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## The Origins of Foreign Exchange Policy: The National Bank of Belgium and the Quest for Monetary Independence in the 1850s

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# Working Paper

Norges Bank's bicentenary project

## The origins of foreign exchange policy: The National Bank of Belgium and the quest for monetary independence in the 1850s

*by Stefano Ugolini*

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## **The Origins of Foreign Exchange Policy: The National Bank of Belgium and the Quest for Monetary Independence in the 1850s**

*Stefano Ugolini\**

**Abstract:** *Can the central bank of a small open economy be mandated with the maintenance of both fixed exchange rates and monetary independence, and still succeed in the long term? Looking at a pioneering experiment put in place by the National Bank of Belgium, this article shows how foreign exchange policy allowed for persistent violations of the predictions of the trilemma in the 1850s. Success was based on four main ingredients. First, the credibility of the peg was not built through the stabilisation of exchange rates, but through the stabilisation of central bank liquidity (i.e. the ‘margin of manoeuvre’ available for countercyclical action): based on constructive ambiguity, this strategy positively influenced market expectations. Second, the stock of bullion circulating in the country acted as a buffer for central bank reserves. Third, the banking system had a structural liquidity deficit towards the central bank. Fourth, the central bank was big enough to meet the domestic demand of credit and accumulate foreign reserves at the same time. These findings shed new light on the nature of monetary policy and its implementation in the 19<sup>th</sup> century.*

**JEL:** E52, E58, F31, N23.

**Keywords:** Foreign exchange policy, monetary policy implementation, reserve management.

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## 1. Introduction

In patent violation with the prescriptions of the trilemma, the central bank of a small open economy was entrusted with an apparently inconsistent mandate: reconciling the defense of fixed exchange rates with monetary independence<sup>2</sup>. Yet the bank spectacularly succeeded in pursuing both targets, thus attracting the interest of international commentators. How was this paradoxical outcome made possible? How did the central bank manage to secure the credibility of the peg despite lack of realignment of domestic interest rates with international ones? And what special conditions were necessary to the success?

This paper provides the first systematic analysis of the celebrated foreign exchange policy implemented by the National Bank of Belgium (NBB, founded 1850) during the first decade of its life. It is organized as follows. Section 2 explains the motivations for this study, and puts the Belgian case in historical context. Section 3 uses a new high-frequency database covering the NBB's foreign exchange operations (1851-1853) in order to understand in which way the credibility of the peg was built through the daily action of the central bank. Section 4 uses a second new database covering the whole NBB's monetary policy (1851-1861) in order to understand which strategies the Bank implemented in reaction to shocks, and what special conditions allowed for this defence of monetary independence to be successful. Section 5 summarises the main results and concludes.

## 2. Motivation

### *2.1: Monetary Independence under Fixed Exchange Rates*

To date, the so-called *monetary policy trilemma* remains one of the most popular and powerful references of textbook macroeconomic theory. In its simplest form, it consists of the prediction that a country cannot have financial openness, fixed exchange rates and monetary policy independence at one time. Although empirical research has started to question the assumption that flexible exchange rates are a sufficient condition for monetary independence (Frankel et al. 2004), the trilemma is still generally seen as grounded by long-term historical evidence (Obstfeld et al. 2005).

Fixed exchange rate regimes, however, happen to leave some room for monetary independence. This depends on the fact that in the real world, exchange rates have seldom been fixed at a precise parity; rather, they have generally been left free to fluctuate within a band around a central parity. According to Svensson (1994), this kind of monetary arrangement (called *target zones*) allows for a certain room of independence in the short term:

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<sup>2</sup> As in most of the literature, monetary independence is defined here as the divergence of domestic short-term nominal interest rates from international ones. For a discussion of this definition, see Obstfeld et al. (2005).

if the peg is credible, expectations of realignment towards the par impede the exchange rate to violate the margins of the band when domestic interest rates diverge from foreign ones. Due to its apparent status of a credible and well-behaved target-zone-system, the international gold standard has been naturally seen as the ideal candidate for testing to what extent currency bands could deliver the much-wanted degree of monetary independence without impairing the long-term stability of exchange rate parities (Eichengreen and Flandreau 1997). For instance, Bordo and MacDonald (2005) have tested Svensson's (1994) hypothesis on the three core currencies of the classical gold standard era (1880-1914) with positive results. Flandreau and Komlos (2006) have analysed the Austro-Hungarian experience during the two decades preceding world war one, to conclude that the successful combination of foreign exchange stability and monetary independence rests on both credibility of the central parity and foreign exchange market efficiency.

Yet the question of how credibility can be built – or differently said, of how independence is made possible in practice – still remains to be clarified. Once more, 19<sup>th</sup>-century monetary systems are an ideal ground for investigation. In an inspiring contribution, Jobst (2009) argues convincingly that the situation observed by Flandreau and Komlos (2006) heavily depended on the action of the Austro-Hungarian Bank, which was 'micro-managing' foreign exchange markets through sophisticated techniques of intervention. As a result, the role of central banks in creating credibility emerges as a fundamental element of the picture. It must be acknowledged that the case of the Habsburg Empire is a rather special one, as – due to the long-lasting volatility of the national currency – Vienna was host to a liquid *forward* exchange market. This was not the case in most other financial centres, where forward exchange markets developed in the aftermath of war world one<sup>3</sup>. But this does not mean that foreign exchange intervention techniques were unknown elsewhere: recent historical research has shown that the central banks of peripheral countries like Portugal (Reis 2007; Esteves et al. 2009), Norway (Øksendal 2008), or Sweden (Ögren 2007) were important players on the *spot* exchange market. Nowhere, however, the scale and scope of foreign exchange policy were comparable to those reached by the National Bank of Belgium (NBB) in its early years.

## 2.2: The 'Belgian Miracle' of the 1850s

Although the NBB was not the first chartered bank of issue to deal with foreign assets<sup>4</sup>, it was undoubtedly the first one to elaborate a consistent body of techniques that is possible to classify as *foreign exchange policy*. By the end of the 19<sup>th</sup> century, the Belgian primacy in this field had become commonplace between economists and practitioners (Conant 1910; Schiltz 2006). Figure 1 explains why the NBB's policies were seen as successful by contemporary observers. Since the opening of the NBB's counters in January 1851, the Belgian franc turned from a high-yield to a low-yield currency<sup>5</sup>. Most remarkably, during most of the 1850s and

<sup>3</sup> See e.g. Michie (2007) for the case of London.

<sup>4</sup> For instance, Bordo et al. (2007) quote anecdotal evidence of operations in sterling claims by the Second Bank of the United States during the 1820s and 1830s.

<sup>5</sup> This was not related to the monetary standard adopted in Belgium, as other currencies on the same foot displayed much higher market interest rates in the same years. For a discussion on this point, see Ugolini (2010).

(to a lesser extent) the 1860s domestic interest rates in Belgium decoupled with respect to international ones, staying on much lower levels for very long periods. The picture suggests that, for anyone wishing to investigate monetary independence under fixed exchange rate regimes, 1850s Belgium is a wonderful case to be looked at. In order to take into account a coherent lapse of time, this paper will study the monetary policies implemented by the NBB from its start-up to the reform of June 1861 – when the country abandoned silver monometallism for bimetallism.

Founded in the aftermath of the 1848 convertibility crisis with a clear mandate for maintaining the Belgian franc's peg to silver<sup>6</sup>, the NBB also had another important (albeit informal) mandate for keeping domestic interest rates low (Kauch 1950, pp. 58-59 and 99). This was intended to benefit both the economy and the Treasury itself, which had been issuing debt in national currency since 1844. Evidence of governmental pressure aimed at obtaining moderate discount rates often emerges in the NBB's archives<sup>7</sup>. However, as the Statutes did not mention such a mandate explicitly, the Bank was left free to set the appropriate policies for pursuing it. This is how foreign reserves came in. It is interesting to note that, perhaps surprisingly, the NBB had not been *designed* to be an active player on the foreign exchange market. The Statutes of 1850 never refer to the possibility of owing foreign assets, just mentioning the opportunity of discounting 'bills': thus, the Bank was just not forbidden to discount foreign bills of exchange. Nonetheless, long before the intuitions of 20<sup>th</sup>-century economists, the Bank immediately understood that in foreign exchange policy laid the solution for concealing the two apparently inconsistent mandates its founders had entrusted to it – maintaining both fixed exchange rates and monetary independence. The next sections will analyse how this 'miracle' was made possible in practice, and under what special conditions the policy managed to prove effective.

### **3. Building Credibility: An Analysis 1851-1853**

#### *3.1: The 1851-1853 Experience: Introduction*

The historian willing to approach the workings of the NBB in the mid-19<sup>th</sup> century is at once struck by a rather unpleasant finding: except for some scanty annual statistics contained in its annual reports to shareholders, the central bank that was internationally renowned for its foreign exchange policy did not disclose any kind of information about its operations. Most remarkably, until the 1872 reform the Bank did not publish data on foreign reserves in its end-of-month balance sheet reports: as foreign assets could not back the issuance of banknotes and thus could not be officially accounted as 'reserves', their amount was aggregated to the

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<sup>6</sup> For more information on the foundation of the NBB and its effects on the Belgian financial system, see Ugolini (forthcoming).

<sup>7</sup> Within the minutes of the Administration Board (AGR/AR, BNB/NBB, PV CdA) see for instance: 8<sup>th</sup> and 11<sup>th</sup> October 1853; 24<sup>th</sup> December 1853; 9<sup>th</sup> and 21<sup>st</sup> January 1854; 29<sup>th</sup> November 1855; 29<sup>th</sup> October 1857; 5<sup>th</sup> and 14<sup>th</sup> November 1857; 6<sup>th</sup> and 20<sup>th</sup> February 1858; 12<sup>th</sup> January 1860; 17<sup>th</sup> April 1860; etc.

Bank's 'portfolio' (mostly composed by domestic bills). This explains why early commentators, such as Conant (1910), Van Elewyck (1913) and Witten (1918), were unable to enter into much detail on the question. What is disconcerting, however, is the fact that even in the archives of the Bank nothing has apparently survived concerning the management of foreign reserves. This justifies the absence of a focused analysis by the official historians of the NBB, Kauch (1950) and Buyst et al. (2005).

Yet, in spite of the absence of the ledgers covering foreign exchange operations, it is still possible to reconstruct the NBB's action by using other archival material. It happens that all the correspondence with both the Bank's provincial branches and foreign agents had to pass through the Governor's office. During the first years of life of the institution, this office kept a systematic recording of all the bills of exchange that were attached to the letters sent and received by the Governor. As the overwhelming majority of domestic operations on foreign bills were implemented in Antwerp (then the country's commercial capital) and not in Brussels, tracking transactions one-by-one since the creation of the Bank allows for a reconstruction of foreign exchange policy in its entirety. A three-year period was chosen as the lapse of time to be covered by this high-frequency analysis. This choice implied the painstaking recollection of more than 7,000 transactions<sup>8</sup>.

This section analyses this newly-created database in order to understand the rationale of the NBB's frantic foreign exchange activities from January 1851 to December 1853. Were such activities aimed at direct intervention on the foreign exchange? And if not, how did the Bank contribute to the creation of credibility?

### *3.2: Marginal Intervention?*

As paragraph 2.1 has pointed out, there seems to be a growing consensus on the fact that target zones allow for a certain degree of monetary independence – provided that the commitment to defend the parity is credible. The theoretical literature on target zones originated by Krugman (1991) assumes that central bank intervention on the foreign exchange market occur only at the margins of the currency band: massive sales close to the upper limit, massive purchases close to the lower limit. The implication is that credibility can be constructed through marginal intervention<sup>9</sup>. Was that the case of the NBB? This paragraph aims to answer this question by reconstructing the currency band and trying to put the Bank's foreign exchange operations in context.

Target zone models built to fit the classical gold standard framework conceive the currency band as a 'strip' surrounding the fixed parity and delimited by the gold points (i.e. the points where the deviation of the exchange rate from parity exceeds the costs of arbitrage, and thus importing/exporting bullion becomes a profitable operation). The assumption is that, in both countries forming every bilateral exchange relationship, the price of the 'reference' metal is

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<sup>8</sup> Constructed on daily recordings of the Governor's correspondence (AGR/AR, BNB/NBB, IC, 1851-1853), the database has then been cross-checked to match the data occasionally provided by other internal sources, such as the proceedings of the Administration Board (AR/AGR, NBB/BNB, PV CdA, 1851-1853) and the annual reports to shareholders (NBB/BNB, AC/CA, RAG, 1851-1853).

<sup>9</sup> An exception comes from Flandreau and Komlos (2006), who argue that what matters is the defence of the central parity rather than the margins of the band.



immutable over time (if this is not the case, the band has to shift). But this assumption cannot hold any longer while looking at the mid-19<sup>th</sup> century international monetary architecture, where gold monometallic, silver monometallic and bimetallic systems co-existed and market prices of metals could sometimes fluctuate even quite far from official ones (Flandreau 2004). Such a situation obliges to set the currency band not in terms of deviations of the spot exchange rate<sup>10</sup> from a fixed parity, but in terms of its deviation from a variable sensitive to fluctuations of the relative price of metals: such a variable is the arbitrated par, defined as the ratio between the domestic price and the foreign price of the ‘reference’ metal<sup>11</sup>.

Once the fixed parity replaced by the arbitrated parity, the margins of the band are set by the bullion points. Unfortunately, we completely lack information allowing to estimate these points<sup>12</sup>. However, it is not strictly necessary to have the bullion points set precisely in order to check if the NBB was implementing marginal intervention: one can just adopt an ‘agnostic’ attitude and see from the distribution of interventions if at some point around the arbitrated parity some kind of concentration does occur.

The distributions of the NBB’s interventions, for every one of the six currencies it was dealing with, are shown in figures 2.1-6. The database allows to distinguish between (strictly) *sterilised* (squares) and *non-sterilised* (triangles) operations – i.e. respectively, operations entailing and not entailing a modification in the domestic money supply (Dominguez and Frankel 1993). Another class of operations did actually exist, even though looking at variations of the total amount of foreign assets would not allow to catch them – viz. *swaps* of foreign assets (circles)<sup>13</sup>. ‘Swaps’ (or ‘loosely’ sterilised) are those zero-sum operations involving a direct exchange of a certain amount of a foreign currency with an equivalent amount of another currency<sup>14</sup>: this means that this class of operations is in fact a subset of sterilised ones, but we prefer distinguishing them because of their very different impact on the Bank’s balance sheets. However, as the effects of (strictly and loosely) sterilised operations

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<sup>10</sup> In this paper, the exchange rate is always defined as the price of a unit of foreign currency expressed in terms of the domestic unit.

<sup>11</sup> For a discussion of the problems concerning the choice of the ‘reference’ metal, see Ugolini (2010). As Belgium was on a silver monometallic foot, silver is taken as the reference metal; and as prices of ingots were not quoted in Belgium, the price of silver is replaced by the metallic content of legal-tender full-bodied species. This is reasonable, as bullion arbitrage from Belgium always took the form of shipments of silver 5-franc species (see paragraph 4.2).

<sup>12</sup> Flandreau (2004) provides data for costs of arbitrage between Paris and London in the 1850s: his computations give on average a value of approximately 1%. Taking into account the transportation networks of the time, it would be reasonable to think that costs of arbitrage were sensibly lower than that between Brussels and Paris; more or less equivalent between Brussels and London; slightly higher between Brussels, Amsterdam and Hamburg; and sensibly higher between Brussels, Frankfurt and Berlin. However, as paragraph 4.2 will show, arbitrage between Antwerp and London could take place when the exchange rate deviation from the arbitrated par exceeded 0.5%.

<sup>13</sup> From a practical point of view, (strictly) sterilised operations corresponded to sales (or purchases) of species to foreign bankers. Non-sterilised operations consisted of a series of different transactions, such as: sales (or purchases) of Belgian francs to foreign bankers; purchases (or sales) of foreign bills at the Belgian bourses; purchases (or sales) of foreign bills to the Belgian public at the NBB’s counters; purchases (or sales) of foreign bills to Belgian banks; purchases (or sales) of claims on foreign bankers to Belgian banks. Finally, swaps amounted to either purchases (or sales) of foreign bills to foreign bankers, or purchases (or sales) of claims on foreign bankers to foreign bankers.

<sup>14</sup> The term ‘swap’ is used in its general meaning of direct exchange of two *stocks* (of cash), and not in its specific meaning of a derivative contract through which two *flows* of cash are exchanged.

on exchange rates are dubious (Dominguez and Frankel 1993), the interventions to which more attention must be paid are the non-sterilised ones.

Figures 2.1-6 suggest that the distribution of the NBB's interventions is very different from the one assumed in the family of models originated by Krugman (1991). The most striking difference lies in the fact that most interventions take place close to the centre of the band, when the exchange rate coincides with the arbitrated par, and not close to its limits. In other words, most operations seems to be *intra-marginal interventions*<sup>15</sup>.

Target zone models allowing for intra-marginal interventions to occur even close to parity do exist: in this framework, the system looks like a managed float (Svensson 1992; Garber and Svensson 1995). Yet the distribution of the NBB's intra-marginal interventions can hardly be explained even by a 'managed float' approach. First of all, while actively intervening at the centre of the band, and often *at* the very parity, most times the bank does *not* intervene at the extremes (far from the arbitrated par, most points lie on the horizontal axis), where intense mean-reverting action should take place. Second, the Bank seems to act counter-intuitively: it often happens to sell when it would be expected to purchase, and vice-versa (should we interpret them as 'leaning-with-the-wind' interventions?). And third, a large share of interventions are (strictly and loosely) sterilised, i.e. not aimed at affecting the exchange rates. To sum up, the NBB's large foreign reserves can hardly be interpreted as an 'arsenal' devoted to mean-reverting interventions on the exchange rate. As a result, it is impossible to see them the Bank's action as foreign exchange intervention properly speaking. No doubt, a different approach is needed in order to understand the rationale of the NBB's policy. In particular, the *targets* of this policy must be specified better. This will be endeavoured in the following paragraph.

### 3.3: Final and Intermediate Targets: Convertibility and Central Bank Liquidity

Central banks have both final and intermediate targets. Nowadays, most central banks have price stability as their final target, while some other variable (like e.g. a given short-term interest rate) as their intermediate one<sup>16</sup>. Markets are generally aware of the importance of intermediate targets and look at them in order to assess the central banks' ability to pursue their long-term aims. In the mid-19<sup>th</sup> century, most central banks had the defence of convertibility as their main final target. The intermediate target through which this was

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<sup>15</sup> The original Krugman (1991) model works under the assumption that the currency band is fully credible and therefore always fixed; but as the arbitrated par is mobile (due to fluctuations in the prices of bullion), one could argue that there are realignments of the currency band, making it imperfectly credible. Target zones models with time-varying realignment predict that expectations of realignments are bound to affect the negative relationship between expected depreciations and exchange rate deviations from the parity (Svensson 1992). However, as shown by Ugolini (2010), this negative relationship generally held in the mid-19<sup>th</sup> century international monetary system: as a result, the hypothesis of *peso problems* can be ruled out.

<sup>16</sup> 'The *final target* of monetary policy is the economic variable that the central bank eventually aims at. Thus, operational and intermediate targets are nothing more than means towards reaching the final target without a specific value of their own. [...] An *intermediate target* is an economic variable that (a) the central bank can control with a reasonable time lag and with a reasonable degree of precision, and (b) which is in a relatively stable or at least predictable relationship with the final target of monetary policy, of which the intermediate target is a leading indicator' (Bindseil 2004, p. 9).

pursued did not consist of the maintenance of exchange rates within the bullion points, but of the preservation of a ‘margin of maneuver’ available for performing countercyclical action without breaking convertibility rules. Such a margin can be called *central bank liquidity* ( $L$ ). What was the correct level of central bank liquidity to be targeted? As a matter of fact, a trade-off existed: as well as too low a level endangered convertibility, too high a level impaired the central bank’s profitability – as cash laying idle in its vault could not be applied to any remunerative form of investment, thus sparking shareholders’ discontent<sup>17</sup>. Both risks put a question mark on the long-term sustainability of current monetary arrangements, and thus on the credibility of the peg. As a result, central banks had to find the right equilibrium level for this intermediate target.

Central bank liquidity was defined differently across countries. Two systems prevailed:

- 1) In the first system (the ‘British’ model)<sup>18</sup>, the central bank was allowed to issue freely a fixed amount of banknotes, while any extra banknote put into circulation had to be met by a 100% bullion backing. In this case, the intermediate target  $L_{Brit}$  the monetary authority monitored in order to maintain convertibility consisted of what Bagehot (1873) called the *cash reserve*<sup>19</sup> – i.e., the amount of banknotes that could still be put into circulation without breaking statutory rules:

$$L_{Brit} = B^c + M - B^i$$

where  $B^c$  is the fixed amount of banknotes the bank is allowed to issue without bullion backing,  $M$  is the bullion reserve, and  $B^i$  is the amount of banknotes already issued<sup>20</sup>.

- 2) In the second system (the ‘Continental’ model)<sup>21</sup>, the central bank was only allowed to issue banknotes against a given fraction  $\gamma$  of bullion kept in reserve. Typically (as in the Belgian case), compulsory bullion backing applied not only to the banknote circulation, but also to all other sight liabilities (in other words, to the whole monetary base except circulating full-bodied coins). In this system, the intermediate target  $L_{Cont}$  the monetary authority monitored in order to maintain convertibility consisted of the *cash surplus* – i.e., the amount of bullion that was not backing the monetary base:

$$L_{Cont} = M - \gamma(B^i + D)$$

where  $D$  is the amount of deposits.

In both the ‘British’ and ‘Continental’ models, central bank liquidity had a full informational value as an indicator of the monetary authority’s funds available for acting counter-cyclically. This item was closely watched by the public in order to understand how much the bank could

<sup>17</sup> For a discussion of the effects of profitability concerns in privately-owned central banks, see Goodhart (1988).

<sup>18</sup> This system was introduced in Britain by Peel’s Act in 1844. Other countries adopted similar arrangements, such as e.g. Norway.

<sup>19</sup> Throughout *Lombard Street*, Walther Bagehot uses the term ‘reserve’ with a variety of meanings. In the case of the Bank of England, Bagehot mainly refers not to bullion, but to the note reserve of the Banking Department (as clearly put forward at the beginning of chapter II).

<sup>20</sup> This interpretation of the Bank of England’s reaction function builds on the accounts of contemporary observers: besides Bagehot (1873), see e.g. the weekly comments on the state of money market published by *The Economist*. A drop in the cash reserve amounted to what Dornbusch and Frenkel (1984) call ‘an *internal drain*’. As central bank liquidity was a synthetic indicator reflecting the overall position of the monetary authority’s balance sheets (including bullion reserves and the monetary base), the idea that the Bank of England was monitoring this item is not necessarily inconsistent with the results of Jeanne (1995) or Davutyan and Parke (1995).

<sup>21</sup> This system was adopted by most Continental countries, including France – and, of course, Belgium.

react to shocks without impairing convertibility – or differently said, how credible the peg was. As a result, stabilising the level of central bank liquidity was supposed to enhance the credibility of the peg in the long term, thus producing stabilising expectations (and mean-reverting speculation) in the foreign exchange market. This is the mechanism the NBB relied on. By analysing the balance-sheet effects of the central bank's operations, the next paragraph will show why foreign exchange operations emerged as the ideal instrument for stabilising central bank liquidity in mid-19<sup>th</sup>-century Belgium.

### 3.4: Foreign Exchange Operations and Central Bank Liquidity

Imagine a simplified version of the NBB's balance sheet as composed by the following items: on the liability side, banknotes in circulation ( $B^i$ ) and deposits ( $D$ ); on the asset side, the bullion reserve ( $M$ ) and the portfolio of bills ( $P$ )<sup>22</sup>. The bullion reserve can be split into two different items, viz. the cash surplus  $L$  and the 'compulsory' reserve  $M^c$ , defined as:

$$M^c = \gamma(B^i + D)$$

Article 13 of the Statutes of the NBB put  $\gamma = 1/3$ .

In turn, the portfolio of bills of exchange can be split into two different items, viz. the domestic portfolio  $P^d$  and the foreign portfolio  $P^f$ . Note that the two items were subject to different rules. On the one hand, the Bank was expected to discount domestic bills on demand without any restriction, and was then obliged to keep the discounted bills in its portfolio until maturity – as rediscounting domestic assets was not a possible option for the central bank. On the other hand, no constraints were in place for foreign bills: the Bank could start or stop discounting them at its will, and was allowed to liquidate them at any moment.

This leads to some reflections concerning the central bank's ability to fix quantities: it is important to underline that the size of most of the items in its balance sheets could not be controlled by the Bank itself. Due to statutory constraints, the NBB was able to establish positively only the volume of  $P^f$  (the foreign portfolio). This was the case neither for  $P^d$  (the domestic portfolio, i.e. the recipient of the activities of the Bank's standing facility) nor for  $B^i$  and  $D$  (the monetary base)<sup>23</sup>: as a matter of fact, the size of these items was demand-driven, and could only be indirectly influenced by monetary policy in the medium term<sup>24</sup>.

From the previous discussion, it will be clear that the only strategy through which the NBB could positively influence the size of  $L$  consisted of playing with  $P^f$ . If this were the case, a direct positive relationship should be observed between the amount of the cash surplus and the variations of the foreign portfolio. This is what figure 3 illustrates: in the scrutinized period, the NBB increased and decreased foreign reserves as a function of its own liquidity

<sup>22</sup> Other minor items actually existed on both sides of the balance, like the stock capital and a small amount of Belgian sovereign bonds; yet, as the evolution of these items was almost irrelevant in the short term, they are not taken into account here.

<sup>23</sup> Of course, the same applies for  $M^c$ , whose size was determined automatically by  $B^i$  and  $D$ .

<sup>24</sup> This is a problem modern central bank have been facing very compellingly a few decades ago. After some failed experiments in quantitative control of the monetary base during the 1970s, central bankers nowadays agree on the principle that monetary policy implementation should not focus on *quantities* (whose extent is demand-driven) but on *prices* (whose level can be positively influenced by central banks). On these issues, see Bindseil (2004, pp. 234-253).

position. The figure also suggests that the Bank was targeting a certain level of  $L$ , set at around 7.5 million Belgian francs.

Provided that the NBB was resorting to its foreign portfolio in order to stabilise the cash surplus, what does account for the different kinds of operations implemented on the foreign exchange market? Figures 4.1-2 show the Bank converting  $P^f$  into  $L$  (and vice-versa) through two different techniques<sup>25</sup>. On the one hand, a (strictly) *sterilised operation* consisted of a direct conversion of bullion into foreign bills (and vice-versa), leaving the liability side of the Bank's balance sheet unchanged (see figure 4.1). On the other hand, a *non-sterilised operation* consisted of exchanging foreign bills against banknotes (and vice-versa), entailing changes on both sides of the Bank's balance sheet (see figure 4.2). A trade-off existed between these two techniques for controlling  $L$  by acting on  $P^f$ . Sterilised operations were more expensive than non-sterilised ones: while buying or selling foreign bills against banknotes virtually entailed no transaction costs, purchasing or dismissing bullion abroad always implied a number of non-negligible fees<sup>26</sup>. However, as figure 4.2 shows, non-sterilised operations were a rather inefficient technique for converting  $P^f$  into  $L$  (and vice-versa): only one-third of the total change in the foreign portfolio (and in circulation) translated into a change in the cash surplus, and beyond a given level, their impact on the monetary base could be big enough to entail destabilising effects on the domestic money market.

As a consequence, it seems logical to expect the Bank to implement non-sterilised operations close to the targeted level of  $L$  (where the required adjustment is small) and sterilised operations far from that level (where the required adjustment is big). Figure 5 lives up to such expectations. Non-sterilised operations are mostly implemented close to the previously observed targeted level of cash surplus (around 7.5 million francs), while they tend to abate at the extremes; on the contrary, sterilised operations are seldom implemented at the centre of this 'band', and often at the margins.

The particular shape of the two distributions in figure 5 tells something about the Bank's perception of risk: as a matter of fact, the risk of seeing the cash surplus disappear was perceived as less bearable than the risk of losing profits due to redundant bullion holdings – or alternatively, brutally decreasing the circulation was perceived as less desirable than brutally increasing it. This is not to be interpreted as evidence of a particularly prudential attitude. On the contrary, one could argue that the small distance between the lower point at which sterilized operations started to be implemented (around 5 million) and the targeted level of  $L$  (around 7.5 million) proves that such a level was actually fixed at too low a point – and this, due to excessive profitability concerns.

To sum up, empirical evidence confirms that the NBB's was mainly using foreign exchange operations not as an instrument for intervening on the exchange rate, but as a way for stabilising its own liquidity at a level compatible with both safety and profitability concerns. This provides a rationale for the total size of the Bank's foreign portfolio. What was the rationale for the currency composition of these reserves, then?

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<sup>25</sup> Swaps (or loosely sterilised operations) are not taken into account here, as they do not entail a variation in the total size of the foreign portfolio.

<sup>26</sup> These are the same fees allowing for the existence of bullion points (freight, insurance, loss of interest).

### 3.5: Foreign Portfolio Composition

If the NBB was not mainly implementing foreign exchange operations with the aim of influencing exchange rates, what did dictate the frantic activities observed in figures 2.1-6? By far, the simplest answer that comes to mind is: profit-seeking. This paragraph will test if such an hypothesis works, and put it into the broader context of the NBB's foreign exchange policy.

To begin with, it will be assumed that the NBB allocated the cash surplus  $L$  to foreign currencies taking into account no other factor than expectations on future returns. Expected returns on foreign bills are composed by two factors: a certain one, i.e. the discount rate applied at the moment of purchase ( $i^f$ ), and an uncertain one, i.e. the expected rate of spot exchange rate depreciation ( $E_t(e_{t+1})/e_t - 1$ ). Different approaches have been followed in order to estimate the latter variable (Papaioannou et al. 2006). If one assumes – as it is convenient in the case of freely floating exchange rate regimes – that  $e$  follows a random walk in the short term, then the expected depreciation may be taken as zero. Yet in the period considered here, all the currencies the NBB dealt with floated within a band and around a certain parity with respect to the Belgian franc: as a consequence, expectations of future variations of  $e$  must have played a non-negligible role.

In order to assess such a role, it is convenient to refer to the target-zone approach adopted by Ugolini (2010) in order to analyse the international monetary system in the mid-19<sup>th</sup> century. In that framework, the basic assumption is that the expected rate of exchange rate depreciation equals the interest rate differential ( $i^d - i^f$ ) minus a risk premium  $\alpha$ , i.e.

$$\frac{E_t(e_{t+1})}{e_t} - 1 = i^d - i^f - \alpha$$

This risk premium is defined as the *ex-ante* expected deviation of future exchange rates from the uncovered interest rate parity (UIP) condition, or

$$\alpha = i^d - i^f - \beta s^{Par} - \varepsilon$$

where  $\varepsilon$  is an error, and  $s^{Par}$  is the exchange rate deviation from the arbitrated par.

By substitution, the expected return on the foreign currency will be equal to

$$E_t(r_{t+1}) = i^f - \left( \frac{E_t(e_{t+1})}{e_t} - 1 \right) = i^f - (i^d - i^f - \alpha) = i^f - \beta s^{Par} - \varepsilon$$

Now, in order to be able to use this formula to compute expected returns, one has to make assumptions on the value of the two parameters. It will be assumed that 1)  $\beta_{90} = 1$ , which means that the expected time horizon for the realignment of the exchange rate equals the time horizon of the investment, i.e. ninety days (a very drastic assumption indeed, taken for simplicity's sake); and that 2)  $\varepsilon = 0$ , which means that no error occurs. As a result, the expected return on foreign currency in ninety days' time is computed as

$$E_t(r_{t+90}) = i_{90}^f - s^{Par}$$

Figure 6.1 plots the results of these computations. In order to check if the initial hypothesis of portfolio allocation is verified, the series on expected returns are matched with data on variations in the composition of foreign reserves (figure 6.2). What one sees is that big changes take place, and they all seem to be dictated by expected returns. Take the case of the most important international currency of the time, i.e. the British pound: the NBB purchased

and bought sterling only looking at the profitability of the placement. When in early 1852 expected returns on this currency plunged for many months, the Bank stopped renewing its bills on London at maturity, up to the point of depleting sterling reserves completely (see figure 7). Large portfolio diversification in the same months was dictated by the need to substitute for pound holdings, rather than by the need to intervene on different currencies.

It is interesting to note that, in general, the profitability threshold at which the Bank started to buy was an expected quarterly revenue rate of about 0.5% – corresponding to an annualised rate of more or less 2%. As this kind of investment was (almost) riskless and fully liquid, we cannot think of this rate as a particularly low one<sup>27</sup>.

Two elements seems to be in conflict with the predicted allocation behaviour by the Bank. First, figure 7 shows that in contrast with all other currencies, total holdings of French francs were not anymore sensitive to expected returns when they plunged below a certain threshold. Second, figures 6.1-2 show that in December 1853, the NBB performed big sales of British pounds despite high expected returns, and big purchases of French francs despite much lower expected returns.

This calls for further investigation. Figures 8.1-6 display the distribution of all kinds of interventions vis-à-vis the expected rate of return for every one of six foreign currencies the NBB dealt with. The overall picture confirms the findings of figures 6.1-2: resource allocation appears to be a function of expected returns<sup>28</sup>. However, figure 8.1 shows that, while non-sterilised purchases of French francs were direct proportional to expected returns, sterilised purchases were not. This is a noteworthy result, as it suggests that sterilised operations were carried out regardless of their cost – which confirms the previous finding that foreign policy choices depended, first and foremost, on the level of  $L$ . The chart also suggests why French franc reserves were insensitive to expected returns below a certain threshold: as bullion was almost exclusively drawn from the Paris market in the form of silver 5-franc species, the French franc was the only proper ‘reserve currency’ the NBB held in its portfolio.

This leads back to the question of the puzzling events of December 1853. They are illustrated by point *I* in figure 8.2, and points *II* and *III* in figure 8.1. It is possible to observe that the Bank’s final purpose was to accomplish a sterilised sale of French francs to pay for bullion imports from Paris (point *III*). But in case the Bank had directly purchased bullion in Paris, its French franc reserves would have plunged well beneath the desired levels (see figure 7). In order to avoid that, it was decided to buy French francs by selling British pounds in London (points *I* and *II*) in spite of very high expected returns on pounds. Once again, this comes as a confirmation to the previous findings: liquidity concerns determined the Bank’s policy first; then, foreign exchange operations were performed in order to allocate in the most profitable way those resources that the size of  $L$  allowed to invest.

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<sup>27</sup> This rate was indeed lower than the official NBB discount rate; but domestic bills were of lower quality than foreign ones both from the point of view of risk (foreign bills were always endorsed by first-class merchant banks) and from the point of view of liquidity (domestic bills could not be realised before maturity). As foreign and domestic bills were actually two very different classes of assets, a direct comparison between the yields of the two, assuming perfect substitutability, is inappropriate.

<sup>28</sup> Note that figures 8.1-6 provide a justification for the numerous foreign exchange ‘swaps’ implemented by the NBB: not having any effect either on exchange rates or on the Bank’s balance sheets, ‘swaps’ can be only explained as an instrument for modifying the currency composition of the foreign portfolio – and thus, as the ideal instrument for profit-enhancing foreign exchange operations.

### *3.6: The 1851-1853 Experience: Conclusions*

Thanks to a newly-created, high-frequency database on the foreign exchange activities of the NBB during the years 1851-1853, this section has looked for the determinants of the Bank's policy. Empirical evidence has shown that Belgium's central bank was using foreign exchange operations not for the stabilisation of the exchange rate, but for another intermediate target – viz. the stabilisation of central bank liquidity. Foreign reserves emerged as the ideal instrument in order to pursue such a target. This determined the total size of the foreign portfolio, whose composition was then mainly driven by expected returns.

The success of the NBB's strategy of stabilisation of central bank liquidity rested on a savvy combination of opacity and transparency. On the one hand, nothing was known about the Bank's foreign exchange policy – neither the size of its reserves, nor the scale and scope of its interventions. On the other hand, the balance sheets of the NBB were published monthly, and the public could look at one single synthetic item (i.e. the cash surplus) in order to assess the strength of the Bank's position. An indicator of the central bank's ability to act counter-cyclically, a stable  $L$  was supposed to enhance the credibility of current monetary arrangements. What mattered in the end was the preservation of central bank liquidity, not the way in which such a preservation was obtained.

The conclusion of this section is that no foreign exchange *intervention* properly speaking took place during the first three years of existence of the NBB. Yet, one could argue that this depended on the absence of major shocks during this period. Could the stabilisation of the cash surplus alone deliver the degree of monetary independence observed in figure 1? The operations implemented by the Bank in December 1853, when the first international disturbance hit the Belgian monetary system, suggest that more sophisticated strategies were at work in the event of crises. Now that the overall rationale of foreign reserve management has been clarified, the next section will focus on foreign exchange intervention properly speaking.

## **4. Reacting to Shocks: An Analysis 1851-1861**

### *4.1: The 1851-1861 Experience: Introduction*

In order to analyse foreign exchange intervention by Belgium's central bank in the 1850s, the first problem to be resolved consists (once more) of the construction of the relevant data series. Besides being extremely time-consuming, the strategy adopted in order to create the database for 1851-1853 cannot be extended to the whole decade due to a discontinuity in the quality of information provided by the source.

Nevertheless, another way to estimate the Bank's foreign exchange operations does exist. As article 9 of the Statutes required every operation of this kind to be approved by a large



majority of Directors (4 out of 6, plus the Governor), the minutes of the Administration Board report every purchase and sell order the Bank decided to execute. Unfortunately, the source is very often elusive about the sums to be purchased or sold. What the minutes always report, however, is the length of the purchasing or selling time – reporting, say, a purchasing order on the first day of the month and its revocation two weeks later, which gives a 50% monthly purchasing time. As a result, one can construct a quantitative series of foreign exchange operations based on the total purchasing and selling time established by the Administration Board<sup>29</sup>.

Figure 9 plots data from this new series in the same context as figure 5: sterilised and non-sterilised operations (quantified by total transacting time) are shown vis-à-vis the cash surplus. Despite the difference in the definition of operations, the outcome for 1851-1861 is similar to the one previously obtained for 1851-1853<sup>30</sup>. This suggests that the validity of the results of section 2 can be extended to the whole of the 1850s.

Building on this new data series (as well as on other previously unavailable weekly financial series), this section looks at foreign exchange intervention properly speaking with the aim of understanding how the NBB reacted to shocks in order to defend monetary independence. For brevity's sake, the analysis will be focused on one bilateral exchange market only – viz. the one for British pounds. This is not only due to sterling's role as the international currency *par excellence*: as a matter of fact, the minutes of the Administration Board report at least six episodes of direct intervention on the British currency explicitly aimed at impacting the exchange rate. Such episodes will be looked at in depth.

#### *4.2: Violations of the Bullion Points and Foreign Exchange Intervention*

Were there violations of the currency band between the Belgian franc and the British pound during the 1850s? As a reliable series of bullion points cannot be properly constructed, it is reasonable to look at actual outflows of precious metals as evidence of violations. This is done in figure 10, which juxtaposes the gross profitability of exporting silver species from Belgium to Britain with quantitative and qualitative evidence of silver shipments<sup>31</sup>. It appears that exports of bullion took place when the gross profitability of the operation exceeded around 0.5%. The striking thing, however, is that the exchange rate on London was often above this threshold during the decade – almost constantly from June 1855 to December 1857, and again from October 1858 to June 1860.

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<sup>29</sup> Archival evidence encourages to consider the length of each operation as a reliable proxy of its size. Incidentally, note that the duration of intervention has been taken as a proxy for size even by some contemporary scholars (Dominguez and Frankel 1993, p. 73). As operations on German currencies became increasingly rare after 1854, this series only takes into account purchasing and selling orders in French francs, British pounds, and Dutch guildens.

<sup>30</sup> A version of figure 9 including only data from 1851-1853 provides a picture fairly similar to figure 5. This can be taken as a good test of the reliability of the new series. It is not provided here for brevity's sake.

<sup>31</sup> Quantitative evidence consists of the actual shipments of silver species made by the Brussels agent of NM Rothschild & Sons to the London house. Qualitative evidence consists of written witnesses of silver shipments to Britain by Belgian arbitrageurs: such reports are taken from two different sources, i.e. both the correspondence of the Rothschild agent in Brussels and the minutes of the NBB Administration Board.

In the course of the 1850s, the minutes of the NBB Administration Board report at least six episodes of direct intervention on the foreign exchange market explicitly aimed at lowering the exchange rate on London. These episodes are marked in red in figure 11. Clearly, their chronology do not follow that of the violations of the currency band: the occurrence of a violation was a necessary, but not a sufficient condition for direct intervention. As shown by figure 11, another condition had to be met: a reduction of central bank liquidity to dangerous levels. To put it differently: an outflow of bullion from the country did not trigger marginal intervention by the NBB, provided that the exported bullion came from the circulating stock and not from the Bank's own reserves.

Persistent violations of the bullion points suggest that substantial amounts of silver were shipped from Belgium to Britain during the second half of the 1850s. In a seemingly imprudent attitude, the NBB was not reacting directly to this apparent depletion of the country's stock of bullion – which should have amounted to a contraction of the monetary base. Why did the Bank let the Belgian franc stay so depreciated – or differently said, why did it not react to such a weak credibility of the peg?

#### *4.3: A Matter of Standard*

As a matter of fact, the weakness of the exchange rate did not derive from a lack of credibility. Actually, there was a technical constraint that did not allow for the Belgian franc to appreciate with respect to the British pound as it would have done under normal conditions. This constraint consisted of the identity of circulation between Belgium and France<sup>32</sup>. This identity prevented the Belgian franc from appreciating with respect to the French franc; but France was on bimetallism, and the bimetallic mechanics was preventing the French franc from appreciating with respect to the British pound (Flandreau 2004). Figure 12 plots together the exchange rate between the French and the Belgian franc, as quoted in Paris and in Brussels. An interesting phenomenon occurred between 1856 and 1861: the exchange rate on Paris depreciated to a certain extent in Brussels, but during the very same period the exchange rate on Brussels was not quoted anymore in Paris. The reason is straightforward. Paris and Brussels were so close and so well-connected that the cost of transporting species from one city to the other was a trifle: in 1851, the NBB estimated that when the exchange rate exceeded 1.00125, shipping species was already more convenient than buying bills<sup>33</sup>. From 1856 to 1861, the exchange rate went far beyond the 1.00125 level: as a consequence, bills on Brussels ceased to be quoted in Paris, as sending species directly to Belgium had become much cheaper.

However, Belgium was not losing to Britain the same silver species that it was taking from France: what Belgian arbitrageurs (except the NBB itself) were importing from France was

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<sup>32</sup> Since the Germinal reform of 1803, French species had always formed the bulk of metallic circulation in Belgium. In concomitance with the great shock in gold prices of 1850, on 28<sup>th</sup> December of that year a bill depriving gold species of the status of legal tender was passed: this amounted to abolishing bimetallism and establishing silver monometallism. But Belgian people had always been accustomed to use all kinds of French species in payments: as a consequence, gold francs continued to circulate freely in the country (Parker Willis 1901).

<sup>33</sup> AGR/AR, BNB/NBB, PV CdA, 1<sup>st</sup> April 1851.

not silver, but gold species. The reason for the depreciation of the French franc with respect to the Belgian franc is illustrated in figure 13: the phenomenon was triggered by the dramatic reduction in the purchase price of gold francs by the NBB. But the Bank did not manage to push the market price of these species as low as its own purchase price, because unaware Belgian people had been acquainted with them for decades and thus continued to accept them at par: as a result, the influx of French gold into the country's circulation continued. In an effort to eradicate these old customs, in July 1859 the Parliament decided to have the price of gold francs listed at the Brussels bourse<sup>34</sup>; but shipments did not stop either. The increasing scarcity of silver in circulation and the Bank's hawkish attitude ended up in sparking disappointment within the public, and a lobby started to campaign in favour of the fixing of a legal value for French gold pieces. The campaign succeeded: on 12<sup>th</sup> April 1861, the Upper House of the Parliament voted the demission of Belgium's pure silver standard. Since 6<sup>th</sup> June 1861, the country found itself on a bimetallic foot<sup>35</sup>.

To sum up, the *de facto* currency union existing between Belgium and France was preventing the Belgian franc from appreciating with respect to the French franc, and thus with respect to all other currencies. This explains why the NBB did not embark into foreign exchange intervention in the event of any violation of the band: when the Bank's bullion reserves were untouched, the silver shipped to Britain came from the circulating stock of the country – in which, unlike at the Bank's counters, it could be replaced by gold. As far as this situation went on, no real danger existed, except the eventual demise of silver monometallism<sup>36</sup>. On the contrary, a reduction of the Bank's own bullion reserve driven by shipments was a different matter, as it meant the real risk of impairment of convertibility rules. That is when foreign exchange intervention properly speaking was actually performed.

#### 4.4: Foreign Exchange Intervention at Work

On 20<sup>th</sup> October 1855, the minutes of the NBB Administration Board report the following sentence pronounced by the Governor:

*'If [1] the domestic portfolio were to grow and [2] the foreign portfolio were to halve with respect to its current level, then there would be room for [3] raising the interest rate on repurchase agreements before changing [4] the discount rate and [5] eligibility criteria for domestic bills'.*

This is perhaps the best synthetic enunciation of the Bank's strategy in the event of monetary disturbances. First of all, the Bank would continue to lend freely to domestic agents in order

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<sup>34</sup> A second special Committee (the first one had been appointed in April 1858) discussed in March 1859 the question of the invasion of gold species; no steps were taken except the listing of the price of gold francs at the bourse (Belgique – Chambre des Représentants 1859).

<sup>35</sup> Another country that had long been accustomed to using French species as circulating media, i.e. Switzerland, was facing precisely the same phenomenon in those years. Gold francs were given legal tender in the Confederation on 14<sup>th</sup> January 1860. All these problems were at the root of the signing of the Convention of 1865 that instituted the Latin Monetary Union, which included France, Italy, Belgium, and Switzerland (Parker Willis 1901).

<sup>36</sup> As long as the bimetallic mechanics had stabilising effects on the relative prices of gold and silver (Flandreau 2004), a switch from the silver standard to bimetalism did not imply a drop in the credibility of the national currency.

to meet increasing demand for credit. Secondly, it would start selling its foreign assets in order to stop the decrease of the cash surplus without reducing the provision of credit to the domestic system. Thirdly, it would raise the interest rate on foreign exchange repos in order to shrink profitability margins for bullion exporters. Fourthly, in case all the previous steps had not been enough, it would resort to raising domestic discount rates. If and only if this latter measure had not worked (which never happened to be the case, except at the outbreak of the Franco-Prussian war in July 1870), then the Bank would change eligibility criteria for domestic bills – which amounted to *de facto* credit rationing, i.e. the disruption of lending-of-last-resort operations.

Foreign exchange intervention consisted of steps number 2 and 3, aimed at delaying the increase in interest rates. They deserve special attention.

- a. Plain vanilla interventions. The rationale of these operations was straightforward: by selling pounds on the Antwerp market, the NBB tried to lower the deviation of the exchange rate on London with respect to the silver arbitrated par, thus annihilating the net profitability of bullion arbitrage. Apparently, this strategy was successful in the very short term, as in the case of December 1853, August 1856, or July 1857 (see figure 10)<sup>37</sup>. However, in most cases the effect vanished as soon as sales came to an end: to all likelihood, the stop was dictated by a depletion of the Bank's sterling reserves. As the Bank refused to borrow reserves abroad<sup>38</sup>, the Bank did not have any choice but stopping plain vanilla interventions once its foreign portfolio was over.
- b. Repo rate policy. Since August 1851 the Bank had opened a new standing facility, named *achats et ventes d'effets sur l'étranger*: the Bank bought spot foreign bills and resold them forward at the same price plus a fixed interest rate<sup>39</sup>. As far as it is possible to know, this is the first documented case of a central bank using this kind of instruments<sup>40</sup>. Archival sources do not provide many elements on the reasons why the Bank gradually entered this business, but one has the sensation that at the very beginning this was merely an additional way of investing the cash surplus<sup>41</sup>. The facility was supposed to be an ideal tool for exporters: as the interest rate applied by the NBB was homogeneous on all kinds of foreign bills, it often happened that the

<sup>37</sup> In the correspondence of the Rothschild agent in Belgium, one finds evidence that the Bank's plain vanilla interventions effectively shrank the profitability margins of silver exporters in the short term. For instance, in June-July 1857 the London Rothschild house had to stop selling pounds because of the NBB's action to depress the exchange rate, and tried to finance the purchase of silver species by selling French francs; however, the Bank increased the supply of this currency as well, and the Rothschilds had to resort to selling Hamburg marks banco, whose market in Belgium was not too liquid. RAL, Correspondance, XI/78/1B.

<sup>38</sup> This was a technique other central banks did not refuse to adopt, but came at a remarkable cost – as shown by the experience of the Bank of Portugal (Reis 2007).

<sup>39</sup> Strictly speaking, from the point of view of the Bank this was a *reverse* repurchase agreement.

<sup>40</sup> Up to now, scholars had never realized that the NBB was actually performing such sophisticated operations. For instance, the Bank's official historian, Kauch (1950, p. 59), seems to interpret the words *achats et ventes d'effets sur l'étranger* as 'outright purchases and sales of foreign bills' (plain vanilla interventions), without wondering why a uniform interest rate was mentioned relative to this kind of transactions.

<sup>41</sup> The first customer with which a foreign exchange repo was contracted was not even a Belgian bank, but the Frankfurt house of Goldschmidt: AGR/AR, BNB/NBB, PV CdA, 14<sup>th</sup> August 1851. It is interesting to notice that these operations were mostly performed by the Antwerp branch, and contrary to plain vanilla interventions their turnover did not impact the official foreign reserves of the Bank. Actually, due to quality concerns, the customer was typically expected to buy back the very same bill that he had previously sold: as a consequence, pawned bills were not sent to the headquarters of the Bank in Brussels, but remained at the Antwerp office.

repo rate was lower than the interest rate applicable on that currency, which made the choice of borrowing on the security of bills more convenient than discounting them on the market. As a consequence, repos began to be widely used by a particular class of exporters, i.e. bullion arbitrageurs<sup>42</sup>. The Bank typically raised the repo rate before all other rates: discussions in the Administration Board confirm that the main aim was to contrast silver exporters, many of whom financed themselves through this facility<sup>43</sup>. The move was supposed to have the same effects as plain vanilla interventions, i.e. shrinking profitability margins for bullion exporters<sup>44</sup>.

#### *4.5: A Case Study: The 1857 Crisis*

The most interesting example of the NBB's policy during the 1850s is probably its reaction to the 1857 crisis, by far the most violent shock of the decade<sup>45</sup>. The Bank's attitude is illustrated by figure 14. In the early spring of 1857, improving central bank liquidity suggested the NBB to drop its rates in spite of the weakness of the Belgian franc with respect to the British pound. Unfortunately, this coincided with tighter money on the London market: this led to a recrudescence in silver shipments to Britain, and thus to an erosion of the Bank's bullion reserves mostly due to withdrawals by exporters. The deterioration of the cash surplus prompted the Bank to implement direct intervention on the foreign exchange market. Since mid-April, conspicuous sales of sterling were enacted in Antwerp. These plain vanilla interventions only had limited (and short-lived) effects in pushing the exchange rate down to the arbitrated par – they met some success in July, which quickly abated as soon as the Bank's sales stopped. Moreover, the fall of sterling was also tied to a temporary ease in London market interest rates, which decreased more than 1% in the same weeks. Nonetheless, sales proved effective in stopping the fall of central bank liquidity, which returned to increase in June.

In mid-July, however, bullion reserves sunk dramatically; by the end of the month, they would fall slightly below the statutory coverage ratio of one-third of the Bank's sight liabilities<sup>46</sup>. In view of the depletion of the sterling portfolio, the NBB rapidly raised its repo rate to the maximum level allowed by the Code de Commerce (an usury ceiling was still fixed

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<sup>42</sup> In late 1854, Director Depouhon proposed to his colleagues to close down the Bank's repurchase facilities, arguing that customers made repos 'directly for exporting 5-franc species'; he added that the facility was only occasionally used for other purposes, so that its suspension would 'exert very few influence on the country's general business'. AGR/AR, BNB/NBB, PV CdA, 23<sup>rd</sup> December 1854.

<sup>43</sup> AGR/AR, BNB/NBB, PV CdA, 7<sup>th</sup> and 23<sup>th</sup> December 1854; 20<sup>th</sup> October 1855; 17<sup>th</sup> and 29<sup>th</sup> January 1856; 17<sup>th</sup> June 1856; 2<sup>nd</sup> April 1859. As time passed and the turnover of repurchase operations grew, the NBB tried to restrict access to this facility to Belgian agents only, refusing to accept bills directly remitted by foreign bankers.

<sup>44</sup> This seems a rather rudimentary way of using derivatives as a tool for monetary policy. More sophisticated techniques could be conceived (Jobst 2009). The lack of institutionalised forward exchange markets, however, implied that the scale and scope of repo policies had to be rather limited in the Belgian case.

<sup>45</sup> For a general account of this international crisis, see the classical work by Morier Evans (1859).

<sup>46</sup> The Statutes of the NBB gave the Finance Minister the power of allowing the minimum coverage ratio to pass temporarily from one-third to one-fourth of sight liabilities. The Minister preferred the Bank to let the cash surplus turn negative rather than to raise the discount rate abruptly. This was also the case at the peak of the crisis: AGR/AR, BNB/NBB, PV CdA, 14<sup>th</sup> November 1857.

by the Belgian law at 6%)<sup>47</sup>. This brought the NBB repo rate to a higher level than the London market rate, thus annihilating the convenience of using this facility for exporting silver to Britain.

A period of ease followed. In late August and September the profitability margins of shipping silver shrank, and the Bank's cash surplus was restored. In the early days of October, however, London was hit by panic, and market interest rates skyrocketed there. As soon as they went over 6%, the NBB decided to suspend repurchase facilities altogether. At this point only, in front of a sharp drop in bullion reserves, the discount rate on domestic bills was raised twice. Yet at the very peak of the crisis, when interest rates in London touched 10%, this 2% increase to 5.5% was enough for reversing the trend: by the end of November, the Bank's cash surplus had already started growing steadily. In the space of a few weeks the crisis was over, without the Bank having to raise the domestic discount rate up to the levels that had been touched abroad.

#### *4.6: The Last Ingredient: The Structural Liquidity Deficit of the Banking Sector*

The previous paragraph has shown that a crucial factor of the NBB's successful handling of the 1857 crisis was the high effectiveness of the delayed increase of domestic interest rates. Without the market reacting properly to this move, the Bank could have not resisted raising rates up to international levels. It is thus important to try to understand how this was made possible. In his study of the Austro-Hungarian case, Jobst (2009) suggests that the structural liquidity deficit of the banking sector towards the central bank played a fundamental role in the Bank's successful control over the foreign exchange market. Was this also the case in 1850s Belgium?

In the complete absence of any kind of statistics for the 19<sup>th</sup> century, a reasonable way to estimate the central bank's position comes from a comparison between the relative levels of market and central bank interest rates. For instance, take the case of the British money market. It is well known that the Bank of England had a very weak control over domestic rates (Sayers 1936). Threadneedle Street was obliged to 'follow the market': while in quiet times the market was 'outside the Bank', in times of crisis the whole market came 'inside the Bank' (Flandreau and Ugolini 2010). The outcome was an extreme volatility of official discount rates – a situation harshly criticized by contemporary observers (Palgrave 1903).

Figure 15 provides quite a different picture for 1850s Belgium. The market interest rate tended to coincide with (or to be only slightly lower than) the discount rate set by the NBB. The figure conveys the idea of a banking sector with a strong liquidity deficit toward the central bank. This means that unlike the British case, no big market must have existed 'outside the Bank' in quiet times: therefore, unlike the Bank of England, no major shock was

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<sup>47</sup> During the 1857 crisis, usury ceilings were abolished in many European countries (included France). At the peak of the storm, the NBB consulted the Government on the prospect of taking the same step in Belgium as well; the Finance Minister showed a positive attitude and prepared a bill to be proposed to the Parliament, but the worst was over before the move became necessary. The usury ceiling was definitively repealed a few years later (Kauch 1950, pp. 121-122).

met by the NBB when the whole market came ‘inside the Bank’ during crises. As a result, even small increases in the official discount rate were enough to weather the panic<sup>48</sup>.

#### *4.7: The 1851-1861 Experience: Conclusions*

Through the analysis of a number of new data series, this section has looked at those episodes in which the Bank implemented foreign exchange intervention properly speaking during the 1850s. This was done with the aim of understanding how foreign exchange policy was functional to the quest for monetary independence in the event of international financial crises.

Empirical evidence has shown that Belgium’s central bank did not react to violations of the currency band, provided that such violations did not sort any effect on its own bullion reserves. As a matter of fact, the stock of bullion circulating in the country acted as a buffer for official bank reserves, allowing for a more flexible stance by monetary authorities. Always focused on its own liquidity, the NBB implemented proper intervention only when official bullion reserves started to look in danger.

The Bank elaborated a rather sophisticated strategy in order to avoid increasing the domestic discount rate for as long as possible. This included the use of different instruments, such as plain vanilla interventions and foreign exchange repos. The deployment of ‘unconventional’ (for those times’ standards) weapons allowed the Bank to delay recourse to ‘conventional’ ones. This enabled the NBB to take time during the initial part of the crisis, and to start raising the domestic discount rate much later than all other central banks<sup>49</sup>. At the peak of the crisis, there still were large margins for the full effect of tightening to be resented, without rates having to reach the high absolute levels touched abroad. The effectiveness of interest rate policy, however, was conditional to another crucial factor: the net liquidity deficit of the domestic banking system with respect to the central bank.

At the end of the story, one cannot help thinking that the success of the NBB’s quest for monetary independence rested on the large relative size of its assets: its foreign portfolio (which provided vast means for intervention) and its domestic portfolio (which was big enough to meet the liquidity deficit of the national banking system). In turn, the size of assets depended on the size of liabilities. On this side of the Bank’s balance sheet, the stock capital was rather modest (Kauch 1950), while the volume of banknote circulation was highly correlated with the volume of the domestic portfolio<sup>50</sup>. The item that was really providing the NBB with a great ‘margin of manoeuvre’ consisted of deposits. Yet the relatively big size of deposits is a rather puzzling circumstance. As no remuneration was paid on them and no

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<sup>48</sup> The importance of keeping the banking system in a moderate liquidity deficit in order to achieve a satisfactory control over domestic interest rates is an issue widely acknowledged by today’s central banks, which have developed a number of instruments aimed at creating this structural condition (Bindseil 2004).

<sup>49</sup> The NBB directors were fully aware of the fact that this strategy only amounted to a temporary delay of the increase of domestic interest rates. For instance, in October 1854 Director Prévinaire declared all his satisfaction for the way the Bank had faced the disturbances of autumn 1853, but warned his colleagues that ‘we must be concerned with the serious difficulties that would arise in the event of a prolonged crisis’. AGR/AR, BNB/NBB, PV CdA, 19<sup>th</sup> October 1854.

<sup>50</sup> This was due to the fact that the main way through which banknotes were put in circulation was the discount of domestic bills at the Bank’s counters.

reserve requirements existed at the time, who was leaving big sums there at a loss? The subject was a matter of discussion during the 1850s and 1860s, as the Bank published no details on the composition of this item. Some critics argued that more than 85% of it consisted of Treasury deposits (Brasseur 1864). Unfortunately, no official data are available to confirm or dismiss such allegations – which nonetheless seem to be rather plausible (Van Elewyck 1913). This opens a fascinating perspective on the institutional arrangements presiding over the functioning of the NBB: the government wanted the central bank to grant low domestic interest rates in order to borrow cheaply, but in exchange for this it had to account for a significant loss of interest on its own deposits. The terms of this trade-off remain to be assessed precisely<sup>51</sup>.

## 5. Summary and Conclusions

Thanks to a considerable bunch of new empirical evidence, this paper has provided the first detailed analysis of the celebrated Belgian model of foreign exchange policy, which allowed for the maintenance of financial openness, a fixed exchange regime, and monetary independence at the same time. The success of this model depended on a number of special ingredients. They may be summarized as follows.

First and foremost, as predicted by the literature on target zones, the establishment of the credibility of the peg was the basic ingredient of the recipe. But contrary to the assumptions of this literature, credibility was not built through the stabilisation of exchange rates or international capital flows, but through the stabilisation of what has been called *central bank liquidity* (i.e. the reserve funds available for intervention before letting the peg go). This policy rested on a savvy combination of transparency (the Bank published data on its own liquidity) and ‘constructive ambiguity’ (nothing was known about the way stabilisation was obtained through the use of foreign exchange reserves). The strategy proved fully effective in enhancing the credibility of the Belgian currency. This was not a Belgian specificity, though: for instance, the late-19<sup>th</sup>-century Bank of England heavily relied on a mix of transparency and opacity in the implementation of monetary policy (Sayers 1936). In the light of the apparently successful performance of 19<sup>th</sup>-century international monetary systems with respect to their successors, this evidence calls for a reflection on the way central banks conceive their communication with markets today.

The second ingredient of the NBB’s success was the reliance on the stock of circulating bullion as a buffer for central bank reserves. As a matter of fact, thanks to the existence of this stock not all outflows of bullion called for central bank intervention: in the end, this provided the monetary authorities with additional flexibility in their reaction to speculative attacks.

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<sup>51</sup> At first sight, one is tempted to suspect that the outcome must have been largely positive, however: by the early 1870s, Belgian sovereign bonds were renowned as those with the lowest yields in the world after the British (*The Economist*, 3<sup>rd</sup> January 1874, p. 6: I am grateful to Riad Rezzik for signalling to me this quotation). Moreover, the transformation of the Belgian franc in a low-yield currency also implied other indirect benefits, deriving from the establishment of international financial activities in the domestic market (Ugolini forthcoming).



This point has an interesting implication: perhaps one of the conditions that impaired the working of the interwar gold standard with respect to the pre-war one was the disappearance of this buffer. Future research might want investigate the impact of the concentration of bullion in the vaults of central banks on the operation of the international monetary system in the wake of the Great Depression.

The third ingredient was the effectiveness of *relative* increases in domestic interest rates in impacting the money market, even though their *absolute* level was lower than the international one. In accordance with what empirical studies have often shown, also in 1850s Belgium the effects of foreign exchange intervention were short-lived: intervention was mainly used as a way to delay interest rate policy. Once this latter policy was implemented, however, its impact was fully felt by the domestic money market even though rates continued to be lower than international ones. This depended on the structural liquidity deficit of the banking system with respect to the central bank. This confirms the importance of a condition that is well-known by practitioners, but not much underlined by the academic literature: a structural deficit is desirable in order for the central bank to be able to influence market interest rates. The insight for monetary historians is that the different performances of central banks should be looked at in the light of the structural features of the banking systems they presided over.

Last but not least, despite the need to meet this deficit, the central bank had ample excess resources to be invested in foreign assets: this was made possible by the size of the Bank's liabilities, to which Treasury deposits contributed substantially. The Government had asked the Bank to keep domestic interest rates low with the aim of reducing the cost of sovereign borrowing, but in order to make this possible it had to contribute to the expansion of the NBB's balance sheets. As deposits were not remunerated, the move must have entailed a non-negligible loss of interest.

All in all, the Belgian experience of the 1850s opens scope for a general reassessment of the working of 19<sup>th</sup>-century international monetary systems. Far from being rudimentary and automatic, they were actively micro-managed through extremely sophisticated sets of monetary policies by shrewd central bankers. No doubts, they still hide many useful lessons for the present that only a micro-oriented historical research will be able to reveal.

## Archival Sources

AGR/AR (Archives Générales du Royaume/Algemeen Rijksarchief), Brussels.  
Fonds Banque Nationale.

- PV CdA: *Procès-verbaux du Conseil d'Administration* (Minutes of the Board of Directors), 1850-1861 (9 volumes).

- IC: *Indicateur de la correspondance du Gouverneur* (Index of the Governor's correspondance), 1851-1853 (6 volumes).

BNB/NBB (Banque Nationale de Belgique/Nationale Bank van België), Brussels.

Archives Centrales/Centraal Archief.

- RAG: *Rapports du Gouverneur à l'Assemblée Générale des actionnaires* (Annual Reports to Shareholders), 1851-1861 (1 volume).

RAL (Rothschild Archive London), London.

Correspondence Department.

- XI/38/212A-B: Lazare Richtenberger (Brussels), 1851-1853.
- XI/78/0A-2B: Samuel Lambert (Brussels), 1853-1861.

## Published Sources

- *Cours authentique de la bourse de Bruxelles* (1851-1861).
- *Moniteur Belge* (1851-1861).
- *Journal de Commerce d'Anvers* (1844-1863, courtesy of SCOB).
- *The Economist* (1851-1870).
- *Cours général de la bourse de Paris publié par Jacques Bresson* (1851-1870).

## References

- Bagehot, Walther (1873), *Lombard Street: A Description of the Money Market*, London: King.
- Bindseil, Ulrich (2004), *Monetary Policy Implementation: Theory, Past, Present*, Oxford: Oxford University Press.
- Brasseur, Henri (1864), *La Banque nationale et la liberté des banques*, Antwerp: De la Montagne.
- Bordo, Micheal D., and Ronald MacDonald (2005), "Interest Rate Interactions in the Classical Gold Standard 1880-1914: Was There Any Monetary Independence?", *Journal of Monetary Economics*, 52, pp. 307-327.
- Bordo, Michael D., Owen Humpage, and Anna J. Schwartz (2007), "The Historical Origins of US Exchange Market Intervention Policy", *International Journal of Finance and Economics*, 12, pp. 109-132.
- Buyst, Erik, Ivo Maes, Walter Pluym, and Marianne Danneel (2005), *The Bank, the Franc, and the Euro: A History of the National Bank of Belgium*, Tielt: Lannoo.
- Conant, Charles A. (1910), *The National Bank of Belgium*, Washington DC: National Monetary Commission.

- Davutyan, Nurhan, and William R. Parke (1995), "The Operations of the Bank of England 1890-1908: A Dynamic Probit Approach", *Journal of Money, Credit and Banking*, 27:4, pp. 1099-1112.
- Dominguez, Kathryn M., and Jeffrey A. Frankel (1993), *Does Foreign Exchange Intervention Work?*, Washington DC: Institute for International Economics.
- Dornbusch, Rudiger, and Jacob A. Frenkel (1984), "The Gold Standard Crisis of 1847", *Journal of International Economics*, 16, pp. 1-27.
- Eichengreen, Barry J. and Marc Flandreau (1997), "Editors' Introduction", in id. (eds.), *The Gold Standard in Theory and History*, 2<sup>nd</sup> ed., London: Routledge, pp. 1-21.
- Esteves, Rui P., Jaime Reis, and Fabiano Ferramosca (2009), "Market Integration in the Golden Periphery: The Lisbon/London Exchange 1854-1891", *Explorations in Economic History*, 46, pp. 324-345.
- Flandreau, Marc (2004), *The Glitter of Gold: France, Bimetallism and the Emergence of the International Gold Standard 1848-1873*, Oxford: Oxford University Press.
- Flandreau, Marc, and John Komlos (2006), "Target Zones in Theory and History: Credibility, Efficiency, and Policy Autonomy", *Journal of Monetary Economics*, 53:8, pp. 1979-1995.
- Flandreau, Marc, and Stefano Ugolini (2010), "Where It All Began: International Trade, the Market for Acceptances, and the Making of Lending of Last Resort in Britain", mimeo.
- Frankel, Jeffrey A., Sergio L. Schmuckler, and Luis Servén (2004), "Global Transmission of Interest Rates: Monetary Independence and Currency Regime", *Journal of International Money and Finance*, 23, pp. 701-733.
- Garber, Peter M., and Lars E. O. Svensson (1995), "The Operation and Collapse of Fixed Exchange Rate Regimes", in Gene M. Grossman and Kenneth Rogoff (eds.), *Handbook of International Economics*, III, Amsterdam: North-Holland, pp. 1865-1911.
- Goodhart, Charles A. E. (1988), *The Evolution of Central Banks*, Cambridge (Mass.): MIT Press.
- Jeanne, Olivier (1995), "Monetary Policy in England 1893-1914: A Structural VAR Analysis", *Explorations in Economic History*, 32, pp. 302-326.
- Jobst, Clemens (2009), "Market Leader: The Austro-Hungarian Bank and the Making of Foreign Exchange Intervention 1896-1913", *European Review of Economic History*, 13, pp. 287-318.
- Kauch, Pierre (1950), *La Banque Nationale de Belgique 1850-1918*, Brussels: BNB.
- Krugman, Paul (1991), "Target Zones and Exchange Rate Dynamics", *Quarterly Journal of Economics*, 106:3, pp. 669-682.
- Michie, Ranald C. (2007), "The City of London as a Global Financial Centre 1880-1939: Finance, Foreign Exchange, and the First World War", in Philip L. Cottrell, Evan Lange, and Ulf Olsson (eds.), *Centres and Peripheries in Banking: The Historical Development of Financial Markets*, Aldershot: Ashgate, pp. 41-80.
- Morier Evans, David (1859), *The History of the Commercial Crisis 1857-58 and the Stock Exchange Panic of 1859*, London: Groombridge.

- Obstfeld, Maurice, Jay C. Shambaugh, and Alan M. Taylor (2005), “The Trilemma in History: Tradeoffs among Exchange Rates, Monetary Policies, and Capital Mobility”, *Review of Economics and Statistics*, 87:3, pp. 423-438.
- Ögren, Anders (2007), “Lender of Last Resort in a Peripheral Economy with a Fixed Exchange Rate: Financial Crises and Monetary Policy in Sweden under the Silver and Gold Standards 1834-1913”, in Philip L. Cottrell, Evan Lange, and Ulf Olsson (eds.), *Centres and Peripheries in Banking: The Historical Development of Financial Markets*, Aldershot: Ashgate, pp. 223-252.
- Øksendal, Lars F. (2008), “Monetary Policy under the Gold Standard: Examining the Case of Norway 1893-1914”, mimeo.
- Palgrave, R. H. Inglis (1903), *The Bank Rate and the Money Market in England, France, Germany, Holland, and Belgium 1844-1900*, London: Murray.
- Papaioannou, Elias, Richard Portes, and Gregorios Siourounis (2006), “Optimal Currency Shares in International Reserves: The Impact of the Euro and the Prospects for the Dollar”, *Journal of the Japanese and International Economies*, 20:4, pp. 508-547.
- Parker Willis, Henry (1901), *A History of the Latin Monetary Union: A Study of International Monetary Action*, Chicago: University of Chicago Press.
- Reis, Jaime (2007), “An ‘Art’, Not a ‘Science’? Central Bank Management in Portugal under the Gold Standard 1863-1887”, *Economic History Review*, 60:4, pp. 712-741.
- Sayers, Richard S. (1936), *Bank of England Operations 1890-1914*, London: King.
- Schiltz, Michael (2006), “An ‘Ideal Bank of Issue’: The Banque Nationale de Belgique as a Model for the Bank of Japan”, *Financial History Review*, 13:2, pp. 179-196.
- Svensson, Lars E. O. (1992), “An Interpretation of Recent Research on Exchange Rate Target Zones”, *Journal of Economic Perspectives*, 6:4, pp. 119-144.
- Svensson, Lars E. O. (1994), “Why Exchange Rate Bands? Monetary Independence in Spite of Fixed Exchange Rates”, *Journal of Monetary Economics*, 33, pp. 157-199.
- Ugolini, Stefano (2010), “The International Monetary System 1844-1870: Arbitrage, Efficiency, Liquidity”, Norges Bank Working Paper 2010/22.
- Ugolini, Stefano (forthcoming), “An ‘Atypical’ Case? The First Emergence of Brussels as an International Financial Centre 1830-1860”, in Youssef Cassis and Laure Quennouëlle-Corre (eds.), *Institutions, Markets and Capital Flows from the 1880s to the Present: Why Are Financial Centres Attractive?*, Oxford: Oxford University Press.
- Van Elewyck, Ernest (1913), *La Banque Nationale de Belgique: Les théories et les faits*, I-II, Brussels: Falk.
- Witten, Paul (1918), “Die Devisenpolitik der Nationalbank von Belgien”, *Schmöllers Jahrbuch für Gesetzgebung, Verwaltung und Volkswirtschaft im Deutschen Reich*, 42:2, pp. 193-228, and 42:3, pp. 135-170.

## Figures

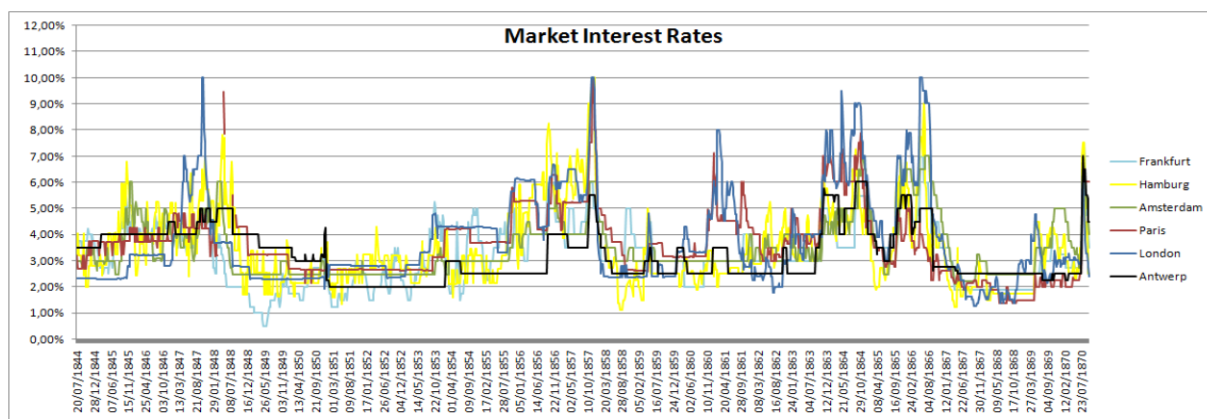
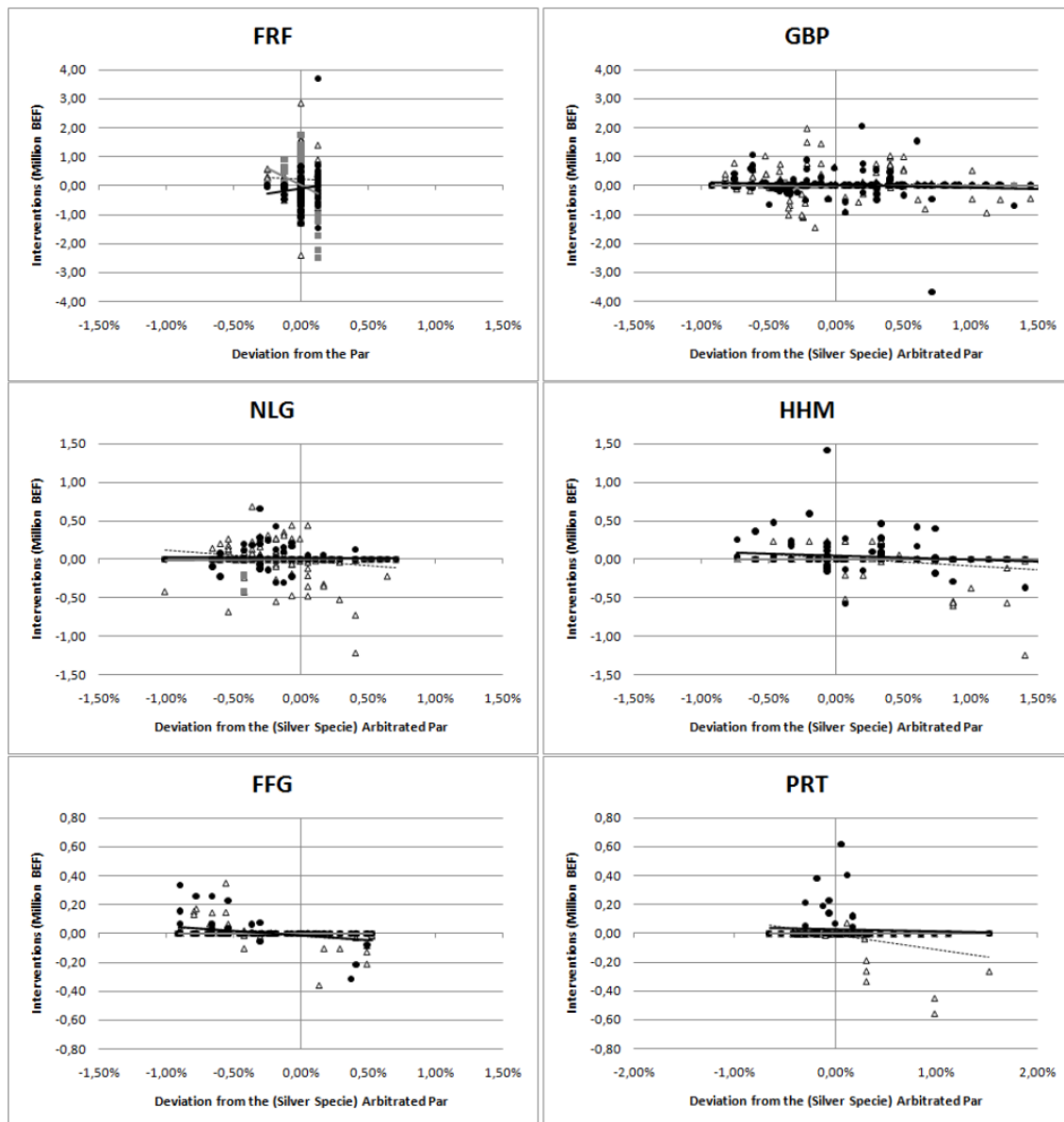


Figure 1: Market interest rates in six financial centres, 1844-1870. Sources: Ugolini (2010), except Antwerp (1844-1863: *Journal de Commerce d'Anvers*, courtesy of SCOB; 1863-1870: *The Economist*).



Figures 2.1-6: Weekly foreign exchange operations (in million Belgian francs) vis-à-vis the deviation from the arbitrated parity, 1851-1853. White triangles: non-sterilised operations; grey squares: sterilised operations; black circles: swaps. FRF: French franc; GBP: British pound; NLG: Dutch guilder; HHM: Hamburg mark banco; FFG: Frankfurt guilder; PRT: Prussian thaler. Sources: NBB interventions: author's database; exchange rates: *Cours authentique de la bourse de Bruxelles*; bulion prices: Ugolini (2010).

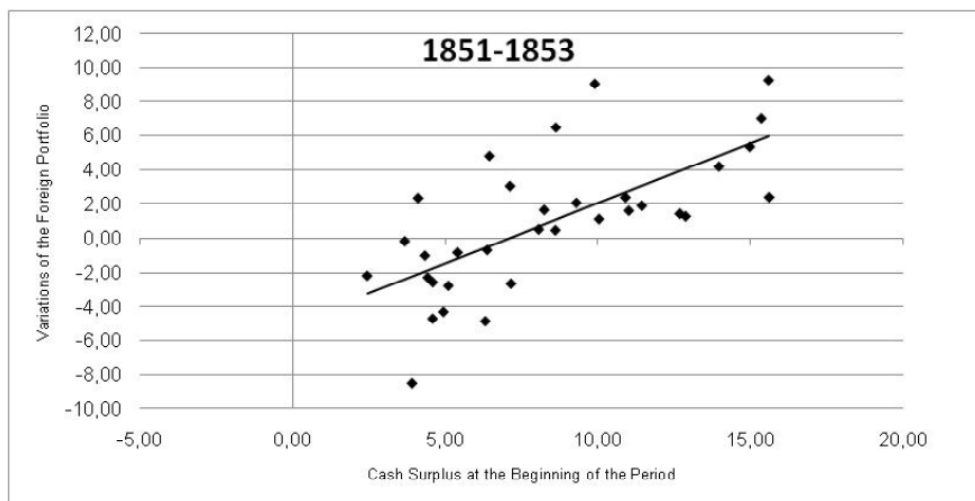
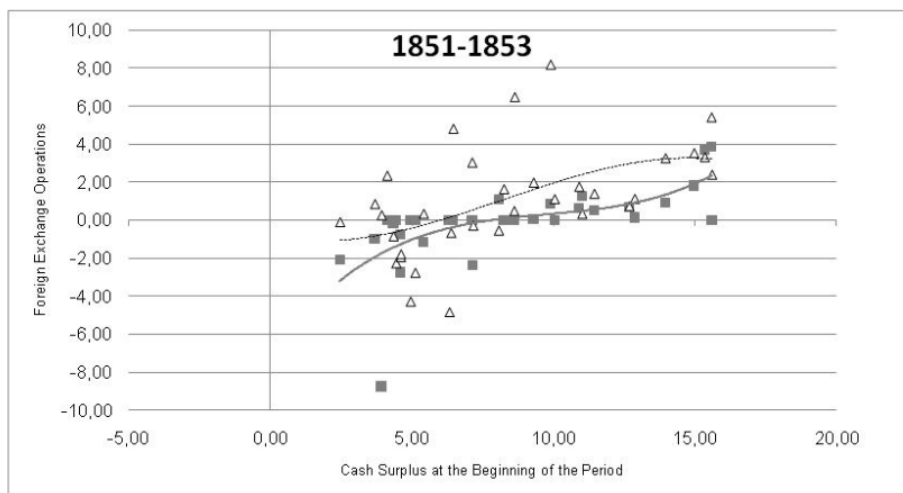


Figure 3: Monthly variations of the foreign portfolio vis-à-vis the cash surplus at the beginning of the month (in million Belgian francs), 1851-1853. Source: author's database.

Assets	Liabilities	Assets	Liabilities
$M^c$	$D$	$=\frac{1}{3}\Delta B^i$	
$\Delta L = -\Delta P^f$		$M^c$	$D$
$L$		$=-\frac{1}{3}\Delta B^i$	
$P^d$	$B^i$	$L$	$\Delta B^i = \Delta P^f$
$\Delta P^f = -\Delta L$		$P^d$	
$P^f$		$\Delta P^f = \Delta B^i$	$B^i$
		$P^f$	

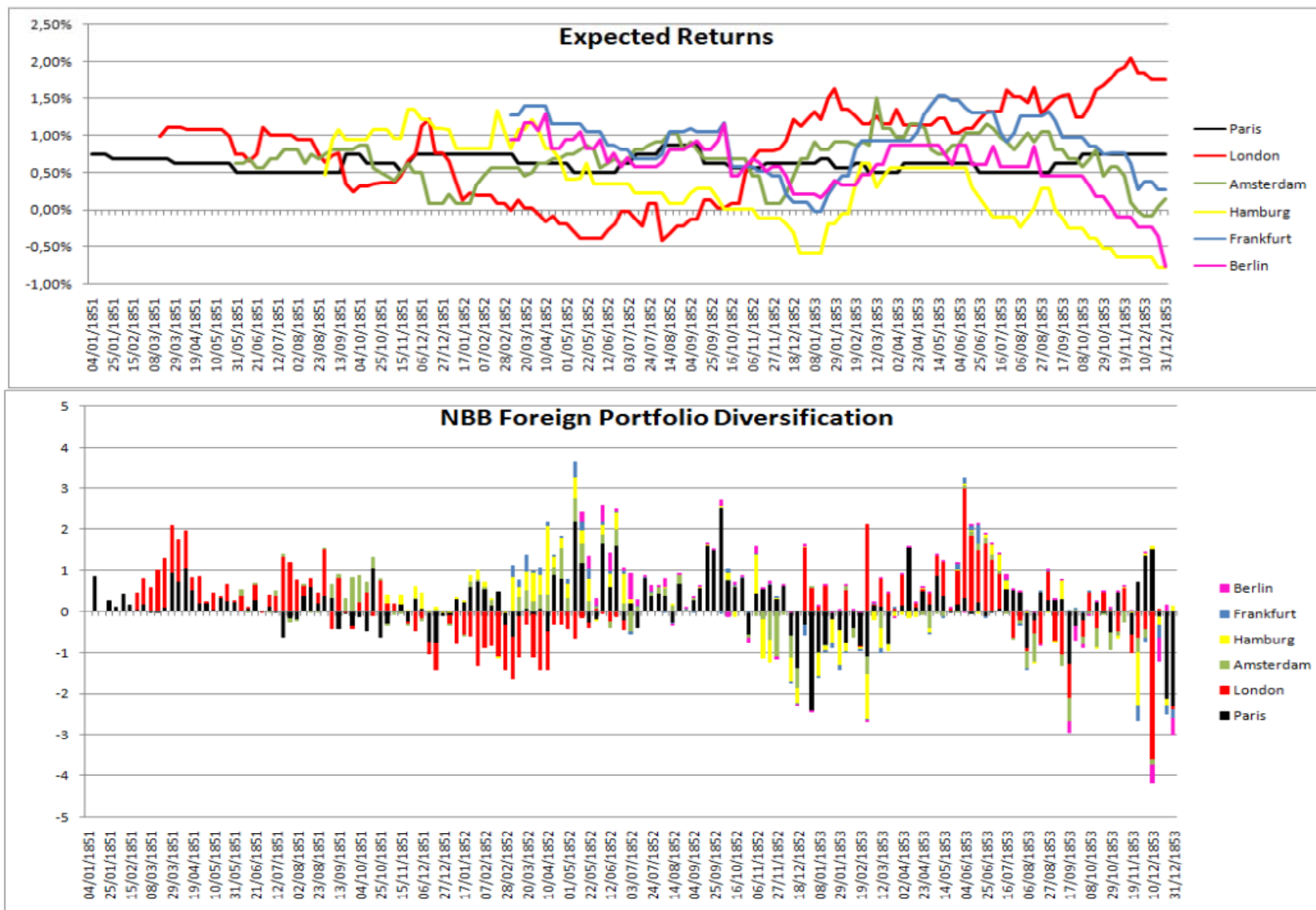
Figures 4.1-2: Effect on the Bank's balance sheet of sterilised operations (left) and of non-sterilised operations (right).



**Figure 5:** Monthly foreign exchange operations vis-à-vis the cash surplus at the beginning of the month (in million Belgian francs), 1851-1853. White triangles: non-sterilised operations; grey squares: sterilised operations. Source: author's database.



Figures 6.1-2: Expected returns and changes in foreign currency holdings (in million francs).



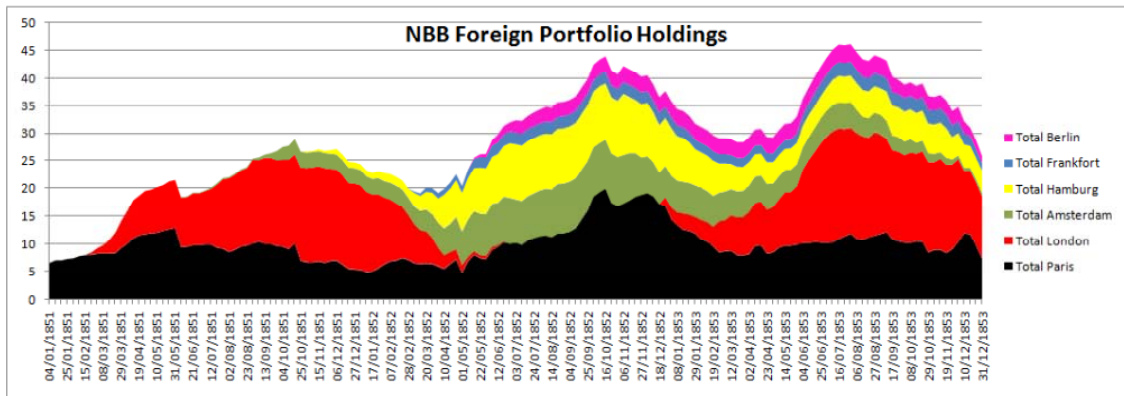
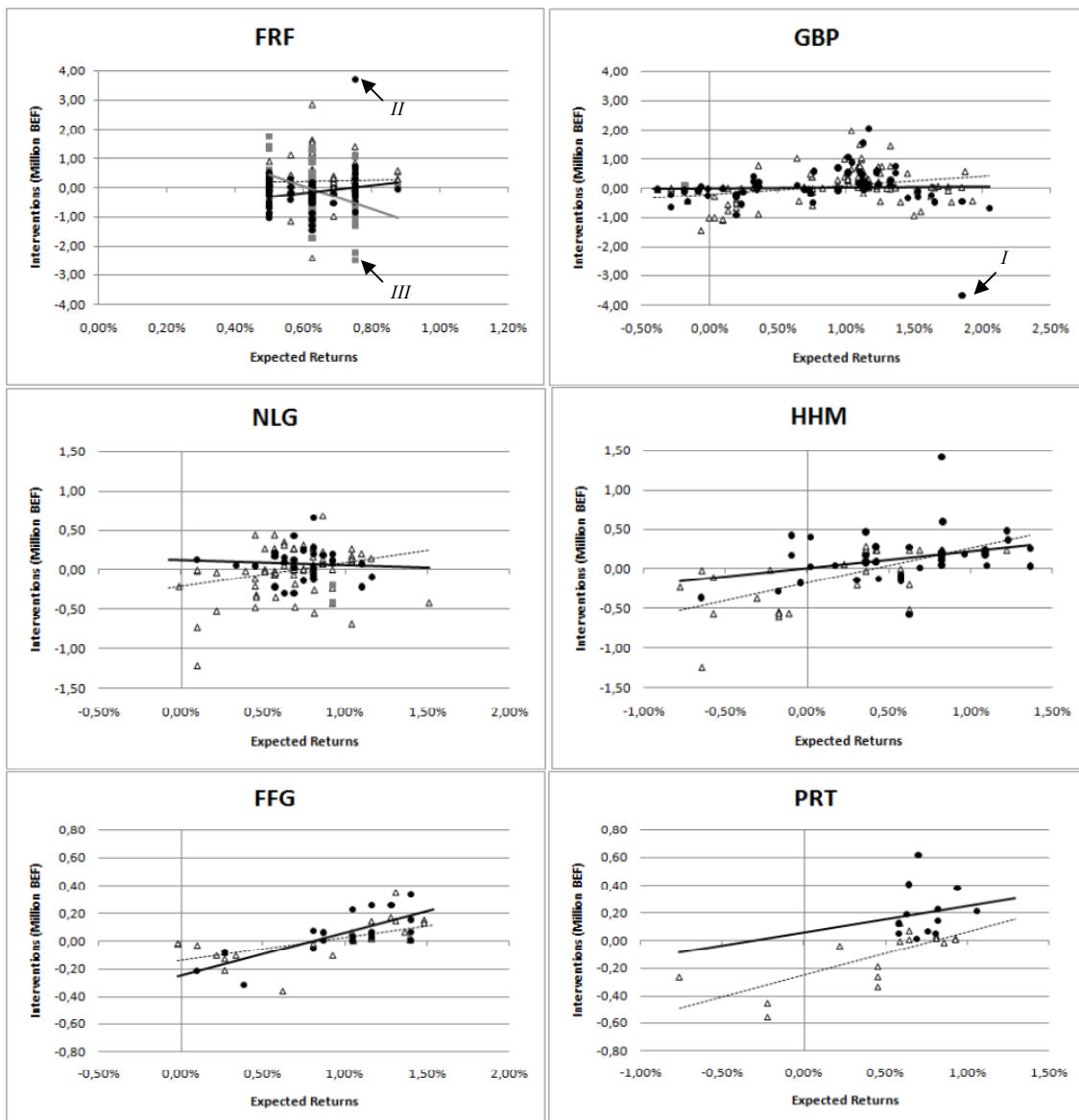
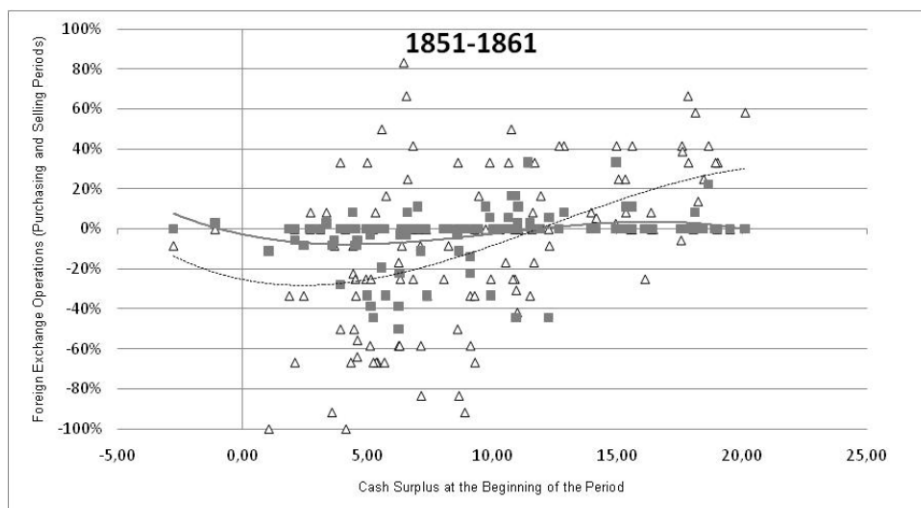


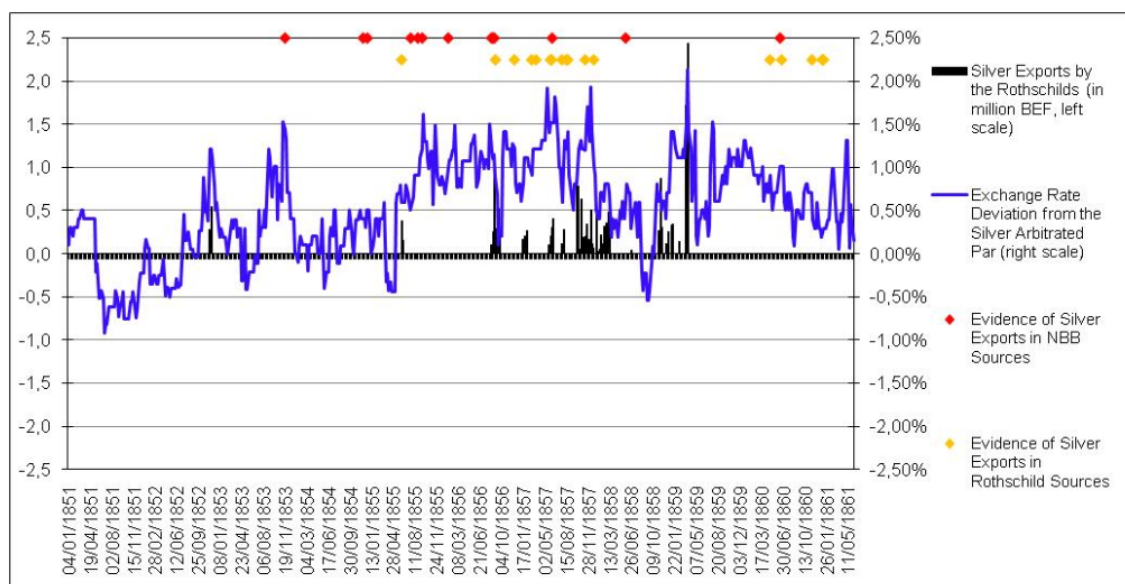
Figure 7: NBB foreign portfolio holdings (in million Belgian francs). Source: author's database.



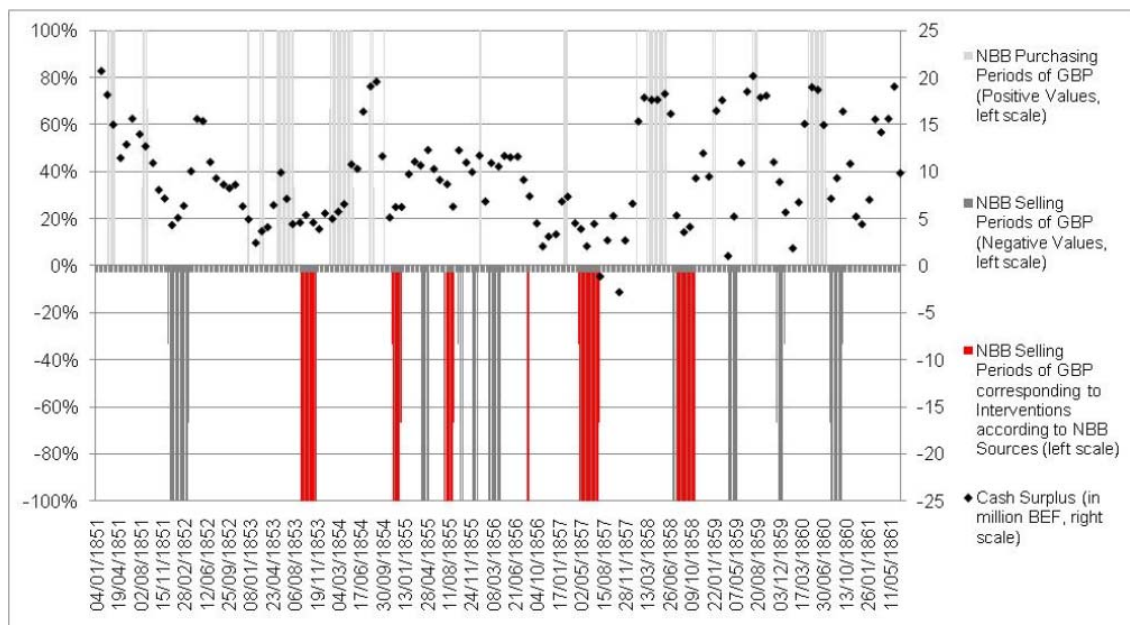
Figures 8.1-6: Distribution of foreign exchange operations (in million Belgian francs) vis-à-vis expected returns, 1851-1853. White triangles: non-sterilised operations; grey squares: sterilised operations; black circles: swaps. Source: see figures 2.1-6.



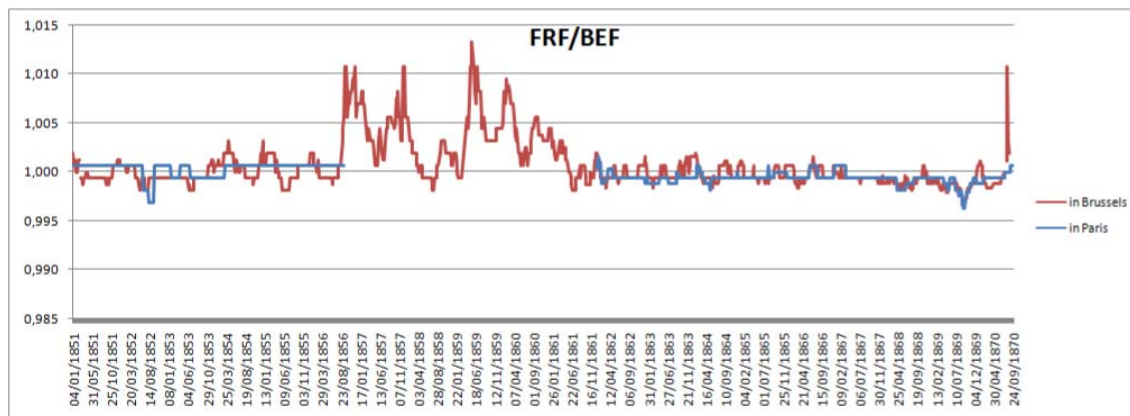
**Figure 9:** Monthly foreign exchange operations (defined as the percentage of the total monthly trading time during which the Bank has been purchasing (+) or selling (-) claims denominated in French francs, British pounds, and Dutch guildens) vis-à-vis the cash surplus at the beginning of the month (in million Belgian francs), 1851-1861. White triangles: non-sterilised operations; grey squares: sterilised operations. Source: author's database.



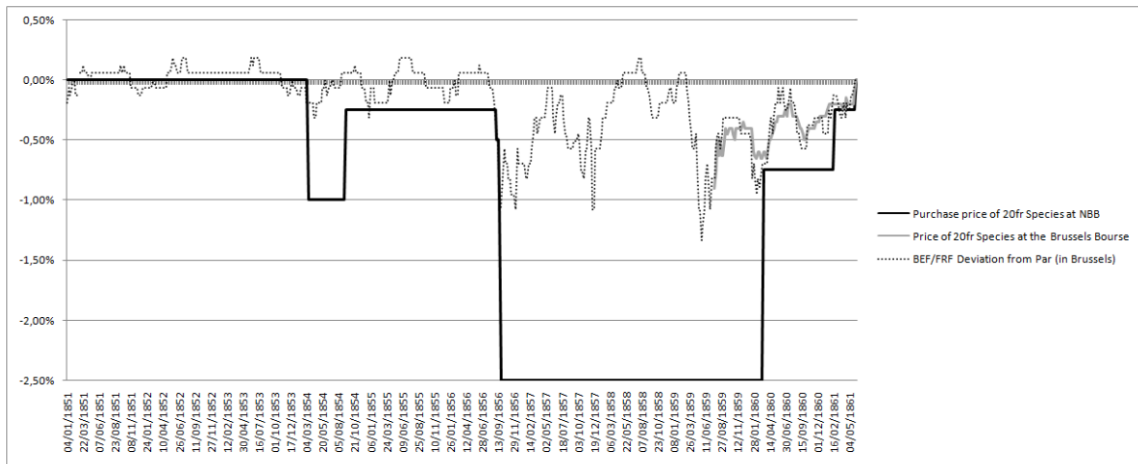
**Figure 10:** Violations of the bullion points on the British pound exchange rate, 1851-1861. Blue line: Gross profitability of exporting silver species to Britain (right scale). Black bars: Silver shipments made by the Rothschild agent in Belgium to NM Rothschild & Sons in London (in million francs, left scale). Red points: Qualitative evidence of silver exports by Belgian arbitrageurs in the NBB archives. Orange points: Qualitative evidence of silver exports by Belgian arbitrageurs in the correspondence of the Rothschild agent in Belgium. Sources: London interest rate: Ugolini (2010); Antwerp interest rate, see figure 1; exchange rate: *Cours authentique de la Bourse de Bruxelles*; Rothschild evidence: RAL, Correspondance, XI/38/212A-B (Richtenger, 1851-1853) and XI/78/0A-2B (Lambert, 1853-1861) ; NBB evidence: AGR/AG, BNB/NBB, PV CdA, 1851-1861.



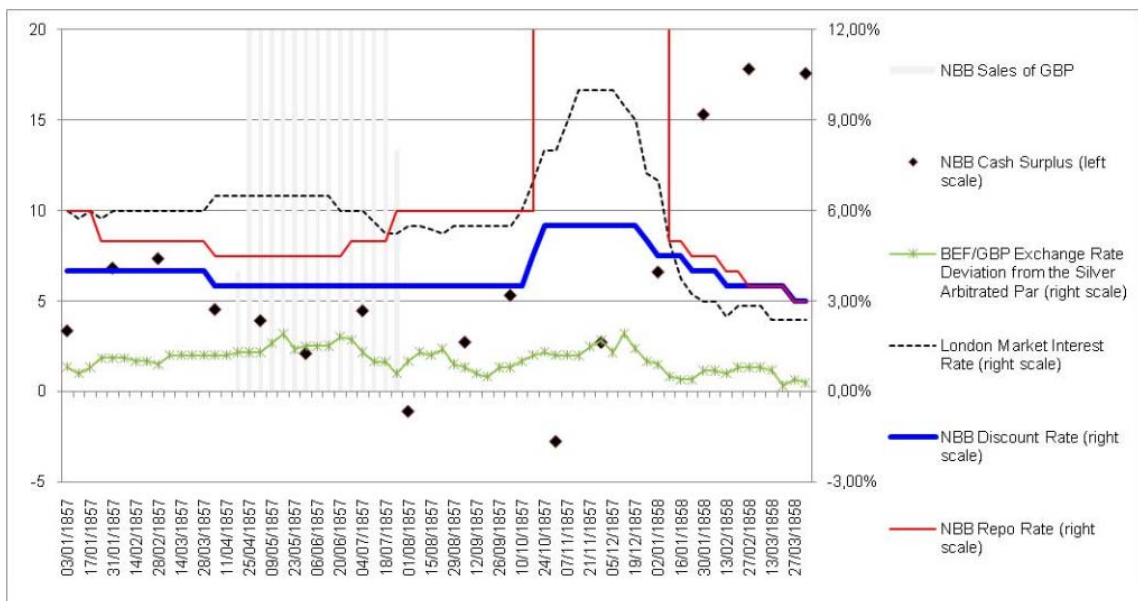
**Figure 11:** NBB interventions on the British pound exchange rate (defined as the percentage of the total weekly trading time during which the Bank has been purchasing (+) or selling (-) claims denominated in British pounds, left scale) vis-à-vis the Bank's cash surplus (in million francs, right scale). Sources: author's database; AGR/AG, BNB/NBB, PV CdA, 1851-1861.



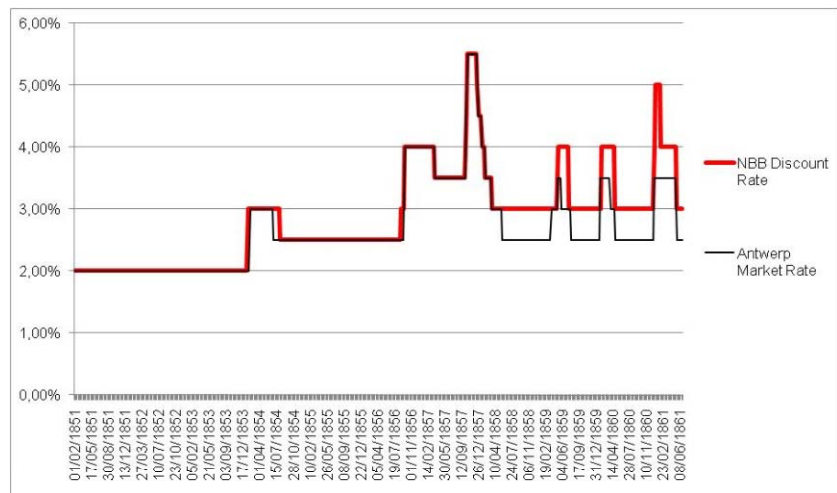
**Figure 12:** The exchange rate between the French and the Belgian franc, as quoted in Paris and in Brussels, 1851-1870. Source: Paris: *Cours général de la bourse de Paris publié par Jacques Bresson* 1851-1870; Brussels: *Cours authentique de la bourse de Bruxelles* 1851-1870.



**Figure 13:** The NBB's struggle against gold francs 1851-1861. Sources: NBB purchase price, AGR/AR, BNB/NBB, PV CdA 1851-1861; gold specie prices and exchange rates, *Cours authentique de la bourse de Bruxelles*.



**Figure 14:** The NBB's reaction to the 1857 crisis. Sources: see figures 1, 10, 11, and 15.



**Figure 15:** The Antwerp market interest rate and the NBB's official discount rate, 1851-1861. Source: AGR/AR, BNB/NBB, PV CdA 1851-1861.