gives the same splits by the value of discount loans. In both cases, we see that Drawing Office customers were a relatively small segment within the overall business conducted by the Discount Office. In fact, during crises, their already small share of total discount loans shrunk even further in both volume and value terms, as the Bank extended loans to non-regular customers facing financial difficulties. Figure E.4 charts the average interest rates charged by the Bank of England to Drawing Office customers and non-Drawing Office customers, split once more between crisis and non-crisis weeks. There is little discernible difference in interest rates and therefore no evidence of price discrimination. In all cases the average interest rate differential is less than ten basis points, with the exception of non-crisis weeks in 1857, when non-Drawing Office customers at the Bank's Discount Office on average paid a 32 basis point premium over the rate obtained by Drawing Office customers. At other times, Drawing Office customers were actually charged a higher rate of interest. For example, during the crisis of 1847, Drawing Office customers on average were charged 5 basis points more than non-Drawing Office customers.

Figure E.2 : Volume of discount transactions split by Drawing Office and non-Drawing Office customers

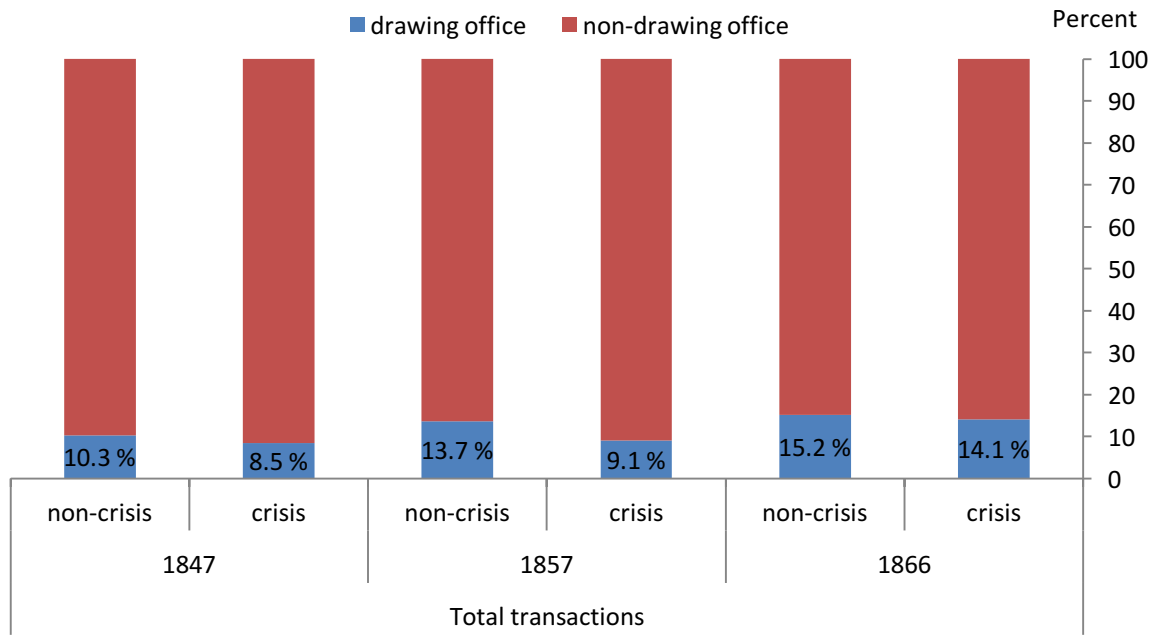


Figure E.3 : Value of discount loans split by drawing office and non-drawing office customers

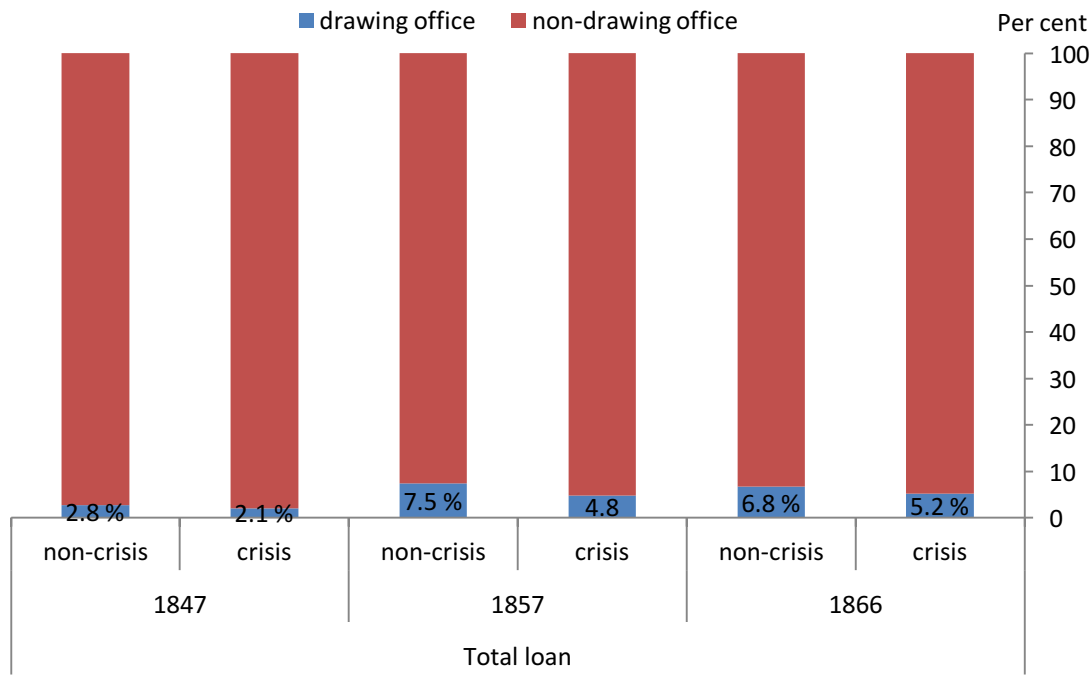


Figure E.4 : Average interest rate paid by Drawing Office and non-Drawing Office customers

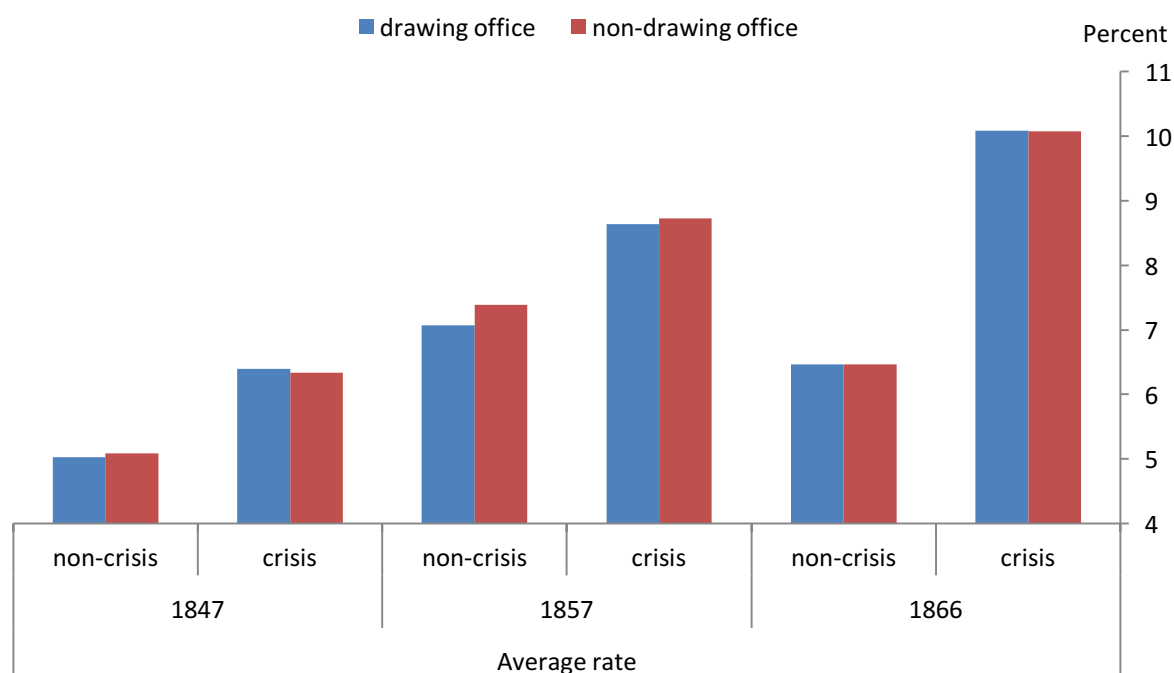
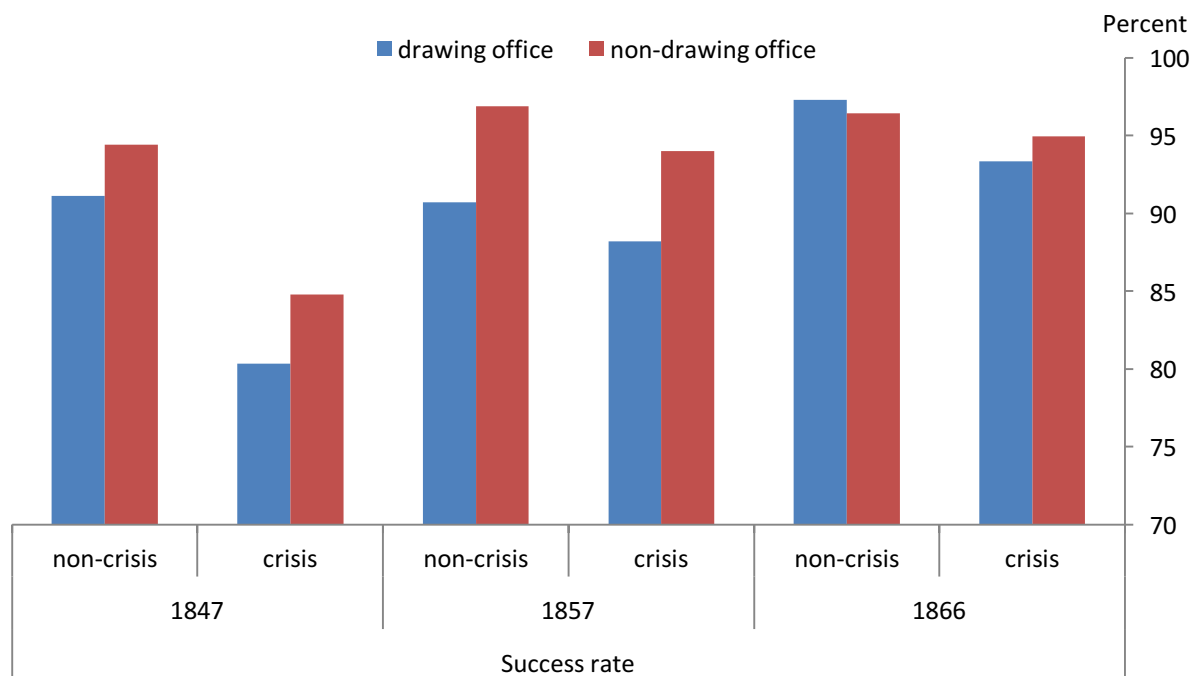


Figure E.5 is based on information in the ledgers about the amount of bills rejected. It shows the relative success of Drawing Office and non-Drawing Office customers in getting bills discounted by the Bank. In both crisis and non-crisis weeks, Drawing Office and non-Drawing Office customers applying for loans are mostly successful. Across all three years, the success rate is never less than 80% for any segment, and, in almost cases, is over 90%. There is no obvious preference given to Drawing Office customers. In fact, during crises, the data shows non-Drawing Office customers were more successful than Drawing Office customers in receiving loans, though the difference in percentage terms is relatively minor. For example, during the 1857 crisis, 88% of the bills brought in for discount by Drawing Office Customers were discounted by the Bank. Put differently 12% of their bills were rejected. By contrast, 94% of bills brought in for discount by non-Drawing Office Customers were accepted by the Bank. Put differently, 6% of their bills were rejected.

Looking at the difference of means in interest rate charged (0.07% in difference) and bills rejected rate (3.42% in difference) between Drawing Office customers and non-Drawing Office customers, it is obvious that the Drawing Office customers were not treated preferentially by the Bank's Discount Office. In value and volume terms, they accounted for a small fraction of the overall business conducted by the Discount Office. Drawing Office customers were charged rates of interest roughly equivalent to non-Drawing Office

customers. Moreover, they were not typically more successful in getting bills discounted by the Bank. In fact, in crisis periods, they were slightly less successful.

Figure E.5 : Success rate between Drawing Office and non-Drawing Office customers

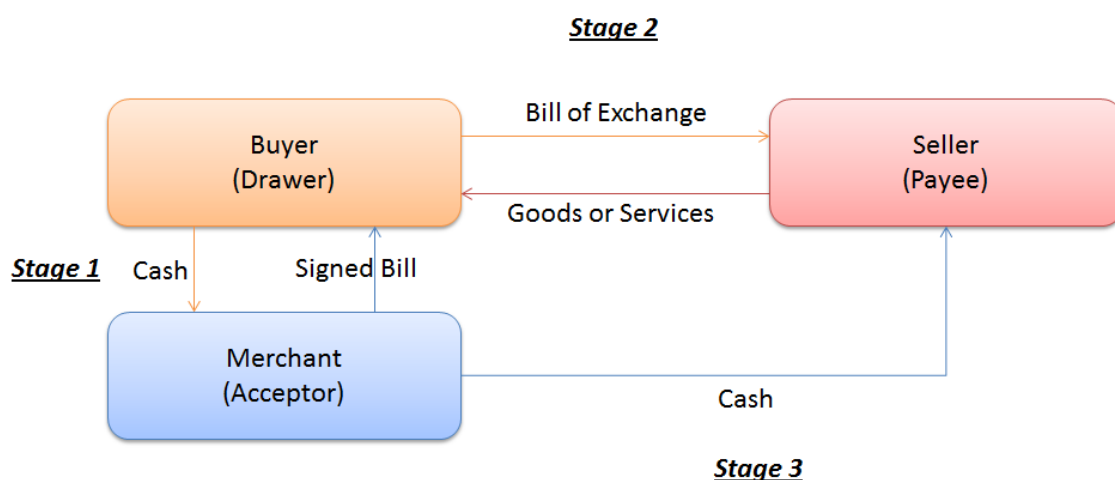


Annex F: Merchant banks

The list of ‘good names’ acceptable by the Bank was never made public. Most historians have assumed that ‘good names’ conventionally referred to prominent international merchants who had specialist knowledge of the creditworthiness of the major importers and exporters operating within particular geographic and product spaces (Leaf 1926: 189). These merchants included Barings (1763), which started out as wool merchants; Rothschilds (1808), which started as cotton good merchants; Schrodgers (1818), which started trading as sugar merchants; and Morgan Grenfell (1838), which began life as dry good merchants (Roberts 1993: 23). Over time, these firms’ role accepting (giving guarantees to) bills of exchange in return for commission became their primary business. As they evolved from distributors of real economic goods to underwriters of financial assets, they were referred to successively as ‘merchant banks,’ ‘accepting houses,’ and eventually ‘investment banks’ (Chapman 1984; Knyaston 1994).

The useful function fulfilled by accepting houses in underwriting bills was in helping overcome asymmetric information that could have otherwise hampered market exchange. For example, a bilateral bills of exchange transaction could be structured instead as a trilateral arrangement involving the buyer and seller of goods, plus a prominent accepting house. In this scenario, the buyer of goods would become the drawer of a bill ordering the accepting house to pay the seller. The accepting house would accept the bill in exchange for a fee from the buyer, agreeing to pay the seller on the buyer’s behalf in, say, three months’ time. The buyer of goods would remit the bill of exchange to the seller. The seller might find this arrangement more suitable because it felt more confident about the creditworthiness of the accepting house than the buyer of the goods.

Figure F.1 : A trilateral bills of exchange

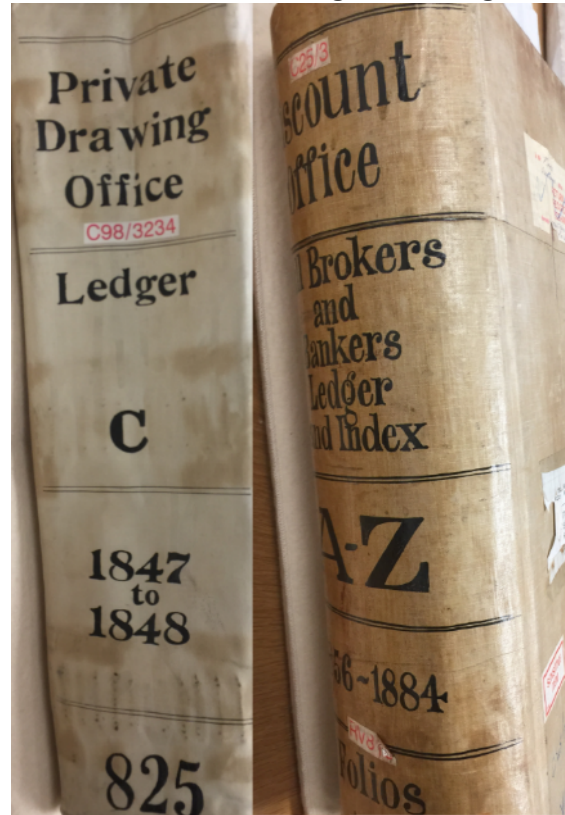


Annex G: The customer “with and upon” ledgers

Figure G.1 : Discounters’ ledgers



Bill brokers’ and Drawing Office ledgers



The Bank segmented its customers into five categories corresponding to five different “with and upon ledgers:”

1. **“Discounters”** (pictured top left). These were reputable City firms with access to Discount Office facilities. To be on the Bank’s list of recognised discount houses required that the firm be ‘introduced’ (their application supported) by a senior member of the Bank. Discounters had a daily discount limit, though the extent to which this was enforced is unclear.
2. **“Bill brokers”** (pictured top right).
3. **“Bankers.”** These were largely private partnership and joint stock banks headquartered in London. Initially, the joint stock banks were included in the bill brokers’ ledgers. After 1864, however, they had their own set of ledgers, reflecting the growing importance of joint stock banks following the extension of limited liability privileges to bank shareholders in 1862 (Taylor 2006). Banks outside London had indirect access to the Discount Office through their correspondent banks in London, or they discounted bills at Bank of England branches.
4. **“Drawing office or ‘DO’ customers** (pictured top right). As detailed earlier, these were customers with a Drawing Office (deposit) account with the Bank.

- 5. Non-customer acceptors of bills.** These were companies without a discount or Drawing Office account but who were acceptors of the bills discounted by the Bank. The ledger for these customers were called simply the “upon ledgers” as they just recorded acceptances.

[illegible]

Figure G.3 : Excerpt from 1857 customer “with and upon ledgers” pertaining to Schroders

DRAWER.	Date of Discount.	Folio.	DISCOUNTER.	Date.	DISCOUNTS		ADVANCES	
					WITH	UPON	WITH	UPON
	1/27		Hough & Co	Dec 26	150061	1172255	45	6000
	2/21	421	Barnes & Co	10				329
	27	426	H. H. H. & Co	28		1200		1500
	27	426	H. H. H. & Co	28		210		
			H. H. H. & Co	28		221	11	
			H. H. H. & Co	28		1200		
			H. H. H. & Co	28		470		
			H. H. H. & Co	28		1721	2	
			H. H. H. & Co	28		1000		
			H. H. H. & Co	28		577	40	
			H. H. H. & Co	28		3000		
			H. H. H. & Co	28		570		
			H. H. H. & Co	28		521	9.5	
			H. H. H. & Co	28		1000		
			H. H. H. & Co	28		290		
			H. H. H. & Co	28		1000		
			H. H. H. & Co	28		2000		
			H. H. H. & Co	28		521	15.0	
			H. H. H. & Co	28		519	15.0	
			H. H. H. & Co	28		520	9.10	
			H. H. H. & Co	28		3000		
			H. H. H. & Co	28		400		
			H. H. H. & Co	28		2000		
			H. H. H. & Co	28		2100		
			H. H. H. & Co	28		172793	18	175551
			H. H. H. & Co	28		170792	11	18152
			H. H. H. & Co	28		270		4174
			H. H. H. & Co	28		1129		
			H. H. H. & Co	28		400		
			H. H. H. & Co	28		440		
			H. H. H. & Co	28		1117		
			H. H. H. & Co	28		111817	11.5	

By 1857, the customer ledger information is organised differently and more clearly. The image above is an example relating to Schroders. A few new features are worth noting. In addition to discounts, advances are now shown (boxed in blue). There are also now separate “with” and “upon” columns, enabling easier identification of whether Schroder’s was the discounter or acceptor (boxed in red). Rather confusingly, however, the “with” and “upon” columns refer to Schroders rather than the counterparty named in the “Discounter” column. This is in contrast to the 1847 ledgers, where the “with” and “on” terms refer to the counterparty. So in this case all the bills in the “Discounts with” column were brought in for discount by Schroders, while all the bills in the “Discounts upon” column were bills accepted by Schroders. As a corollary, this meant the counterparty names in the “Discounter” column could be either an acceptor (for a “with” entry when Schroders was the discounter) or a discounter (for an “upon” entry when Schroders was the acceptor). This potential for confusion in the ledgers was removed by 1866, as can be seen in the ledger entry for Bieber & Co for May 1866 on the following page. The word “Discounter” was replaced in the column title by “Acceptor or Discounter”. More importantly, it appears the Bank had started monitoring its exposure by summarising its cumulative exposure to the key acceptors of the bills brought in for discount (boxed in blue).

Figure G.4 : Excerpt from 1857 customer “with and upon ledgers” pertaining to Schrodgers

175		30 Jan 1865		Bieber & Co																					
Whose Draw		DRAWER		Date of Discount		Folio		ACCEPTORS OR DISCOUNTERS		Due		WITH		DISCOUNTS		UPON		ADVANCES		WITH		Folio		Whose Draw	
(A 00/34)		(A 00/34)		1866																					
N York		Edw. L. L.		Dec 1		1866		Amster D. Co		May 24						6.00									
Barren		B. F. Barker & Co		21		1866		1st York		May 24						5.00									
				22		1866		2nd York		May 24						4.00									
				23		1866		3rd York		May 24						3.00									
				24		1866		4th York		May 24						2.00									
				25		1866		5th York		May 24						1.00									
				26		1866		6th York		May 24						0.50									
				27		1866		7th York		May 24						0.25									
				28		1866		8th York		May 24						0.12									
				29		1866		9th York		May 24						0.06									
				30		1866		10th York		May 24						0.03									
				31		1866		11th York		May 24						0.01									
				32		1866		12th York		May 24						0.00									
				33		1866		13th York		May 24						0.00									
				34		1866		14th York		May 24						0.00									
				35		1866		15th York		May 24						0.00									
				36		1866		16th York		May 24						0.00									
				37		1866		17th York		May 24						0.00									
				38		1866		18th York		May 24						0.00									
				39		1866		19th York		May 24						0.00									
				40		1866		20th York		May 24						0.00									
				41		1866		21st York		May 24						0.00									
				42		1866		22nd York		May 24						0.00									
				43		1866		23rd York		May 24						0.00									
				44		1866		24th York		May 24						0.00									
				45		1866		25th York		May 24						0.00									
				46		1866		26th York		May 24						0.00									
				47		1866		27th York		May 24						0.00									
				48		1866		28th York		May 24						0.00									
				49		1866		29th York		May 24						0.00									
				50		1866		30th York		May 24						0.00									
				51		1866		31st York		May 24						0.00									
				52		1866		32nd York		May 24						0.00									
				53		1866		33rd York		May 24						0.00									
				54		1866		34th York		May 24						0.00									
				55		1866		35th York		May 24						0.00									
				56		1866		36th York		May 24						0.00									
				57		1866		37th York		May 24						0.00									
				58		1866		38th York		May 24						0.00									
				59		1866		39th York		May 24						0.00									
				60		1866		40th York		May 24						0.00									
				61		1866		41st York		May 24						0.00									
				62		1866		42nd York		May 24						0.00									
				63		1866		43rd York		May 24						0.00									
				64		1866		44th York		May 24						0.00									
				65		1866		45th York		May 24						0.00									
				66		1866		46th York		May 24						0.00									
				67		1866		47th York		May 24						0.00									
				68		1866		48th York		May 24						0.00									
				69		1866		49th York		May 24						0.00									
				70		1866		50th York		May 24						0.00									
				71		1866		51st York		May 24						0.00									
				72		1866		52nd York		May 24						0.00									
				73		1866		53rd York		May 24						0.00									
				74		1866		54th York		May 24						0.00									
				75		1866		55th York		May 24						0.00									
				76		1866		56th York		May 24						0.00									
				77		1866		57th York		May 24						0.00									
				78		1866		58th York		May 24						0.00									
				79		1866		59th York		May 24						0.00									
				80		1866		60th York		May 24						0.00									
				81		1866		61st York		May 24						0.00									
				82		1866		62nd York		May 24						0.00									
				83		1866		63rd York		May 24						0.00									
				84		1866		64th York		May 24						0.00									
				85		1866		65th York		May 24						0.00									
				86		1866		66th York		May 24						0.00									
				87		1866		67th York		May 24						0.00									
				88		1866		68th York		May 24						0.00									
				89		1866		69th York		May 24						0.00									
				90		1866		70th York		May 24						0.00									
				91		1866		71st York		May 24						0.00									
				92		1866		72nd York		May 24						0.00									
				93		1866		73rd York		May 24						0.00									
				94		1866		74th York		May 24						0.00									
				95		1866		75th York		May 24						0.00									
				96		1866		76th York		May 24						0.00									
				97		1866		77th York		May 24						0.00									
				98		1866		78th York		May 24						0.00									
				99		1866		79th York		May 24						0.00									
				100		1866		80th York		May 24						0.00									
				101		1866		81st York		May 24						0.00									
				102		1866		82nd York		May 24						0.00									
				103		1866		83rd York		May 24						0.00									
				104		1866		84th York		May 24						0.00									
				105		1866		85th York		May 24						0.00									
				106		1866		86th York		May 24						0.00									
				107		1866		87th York		May 24						0.00									
				108		1866		88th York		May 24						0.00									
				109		1866		89th York		May 24						0.00									
				110		1866		90th York		May 24						0.00									
				111		1866		91st York		May 24						0.00									
				112		1866		92nd York		May 24						0.00									
				113		1866		93rd York		May 24						0.00									
				114		1866		94th York		May 24						0.00									
				115		1866		95th York		May 24						0.00									
				116		1866		96th York		May 24						0.00									
				117		1866		97th York		May 24						0.00									
				118		1866		98th York		May 24						0.00									
				119		1866		99th York		May 24						0.00									
				120		1866		100th York		May 24						0.00									
				121		1866		101st York		May 24						0.00									

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