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▶ **To cite this version:**

Stefano Ugolini. The Bank of England as the World Gold Market-Maker During the Classical Gold Standard Era, 1889-1910. Sandra Bott. The Global Gold Market and the International Monetary System from the late 19th Century to the Present, Palgrave Macmillan, pp.64-87, 2013, 978-1-137-30671-5. hal-01293932

HAL Id: hal-01293932

https://univ-tlse2.hal.science/hal-01293932

Submitted on 25 Mar 2016

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The Bank of England as the World Gold Market-Maker during the Classical Gold Standard Era, 1889-1910

Stefano Ugolini[*]

Abstract: This paper studies the microfoundations of the so-called "gold device" policy by analysing a new dataset on the Bank of England's operations in the gold market at the heyday of the classical gold standard. It explains that "gold devices" must be understood in connection to the Bank's role as gold market-maker in London and to the position of London as world gold market. Contrary to the literature, the paper shows that "gold devices" were sophisticated monetary policy tools intended to complement – not to substitute – interest rate policy and aimed at smoothing – not at hampering – international adjustment. These findings demonstrate the potential of adopting a microstructural approach to the study of monetary policy, and call for a reassessment of efficiency measurement for the gold standard.

JEL: E58, G24, L11, L14, N23.

Keywords: Monetary policy, gold standard, gold market, market microstructure.

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1. Motivation

Although textbook accounts of the classical gold standard understandably simplify its illustration by arguing that it featured a fixed price of gold, connoisseurs know that such a claim is not completely accurate: albeit extremely narrowly, the price of gold did actually happen to vary under the aegis of this international monetary system. This was not only due to transaction costs: the practice of slightly modifying from time to time the official price of gold was in fact a rather common one, as it was followed by many central banks – including the Bank of England itself, i.e. the institution which stood at the very centre of the whole system (Sayers 1953, 1976). Because the effect of such practices was to change the "gold points" (i.e., the band within which the exchange rate was allowed to fluctuate without entailing international gold flows), they have generally been seen as violations of the (alleged) rules of the gold standard: hence, they have been dubbed with the pejorative name of "gold devices". How should we interpret the fact that central banks departed so considerably from the standard theory of the workings of a monometallic system, which was nonetheless already well established at the time (see e.g. Goschen 1864)? Scholars have generally answered that policymakers' unwillingness to comply with the "rules of the game" was a sort of relic of bullionist sentiments, tied to a certain reluctance to implement the "proper" strategy (i.e., moving interest rates: see e.g. Sayers 1953, 1976; Scammell 1965; Contamin 2003), if not to a certain sympathy towards some forms of capital controls aimed at hindering international arbitrage (see e.g. Gallarotti 1995, pp. 47-9). Yet this macroeconomic approach does not provide completely satisfactory answers to the question. Raising the official gold price can hardly be assimilated to establishing capital controls, because it did not at any rate impede the physical transfer of gold abroad. Moreover, other strategies than paying premia on gold – and hence risking losses – were available to central bankers in order to avoid raising interest rates: for instance, foreign exchange policy was a viable – and potentially, much more profitable – alternative (Ugolini 2012a). Why were "gold devices" preferred to seemingly more advantageous monetary policy implementation techniques, and why spectacularly so at the very core of the international monetary system – i.e. at the Bank of England, the institution which is generally seen as the custodian of 19th-century monetary orthodoxy (Fetter 1965)?

This paper is novel in the fact that it tries to answer this question by assuming a different, microeconomic perspective: it looks at the Bank of England's gold price policy from the viewpoint of the Bank itself. It does so by reassessing – in the light of previously unused archival data – the constraints to which central bankers were subjected. But there is more. By reconstructing the Bank's action, the paper also provides valuable insights on the structure and functioning of the London gold market at the time when this was the world's gold market *par excellence*.

The reason why studying the Bank's policy and studying the gold market basically amount to the same thing is straightforward. Before the First World War, London was not only the most liquid exchange for refined gold; it also was the place to where most newly-minted gold ore headed directly. According to Van Helten (1982, pp. 539-40), there were at least four reasons

why this was the case: 1) the United Kingdom's *laissez-faire* legislation concerning bullion flows; 2) the exporters' certainty to be able to sell gold – whatever the state of supply – at least at the Bank of England's legal minimum bid price; 3) the presence in London of considerable network facilities (insurance, brokerage, banking, securitized warehousing, etc.); 4) the presence in London of reputed mints and refineries, which gold-producing countries lacked[2]. Of these four, the second condition in particular is relevant from our viewpoint. It shows that the Bank of England played a pivotal role in ensuring the centrality of the London gold market. Contrary to most other central banks (Contamin 2003; Ugolini 2012b), Threadneedle Street actually had a formal obligation to buy unlimited amounts of pure gold at a price fixed by the law (see section 2.l). Being certain about the minimum eventual yield of their shipments, gold exporters systematically preferred London to other financial centres as their final outlet. *De facto*, this circumstance made the Old Lady the *market-maker of last resort* of the world's most important gold market[3].

In the light of what precedes, it is convenient to see the Bank of England's "gold devices" as the strategies put in place by the London gold market-maker in order to carry out the daily functioning of this market. This microstructural approach allows to better qualify both the rationale of the Bank's monetary policy and the workings of the London gold market at the time of their undisputed heyday.

The remainder of the paper is organized as follows. Section 2 reviews the microstructural features of the London gold market and introduces the question of how to interpret its market-maker's price policies. Section 3 analyses the Bank's operations in the light of the institutional constraints imposed on it, and thus reassesses the question of "gold devices" as monetary policy tools. Eventually, section 4 concludes.

2. The Bank and the Market: Institutional Features

2.1: The Microstructure of the London Gold Market

When in the 19th century people talked about the "London gold market", they meant to refer to that particular subsection of the British financial system – composed by a well-defined group of intermediaries – which was specialized in dealing in a set of similar, but imperfectly substitutable goods: these included unrefined gold ore, refined gold bars, and a variety of gold coins produced by national or foreign mints. Because conversion of one kind of item into the other entailed a number of small but non-negligible costs (refining, melting, essay, minting, transportation, insurance, loss of interest...), the relative price of each item with respect to the others varied within a narrow but non-null band of fluctuation.

[2] Van Helten (1982, pp. 540-2) reports that in the 1890s, tentative efforts by German carriers and refiners to secure the output of South African goldmines were outcompeted by London-based agents: although transportation, brokerage and refining costs were lower in Hamburg, loss of interest and foreign exchange risk still made London a more convenient outlet to South African producers.

[3] Other central banks (e.g. the Bank of France) usually purchased gold bars to the public, but they were not required to precommit to fixed bid prices: contrary to the Bank of England, therefore, they failed to be market-makers of last resort on their domestic gold markets.

As far as its microstructure is concerned, the London gold market was a fairly concentrated one. It only featured four brokers[4], as well as one big dealer (the Bank of England) which set bid and ask prices to market participants[5]. The dealer did not receive limit orders from its customers (only spot orders were allowed), and did not initiate trades on its own initiative (the Bank just offered the gold market a number of *standing facilities*).
Microstructure theory suggests that the fixing of bid and ask prices by a dealer of this kind might be determined by two different factors. On the one hand, it might depend on market power: the dealer sets prices with the aim of maximising her profits on intermediation. On the other hand, it might depend on inventory costs: the dealer sets prices with the aim of preserving the optimality of her inventories[6]. Which of the two possible determinants of bid-ask spreads highlighted by theory was actually predominant in the case of the London gold market-maker's price policy?

2.2: Bid-Ask Spreads and Market Power

Let us start from monopolistic power. To begin with, it must be acknowledged that the Bank of England's *de facto* monopoly of gold dealership was not the outcome of legal restrictions: had they wished to do so, competitors might have freely entered the business[7]. To all likelihood, the reason why the Old Lady stayed alone must have been related to the specificities of gold-dealing activities. On the one hand, fixed costs tied to safety issues (including managing and verification costs) made the business subject to increasing returns to scale. On the other hand, opportunity costs of holding inventories (tied to the fact that bullion is an unproductive investment) were much lower to the Bank of England than to any other British intermediary, because its money-issuing privilege already implied the obligation to hold statutory gold reserves. Therefore, on the whole, Threadneedle Street enjoyed a considerable vantage position which constituted an entry barrier to competitors.
Such advantages, however, did not come for free: as a matter of fact, regulation of the Bank's overall business by the Act of 1844 had important implications for its gold-dealing activities as well. First, the requirement to hold statutory gold reserves meant that the Bank was unable to set freely the overall level of its inventories as an unregulated competitor might have done. Second, the requirement to convert banknotes into British full-bodied gold coins (the so-called "sovereigns") and vice-versa at a fixed exchange rate did not leave the Bank with any margin for manoeuvre concerning this particular quality of gold: while a private dealer might well have refused to sell sovereigns at the legal price, the Old Lady was forbidden to do so. Third, as already mentioned by section 1, the Bank was explicitly imposed a minimum bid price for gold bars – once more, a requirement a private dealer was free not to fulfil. Hence, the fixing of gold prices by the Bank was seriously constrained by law. In the light of this, it

[4] The four London bullion brokers were: Mocatta & Goldsmid, Sharps Wilkins, Pixley & Abell, and Samuel Montagu & Co (Green 1968). Note that brokers differ from dealers in the fact that they "act strictly as agents for investors and do not assume risk" (Stoll 1978, p. 1133).
[5] A nice description of the London gold market and of the Bank of England's Bullion Office as seen by coeval observers can be found in Seyd (1868, pp. 242-58).
[6] For of a survey of microstructure theories, see Biais et al. (2005).
[7] Actually, it seems that an attempt to break the Bank's monopoly was indeed planned by some competitors towards the end of the period (see section 4).

is difficult to conceive of intermediation profit maximisation as the major determinant of gold price policy.

2.3: Bid-Ask Spreads and Inventory Costs

The argument according to which the setting of bid and ask prices reflects the dealer's need to restore optimal inventories is conveniently illustrated by Stoll (1978). His model is designed to describe the behaviour of one dealer whose portfolio is made suboptimal (with respect to her own investment preferences) by the need to accommodate for the customers' desires to buy and sell the asset in which the dealer is specialized. In order to move back from a risky position that she does not wish to maintain, instead of trading on her own initiative the dealer sets new bid and ask quotations: by giving the appropriate incentives to the public, such change is supposed to help the dealer passively rebalance her portfolio. In this framework, the spread between bid and ask prices is dictated by three different kinds of costs faced by the dealer: 1) *order-handling costs* – i.e., the marginal cost of transactions; 2) *information costs* – i.e., the premium compensating the dealer for the risks of trading with customers having superior information about the future value of the asset; 3) *inventory costs* – i.e., the premium compensating the dealer for the risks of holding an undesired position.

Not all three determinants of bid-ask spreads proposed by Stoll (1978) were equally at play in the case of the London gold market-maker. First, available information suggests that no major change in order-handling costs must have occurred during the period of our concern (Officer 1996). Second, the main source of information costs – i.e., uncertainty about the future value of the traded asset – must have played a minor role in the dealer's price-setting strategies: as a matter of fact, uncertainty about the future value of gold was supposed to be nil under a credible gold standard system. As a result, varying inventory costs – or differently said, the costs associated by the dealer to the current level of suboptimality of its own gold portfolio – emerge as the most plausible candidate as the determinant of price changes. Yet this prediction needs to be qualified in the light of the institutional constraints to which the dealer happened to be subjected.

Taken together, the three dispositions of Peel's Act set serious constraints on the Bank's action as gold market-maker. A major breech of law would have resulted in case the Old Lady had failed to 1) keep adequate gold inventories, 2) buy and sell sovereigns at par in unlimited amounts, or 3) purchase gold bars at legal price: as a result, the Bank was legally bound to act as market-maker of last resort on the gold market. All this had serious implications for the determination of optimal inventories and prices. The Bank's optimal gold portfolio had to be a) sufficiently large to meet exogenously-determined reserve requirements, and b) sufficiently provisioned with British sovereigns to meet exogenously-determined demand for this item by the public. In order to adjust the size of the portfolio and to rebalance its composition, however, the Bank was allowed neither to change bid and ask prices for sovereigns, nor to lower the bid price for gold bars below a given threshold. As a result, control over the total size of gold inventories – and even more so, over the size of British coin inventories – could not possibly be maintained through changes in the prices of the gold bars and sovereigns. Faced with these constraints to its gold-dealing activities, the Old Lady started to look for new instruments allowing it to gain more flexibility in the rebalancing of the gold portfolio.

2.4: "Conventional" and "Unconventional" Gold Policy

To the authors of the Act of 1844, it seems to have been self-evident that the Bank's reserves should be basically made up of two "conventional" components (gold bars and sovereigns). As a result, the Act did not dictate any explicit constraint concerning the composition of such reserves, nor did it require the Bank to provide any detail about that. This is not surprising in view of the fact that before the "Gold Rush" of the 1850s, gold coinage was uncommon outside the United Kingdom (Ugolini 2012b). Since gold started to be increasingly minted abroad, however, the market for foreign gold specie turned increasingly liquid in London. At that point, the opportunity was open to the Bank to substantially complement its operations in "conventional" gold items with operations in "unconventional" ones (foreign full-bodied gold coins)[8].

According to Sayers (1976, pp. 48-9), when the Bank first implemented these operations in 1852 it was driven by a "principle of indifference": foreign specie holdings were considered as occasional and as destined to imminent melting – and thus, they were priced accordingly. As the gold standard spread internationally, however, the Bank started to realize that "unconventional" gold assets gave room for some flexibility in the carrying out of its tasks as London gold market-maker. On the one hand, thanks to the Peelites' insouciance with respect to the definition of "gold", "unconventional" gold assets could well be accounted as legal reserves; on the other hand, however, no constraints were imposed on the Bank concerning the pricing of such assets. As a result, changes in bid and ask prices of "unconventional" gold items could be employed to restore the optimal size of the total portfolio in case of need.

To sum up, since the Bank of England was dealing in a number of imperfectly substitutable gold items and was actively seeking to rebalance the size – and hence, the composition – of its gold portfolio, the Bank's price policy was very much diversified at a disaggregate level in order to make such rebalancing viable. In this framework, it is difficult to interpret bid-ask spreads as evidence of market power. Rather, it is plausible to interpret them as an indicator of inventory costs: the higher the dispersion of gold prices set by the dealer, the lower the degree of optimality of her gold portfolio. These conclusions will be discussed in the next section in the light of empirical evidence.

3. Gold Inventory Strategies and Monetary Policy

3.1: Gold Prices

As Sayers (1953, pp. 132-3) already pointed out, gold price policies had narrow limits: the Bank of England could set bid and ask prices for different gold assets only within a non-arbitrage band whose margins were determined by the costs of converting one asset into the

[8] Albeit "unconventional" from the viewpoint of textbook gold standard policy, the practice of keeping foreign coins within bullion reserves was not at any rate "unconventional" by international standards. As a matter of fact, a number of central banks adopted this practice with the aim of smoothing international transactions (see e.g. the case of the Austro-Hungarian National Bank: Jobst 2007, pp. 43-7). Nonetheless, the Bank of England was unique in the scale and scope of its gold-dealing operations.

other[9]. Still, "within this range the Bank could make a considerable difference to the foreign exchange markets by altering its prices".

In order to analyse the Bank's gold price policy at the heyday of the classical gold standard, a new database has been reconstructed here on the basis of unpublished material from the Bank's archives. This is a considerable improvement with respect to Sayers's (1953) analysis, which – because of the unavailability of archival records – could only rely on market rumours reported by the financial press, and was therefore somewhat discontinuous.

Figure 1 shows the range of all bid and ask prices for a kilogram of fine gold in different shapes (bars or coins) set by the Bank. The picture shows that bid and ask prices for different kinds of gold assets fluctuated very often, and that the gap between minimum and maximum prices changed over time. Bid-ask spreads for gold bars fluctuated from a minimum of 0.10% (in November 1890) to a maximum of 0.43% (from September 1906 on), but the range of variation of all gold prices was much wider (stabilizing at 0.82% from June 1900). As Sayers (1953, pp. 138-9) already remarked, bid-ask spreads for this period are very large compared to those allowed in the interwar by the Gold Standard Act of 1925, which imposed on the Bank a maximum bid-ask spread of 0.16% only. Most interestingly, bid-ask spreads tended to increase over time. In the light of the conclusions of section 2, this should be interpreted as evidence of increasing suboptimality of the Bank's gold portfolio.

The impression is confirmed by figure 2, which compares the total size of the London gold market-maker's inventories with the width of the range of gold prices. The picture suggests that there was some negative relationship between the two factors. The bid-ask spread increased in the aftermath of the Baring crisis of 1890, when the Bank had an hard time securing adequate reserve levels; then it decreased in the central years of the decade, when substantial gold arrivals from South Africa refurbished the Bank's vaults; then it stabilized on a higher level since the eve of the Boer War, when reserves stabilized on a lower level than their mid-1890s peak[10]. Once more, the gold market-maker appears to have widened the range of prices according to varying inventory costs – associated to the degree of suboptimality of its total portfolio. This circumstance appears to be somewhat conflicting with Sayers's conclusion (1953, pp. 148-50) that towards the end of the period under scrutiny, the Bank was acquiring an increasingly firmer control on gold flows through interest rate policy.

Figures 1 and 2 about here

3.2: Gold Reserve Composition

The aggregate picture of the Bank's gold policies is therefore consistent with the idea that the market-maker's main aim was to restore the optimality of its gold portfolio. Does this

[9] "There was nothing to regulate the prices at which it would deal in foreign gold coin, save that it would be futile to offer a price lower than that at which it would pay dealers to have foreign coin converted into bars, and equally futile to charge so much that it would pay them to take gold from the Bank in sovereigns. […] These limits were recognized by the Bank, which would generally prefer to part with foreign coin *within* the limits set" (Sayers 1953, p. 133).

[10] It might be objected that the adequate level of gold reserves should not be inferred from their absolute amount, but from the coverage ratio of banknote circulation. Yet, as Ugolini (2012c) has pointed out, under the provisions of Peel's Act the adequacy of the Bank's reserve could not be inferred automatically from the coverage ratio. At any rate, the overall volume of the Bank's note circulation remained basically flat throughout the concerned period.

conclusion still hold once we look at the data at a more disaggregated level? Figure 3 provides previously unavailable archival data on the actual composition of the "gold reserve" item. A number of interesting features emerge from the picture. First and foremost, the composition of reserves changed very considerably over time. For instance, bars varied from a minimum of 5.75% (July 1891) to a maximum of 69.43% (October 1906) of total gold holdings, while sovereigns varied from 22.85% (June 1910) to 62.06% (March 1894). Taken together, the two "conventional" reserve assets varied from a minimum of 43.97% (October 1910) to a maximum of 96.84% (October 1906) of total holdings. This confirms that in order to restore the optimal size of its gold portfolio, the Bank complemented "conventional" assets by recourse to "unconventional" ones – basically, foreign gold specie. The amount of foreign coins might fall as low as 0.06% of the Bank's total gold holdings (September 1906) and rise to as much as 52.91% (October 1910). Then there were two minor assets: British divisionary silver coins, whose amount was small but non-negligible (averaging 3.77% of reserves), and British worn coins, whose amount was fractional (averaging 0.43%) and only exceeded 1% in two occasions (in 1890 and in 1891) probably in connection with a general recoinage (Clapham 1944, p. 349). The latter is a relevant finding: whereas the literature has traditionally ascribed "paying in light coins" as a typical "gold device" ordinarily deployed during crises (see e.g. Sayers 1953; Officer 1996), the systematic paucity of the Bank's holdings of worn specie throughout the period suggest that the practice must have been confined to some minor episodes only.

Figure 3 has shown that foreign specie were a very important – and occasionally, even a majority – component of total reserves. But what kinds of foreign specie were actually held in the Bank's vaults? Sayers (1953) reported evidence of transactions in a variety of different items (including American, German, and Japanese coins), but unavailability of archival sources forced him to leave open the question of their actual relevance within the Bank's portfolio. The answer to this question is provided by figure 4. While an important role was occasionally played by French napoleons (in 1889 and 1898-1900), German marks (in 1898-1904 and 1907-10), and Russian imperials (in 1889-93), the lion's share was kept by United States eagles (averaging 77.40% of total foreign specie reserves throughout the period). Despite featuring a large variety of items (including Dutch, Spanish, Japanese, Scandinavian, and Austrian coins), holdings of other foreign-minted specie always remained fractional (averaging 0.33% of total foreign specie reserves throughout the period). Figure 4 also shows that – unlike what was the case for bars and sovereigns – changes in the amounts of each sort of foreign coins were concentrated at some particular moments. This suggests that their acquisition and dismissal must have been tied to some specific market conditions, rather than being a business regularly run by the Bank. Such a circumstance corroborates the impression that "unconventional" gold operations were performed by the Bank only when resorting to "conventional" ones was impossible.

The picture emerging from figures 3 and 4 is important under at least three respects. First, it confirms that the Bank's recourse to "unconventional" gold policy was not actually decreasing towards the end of the period – purchases of foreign specie being maximum in late 1910. Second, it suggests that the deployment of "gold devices" was connected to the degree of suboptimality of the Bank's inventories with respect to the public's utilization of the gold standing facilities. Last but not least, it shows that the composition of reserves varied

extremely fast, so that an optimal position could be very quickly overturned. All this implies that the Bank's gold policies need to be studied at a disaggregated level in order to be properly understood.

Figures 3 and 4 about here

3.3: Inventory Strategies, I: Quantity Policies

Before studying the Bank of England's gold price policies into detail, it is expedient to start from another kind of gold inventory strategy – i.e., a quantity policy: the conversion of bars into British coins through minting at Tower Hill. This is interesting, as it confirms that the Bank's need to restore the optimality of its portfolio was a major driver of gold policies.

The duty of providing unlimited amounts of sovereigns on demand was rather onerous to the Bank. Because the London Mint was unwilling to precommit to precise delivery dates, customers were unable to compute precisely the loss of interest they might have to face. This circumstance made selling gold bars at the Bank's minimum bid price constantly more convenient than selling them to the Mint: therefore, the only purveyor of gold to Tower Hill happened to be Threadneedle Street itself (Ugolini 2012b). The result was that the Bank was the only supplier of sovereigns in the country, and had thus to sustain the whole pressure of demand for this item.

Figure 5 compares the net amounts of gold bars and sovereigns purchased by the Bank on demand of the public, as well as the amount of bars sent to the Mint. It shows that the Bank's position with respect to the public was very much asymmetric: the Old Lady systematically bought many more bars than it sold to the market, while at the same time it systematically sold many more British coins than it bought at its counters. The Bank earned a tiny profit on the operation (its bid price for bars never exceeded the Mint's bid price of £136.567 per kilogram of pure gold), but it also run the whole risk of being unable to match demand (by the public) with supply (by the Mint). As a result, the Bank was obliged to actively adjust to changes in the conditions of the gold market.

The Bank's minting policy strengthens the point that a crucial determinant of its gold policy was the necessity of keeping balanced inventories in order to meet its statutory obligations. Minting was a quantity policy, and as such it does not belong to the category of "gold devices". As the following section will be showing, however, price policies that are commonly dubbed as "devices" did actually respond to the same rationale.

Figure 5 about here

3.4: Inventory Strategies, II: Price Policies

Figure 6 compares the Bank's bid and ask prices for gold bars with its holdings of this item. It shows that the two prices were set independently of each other. The Bank adjusted the bid price when it wanted to impact the public's recourse to its "gold-buying standing facility", while it adjusted the ask price when it wanted to impact the public's recourse to its "gold-selling standing facility". The two eventualities were not bound to happen at the same time. In order to encourage the public to sell bars to it, the Bank raised its bid price three times over the period of our concern (November 1890, May 1891, and November 1906); yet, these

moves did not coincide with the moments when the Bank raised its ask price in order to stop the public buying bars from it (August and October 1893, January and February 1896, September 1896, October 1897, and September 1906). For instance, after bar holdings collapsed to a record low in May 1891, the Bank attempted in vain to encourage use of its "gold-buying standing facility" (by raising the bar bid price), yet it did not need to discourage use of its "gold-selling standing facility" (by raising the bar ask price) as the public was not making use of it. It is interesting to notice that, in spite of its failure to make its bar bid price attractive to sellers, the Bank did not dare push it higher than £136.421, and preferred purchasing "unconventional" gold assets (see below). On the contrary, the Bank did not hesitate to push ask prices to much higher levels than the traditional ones on other occasions.

The Bank's behaviour with respect to "unconventional" gold assets is consistent with what has been observed so far. Figures 7, 8, and 9 compare the Bank's bid and ask prices and its holdings of (respectively) Russian imperials, French napoleons, and German marks. In all cases, the Bank changed rather vigorously bid and ask prices according to its needs to reshuffle gold inventories. In the above-mentioned episode of May 1891, the Bank reacted to a drain of "conventional" reserves by raising its bid price for foreign coins to very high levels (£136.715 for a kilogram of pure gold in foreign specie), which allowed it to refurbish its reserves with "unconventional" assets. At the same time, however, ask prices remained untouched. Ask prices were moved in other moments: raised when the Bank attempted to defend its inventories, lowered when it considered getting rid of them – see e.g. Russian imperial ask prices (figure 7), repeatedly increased in 1892 in order to protect the stock, and subsequently lowered in late 1894 in order to dismiss it. The case of the Bank's German mark policy in 1899-1900 – when "conventional" reserves were again being eroded – is illustrative (see figure 9). In late 1899, the Bank raised the mark bid price in order to attract sellers, while leaving its ask price untouched: as a result, the bid-ask spread shrank. When in early 1900 German specie started to flow in copiously, the Bank lowered its bid price in order to stop purchasing them at high price, but it also started raising its ask price in order to avoid losing its newly-acquired stock: as a result, the bid-ask spread widened considerably. This suggests that bid-ask spreads are not necessarily representative *per se*, and should henceforth handled with care.

Evidence provided in this section has confirmed that the Bank's need to manage its gold portfolio – by attracting "unconventional" assets when "conventional" ones were unavailable at viable prices, or by dismissing the former when the latter were plentiful – was at the root of its gold price policies. Recourse to "unconventional" gold items was had because the Bank faced serious constraints in setting its prices for "conventional" ones. As a matter of fact, the bid price for British coins could not be changed: the fact that their ask price was fixed by law impeded the Bank to set a higher bid price, because arbitrage opportunity would otherwise be created for the public. Similarly, the bid price for gold bars could not be raised above the Mint bid price, as this would have annihilated the – already meagre – profitability margins the Bank derived from its copious minting operations. As a result, if Threadneedle Street was willing to refurbish its total reserves *cœteris paribus* (i.e., without changing its monetary stance), it was obliged to rely on purchases of foreign specie – whose bid prices it could vary much more aggressively; the Bank would then dismiss these "unconventional" reserves by playing on ask prices when general conditions would have turned more favourable. On the

whole, recourse to "unconventional" assets allowed the Bank to avoid losses in the conduct of its business as gold dealer.

Figures 6, 7, 8, and 9 about here

3.5: From Inventory Strategies to Monetary Policy

In what precedes, gold inventory strategies have been studied under the assumption of no changes to the monetary stance. Yet the attractiveness of the Bank of England's "gold standing facilities" to foreign agents depended on exchange rates, which – in turn – were influenced by the Bank's discount rate. By replacing gold inventory strategies into the context of monetary policy, this section will connect the microeconomic analysis conducted so far to the macroeconomic literature. This will be done by focusing on the Bank's action on the most important "unconventional" reserve asset – i.e., United States gold eagles.

As the previous section has pointed out, when the Bank changed its bid or ask prices for a given sort of foreign coins, it did so with the aim of impacting recourse to its two "standing facilities" for that particular quality of gold. By raising/lowering the bid price, the Bank made its facility more/less attractive to foreign holders of that asset: in other words, the Bank lowered/raised the gold specie import point with respect to the issuing country of that coin (i.e., the upper bound of the exchange rate band, beyond which taking coins out of that country's circulation and selling them to Threadneedle Street would become a profitable operation). In an analogous way, by raising/lowering its ask price for that item, the Bank lowered/raised the gold specie export point with respect to that country (i.e., the lower bound of the exchange rate band, beyond which buying coins from the Bank and putting them in that country's circulation would become a profitable operation)[11]. Thanks to Officer's (1996, pp. 124-30) dataset on the costs of gold shipments between London and New York[12], it is possible to reconstruct precisely the margins of the exchange rate band beyond which arbitrage between the Bank of England's vaults and United States circulation was supposed to become profitable – and hence flows of American coins were supposed to occur between the two places. This is done in figure 10, which also gives the size of the Bank's gold eagle holdings.

The picture shows that the Bank actively – and effectively – implemented price policies in order to rebalance its inventory of this "unconventional" reserve asset. For instance, in the aftermath of the Baring crisis (spring 1891), the Bank aggressively lowered the eagle import point in order to have American coins sold to its buying facility; when in August sterling depreciated substantially and the selling facility became active, the Bank lowered the eagle export point to avoid further drains. But price policies did not always have a "bullionist" aim. For instance, in September 1896 the Bank raised the export point up to the exchange rate level in order to dismiss some of its eagle inventories; and in April 1900, it raised the import point beyond the exchange rate level precisely to avoid attracting further American coins. On the

[11] This description implies that the pound is the base currency and the foreign country's monetary unit is the term currency – which is consistent with coeval habits, as well as with the way figure 10 is constructed.

[12] In using Officer's (1996) data, his own assumption that transaction costs were the same for bars and coins is also taken as valid.

whole, the Bank played with gold points not in order to subvert the "rules of the game", but in order to facilitate the working of the world gold market.

This is confirmed by another important finding emerging from figure 10: the Bank implemented gold price policies in order to take profit from the exchange rate's proximity to one of the gold points, not in order to influence its path. As a matter of fact, the position of the exchange rate was supposed to be influenced by the Bank's monetary stance; by contrast, "gold devices" were supposed to be "surgical" interventions enacted on the very margin of the band. This finding is corroborated by figure 11, which puts the number of gold price changes *vis-à-vis* the number of official discount rate changes implemented by the Bank. The picture shows that gold price policy was mostly implemented in concurrence with modifications of the monetary stance: while the policy became decidedly more focused in the 1900s with respect to the 1890s – hence, probably, Sayers's (1953) impression that it was losing importance towards the end of the period –, it actually continued to be deployed quite actively in times of disturbances. This allows to conclude that "gold devices" were not a *substitute*, but a *complement* to orthodox interest rate policy. On the one hand, changes in the official discount rate had the task to drive the exchange rate in the region surrounding the gold points; on the other hand, marginal interventions on gold prices had the task to make the move fully effective – and that, without additional negative externalities having to be engendered by the adoption of a more extreme monetary stance. Under this respect, "gold devices" may be seen as the very refined tools of a mature central bank's policymaking, rather than as the relics of an archaic monetary era.

Figures 10 and 11 about here

4. Conclusions

This paper has proposed a reassessment of the traditional literature on "gold devices" under the classical gold standard. By focusing on the microfoundations of the Bank of England's gold price policies in the period 1889-1910, it has shown that such policies were the natural outcome of the Bank's role as world gold market-maker. At a time when the international monetary system was consolidating as a full gold *coinage* standard – to borrow Scammell's (1965, pp. 32-3) expression –, the Bank became more and more involved in dealing in "unconventional" gold assets (as foreign coins used to be) in order to gain more flexibility in the carrying-out of its duties[13]. As a result, the Bank's price policies may be interpreted as the inventory strategies put in place by the gold market-maker in order to rebalance its gold portfolio. The analysis illustrates the potential of adopting a microstructural approach to the study of monetary policy implementation: central banks can be suitably seen as money

[13] In the light of this, the dissimilarities between the workings of the prewar gold standard that of the and interwar ones – in which gold coins were no longer in circulation – cannot be overemphasized: as a matter of fact, the two systems were built on completely different microfoundations. Future research might want to investigate what role this may have played in determining the higher degree of dysfunctionality displayed by the "restored" gold standard with respect to the "original" one.

market-makers, and the price of accessing their standing facilities can be conveniently interpreted as bid and ask prices. This useful approach – which has only recently started to gain some ground (see e.g. Mehrling 2010) – appears to be a promising avenue for future research.

Contrary to what the literature has unanimously maintained following Sayers (1953), this paper has shown that "gold devices" were not implemented by the Bank as a substitute, but as a complement to interest rate policy. The term "gold devices" is hence a somewhat misleading wording: gold price policy was not a violation of some alleged gold standard rule, but a way for smoothing international adjustment (via gold arbitrage) without extreme interest rate and exchange rate volatility being engendered within the system. These findings imply that we should perhaps rethink the way to measure efficiency under the gold standard. For decades, scholars have assumed that lack of gold flows was the indicator of central banks' success in smoothing international adjustment within the system (see e.g. Morgenstern 1959; Officer 1996; Canjels et al. 2004). The evidence presented here points to a different direction: the Bank of England actually smoothed international adjustment by *provoking*, not by *avoiding* the occurrence of gold flows. The textbook adjustment mechanism under the gold standard implied the continuous melting and re-minting of gold coins; the transaction costs implied by such operations *widened* the gold points. By buying and selling foreign coins without requiring their conversion into other gold items, the Bank *shrank* the gold points: as a result, foreign exchange volatility – as well as interest rate volatility – were actually *reduced* by the Bank's inducement of gold flows. How to re-evaluate the system's actual efficiency in the light of these findings is a question left open for future research.

This paper has also provided evidence on the structure of the London gold market at the time of its international heyday. It has unveiled the existence of a sort of "consubstantiality" between the market and the Bank: the former prospered thanks to the availability of the latter's facilities, while the latter's action was considerably eased by the centrality of the former. The ensuing virtuous circle – which made the London gold market's world primacy unassailable by competitors – must have played a considerable role in securing sterling's unrivalled pre-eminence among international currencies under the classical gold standard. Not everything was rosy, though, in the decades leading to the First World War. The substantial increase in the Bank's ask prices for all gold items since the Boer War is evidence of mounting difficulties in the management of the market. The ensuing rise in the costs of accessing the Bank's facility started to threaten the position of the Old Lady as the only gold market-maker in London: maybe in view of the rising profitability margins of the gold-dealing business, plans were made by commercial banks for the creation of an alternative source of bullion than the Bank (the "Gold Pool"). These were signs of increasing fragility of the system as the final crisis of 1914 was approaching. This was no mystery to contemporary observers: after all, everybody knew that the system was growing less and less manageable behind the veil of a – maybe too much – "thin film of gold" (De Cecco 1974).

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Figures

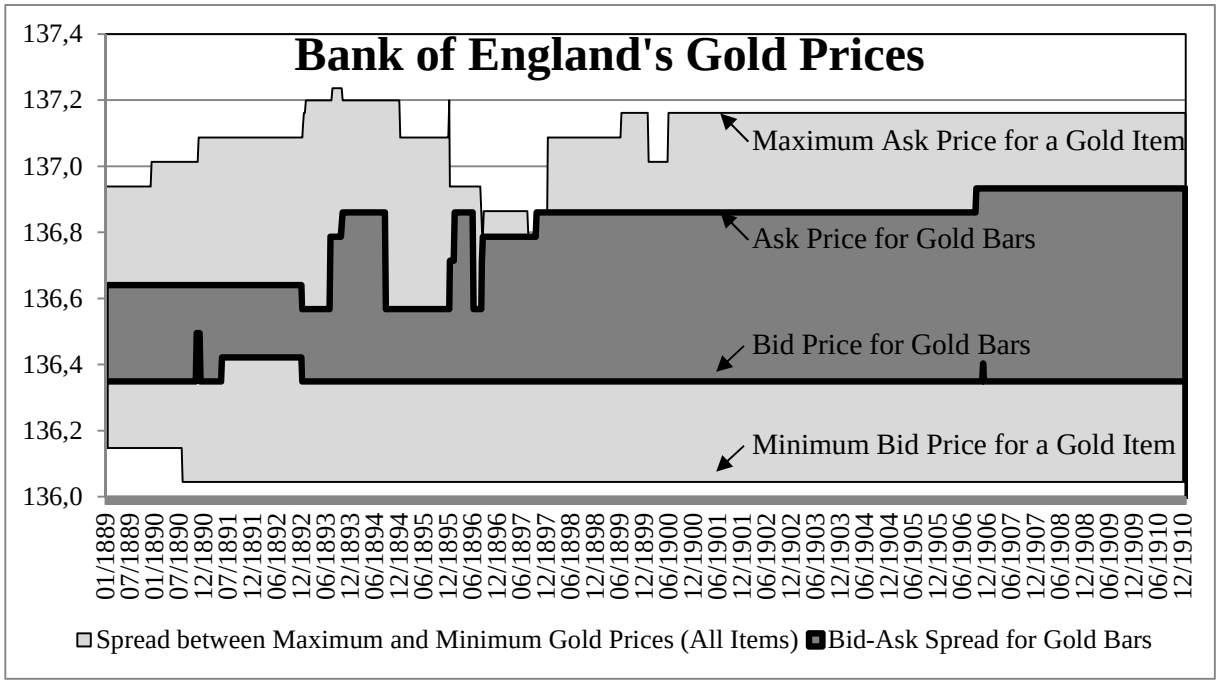

Figure 1: Range of prices fixed by the Bank of England for one kilogram of pure gold (in pounds). Source: author's database.

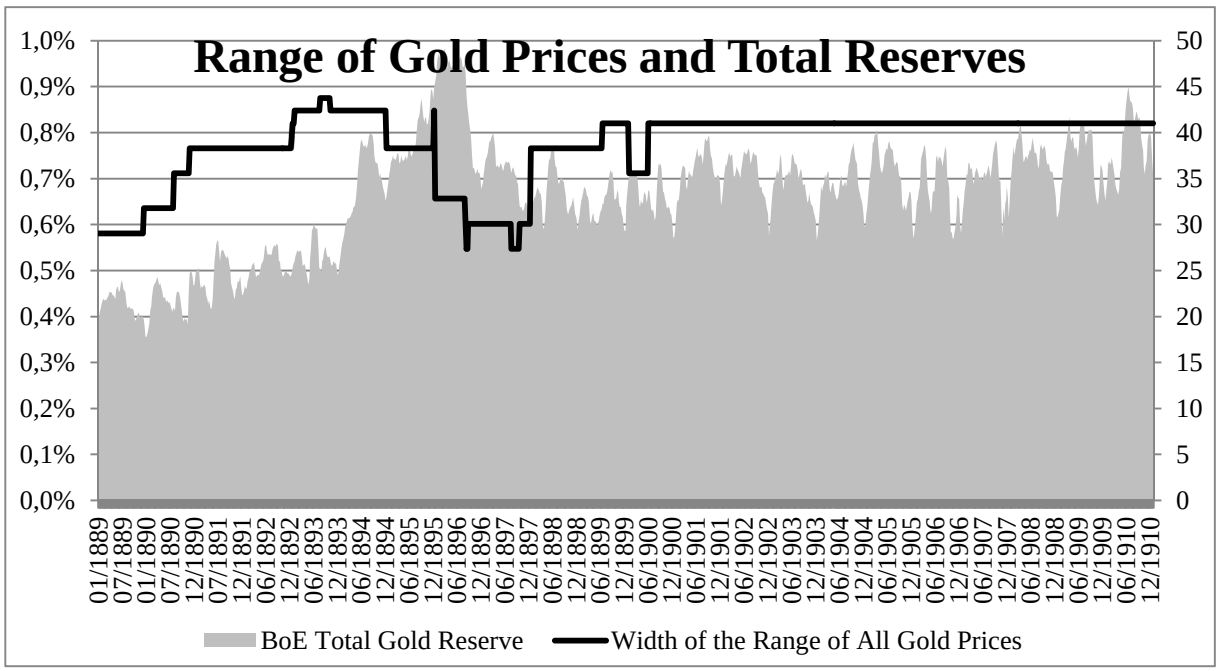

Figure 2: Width of the range of all gold prices (in percentage, left scale) and total gold reserves (in million pounds, right scale). Source: author's database.

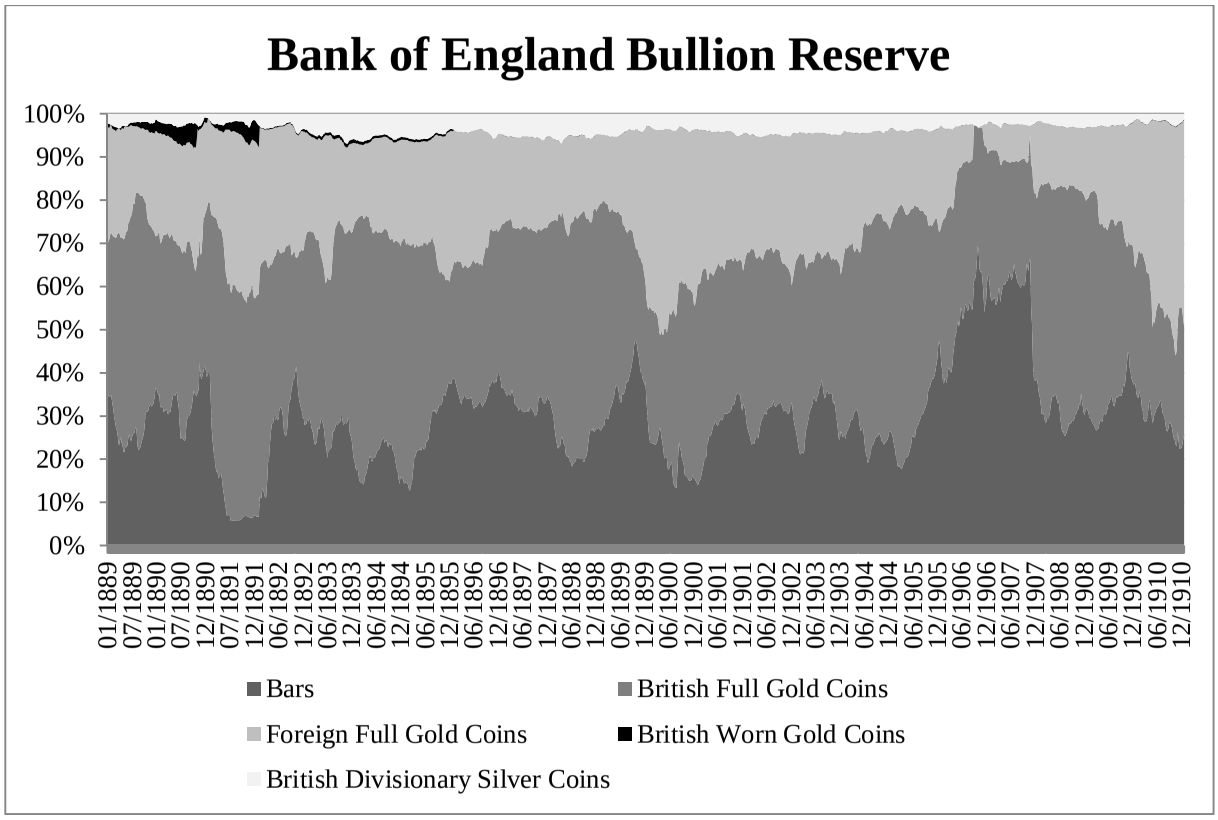

Figure 3: Composition of Bank of England gold reserves, by kind of asset (in percentage). Source: author's database.

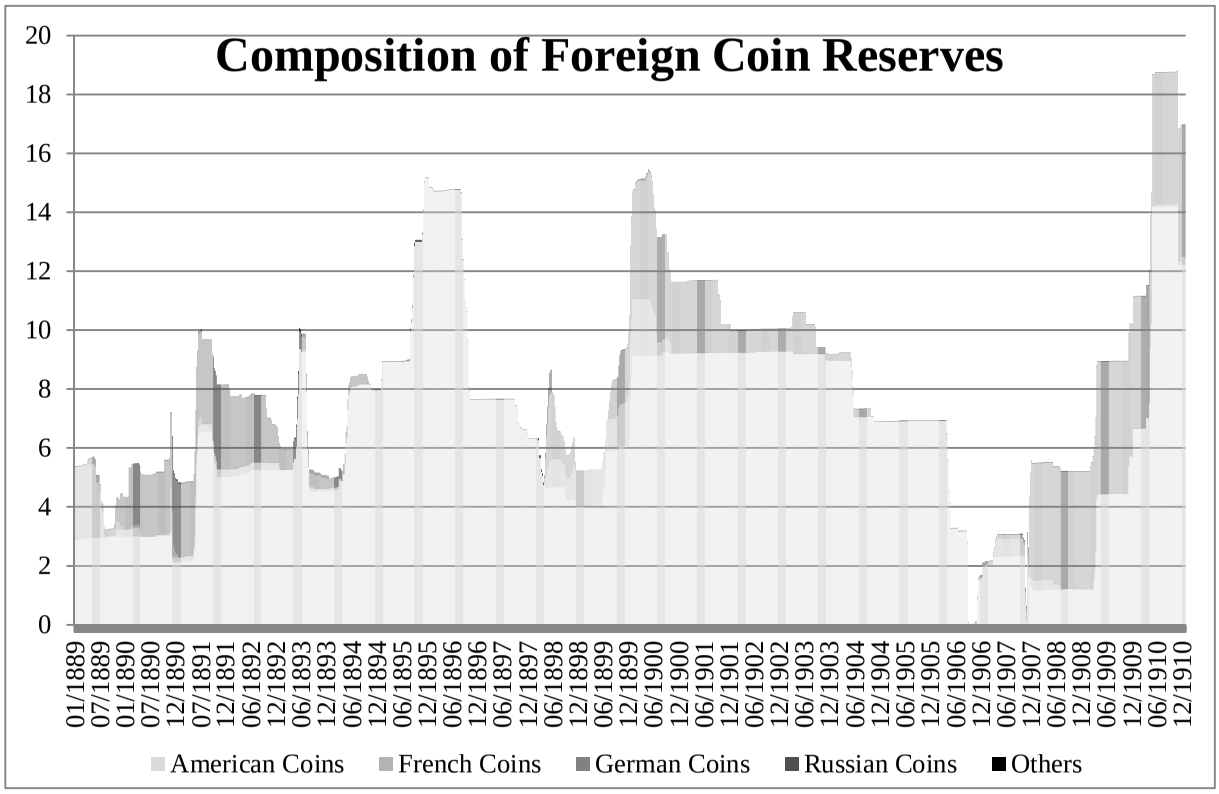

Figure 4: Composition of Bank of England's foreign gold coin reserves (in million pounds). Source: author's database.

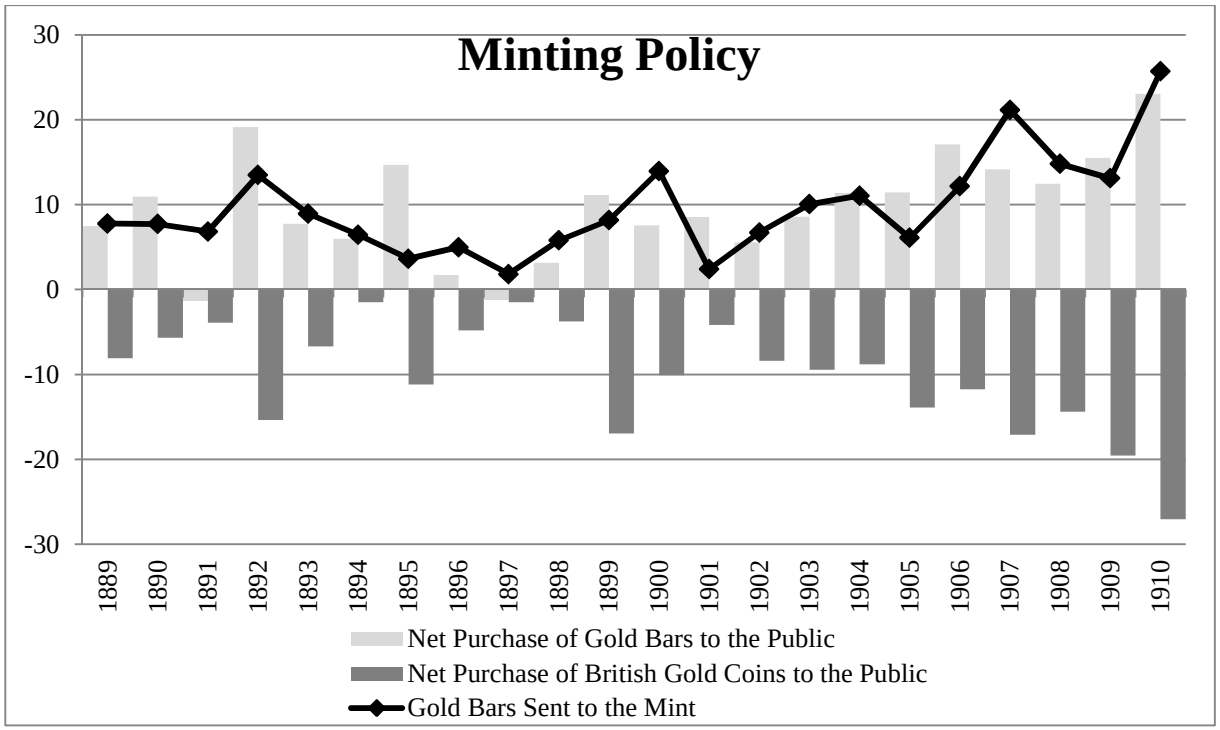

Figure 5: Bank of England's net purchases of gold bars and British coins to the public, and gold minted by the Bank (in million pounds). Source: author's database.

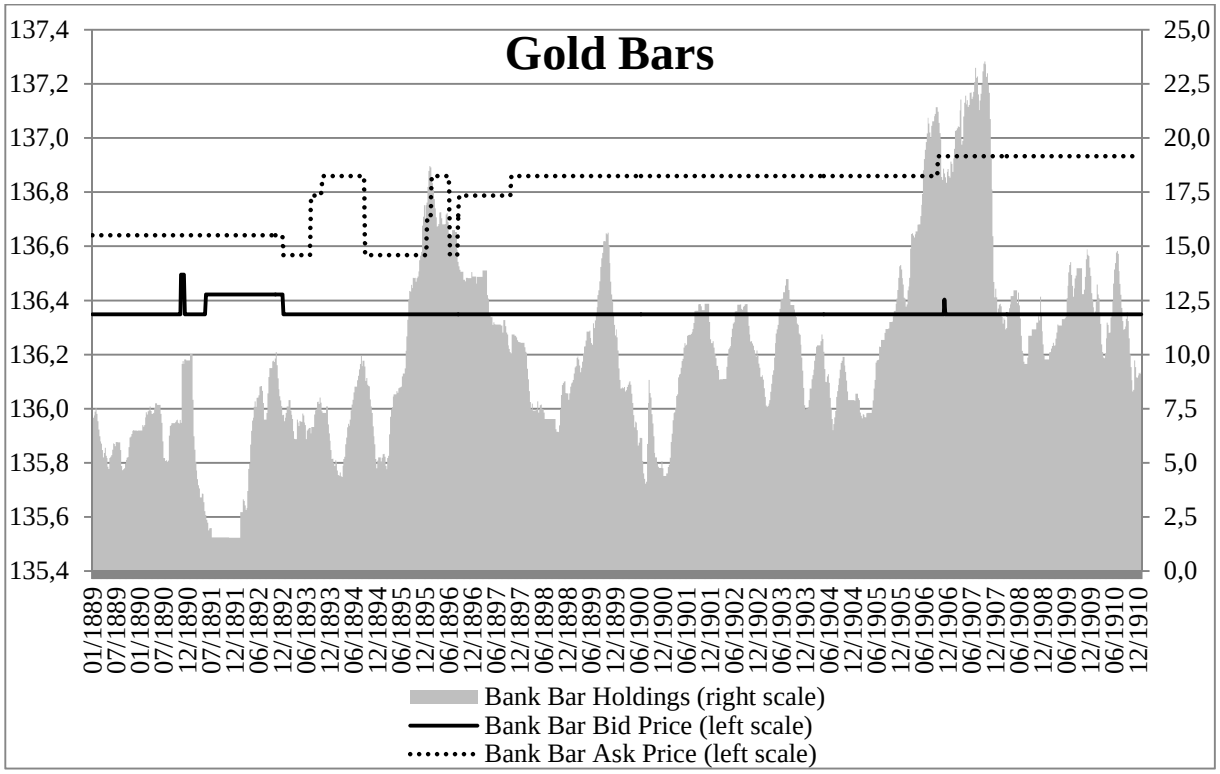

Figure 6: Bank of England's holdings of gold bars (in million pounds, right scale) and Bank bid-ask prices for a kilogram of fine gold in the shape of bars (in pounds, left scale). Source: author's database.

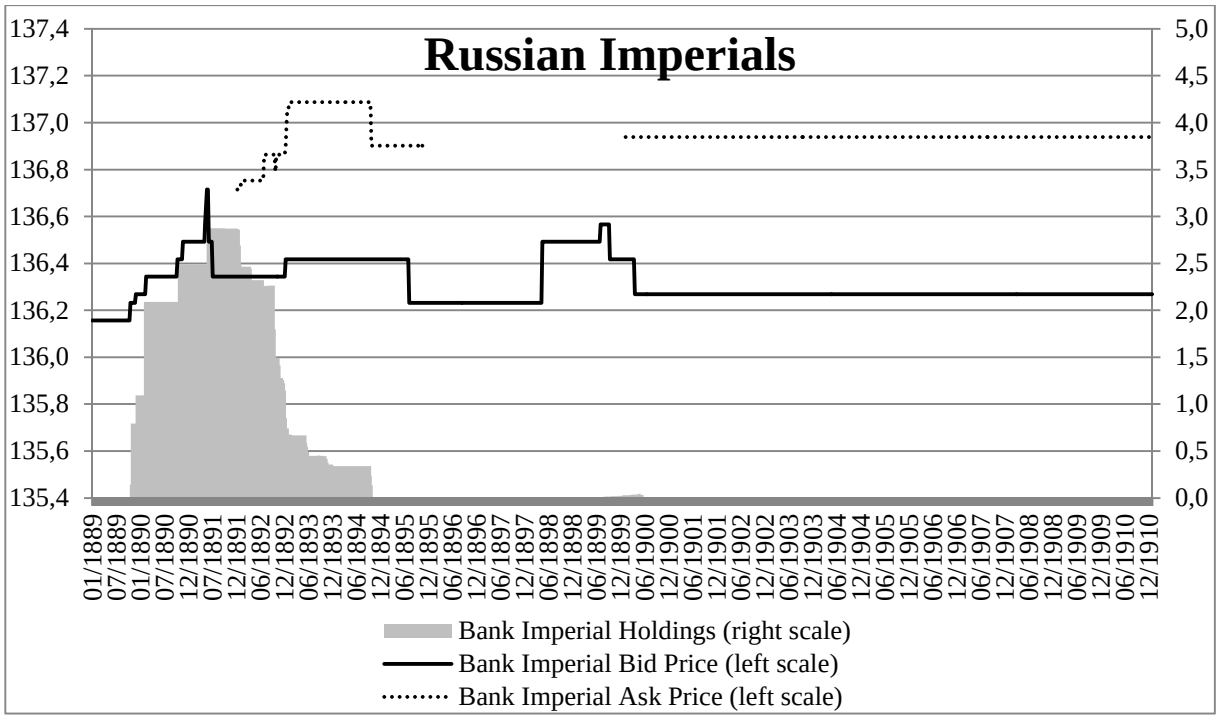

Figure 7: Bank of England's holdings of Russian imperials (in million pounds, right scale) and Bank bid-ask prices for a kilogram of fine gold in the shape of Russian imperials (in pounds, left scale). Source: author's database.

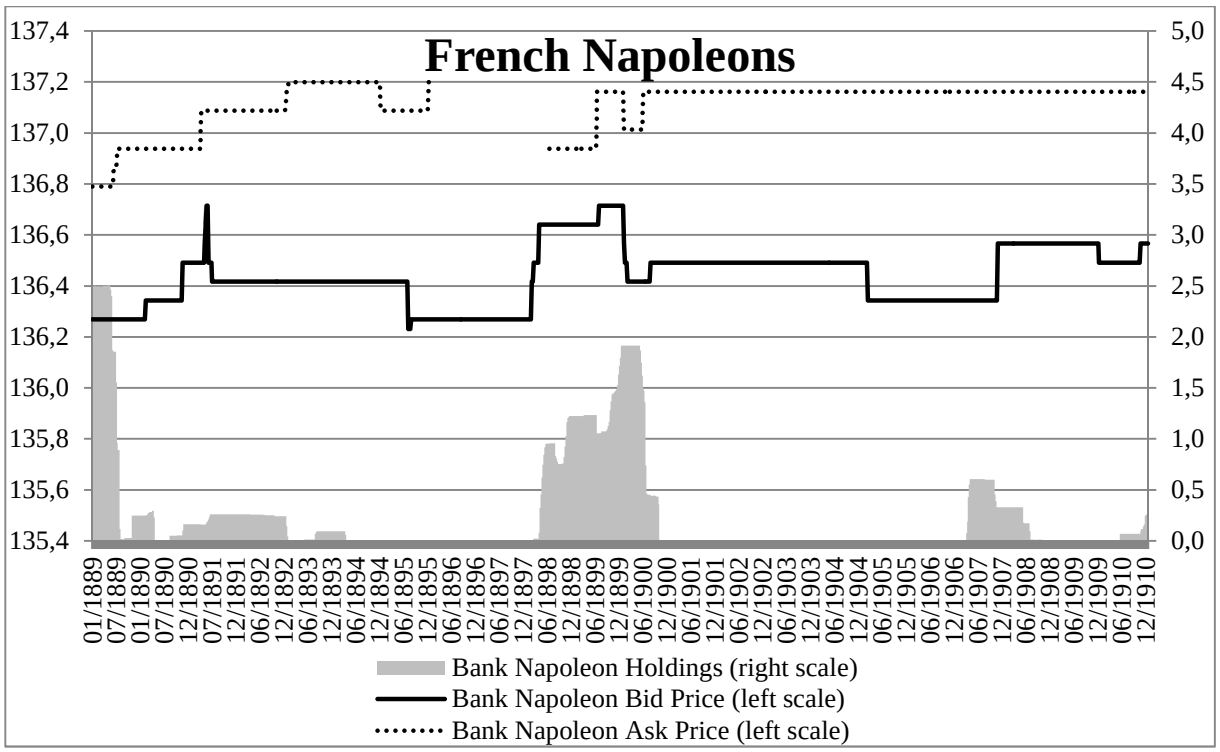

Figure 8: Bank of England's holdings of French napoleons (in million pounds, right scale) and Bank bid-ask prices for a kilogram of fine gold in the shape of French napoleons (in pounds, left scale). Source: author's database.

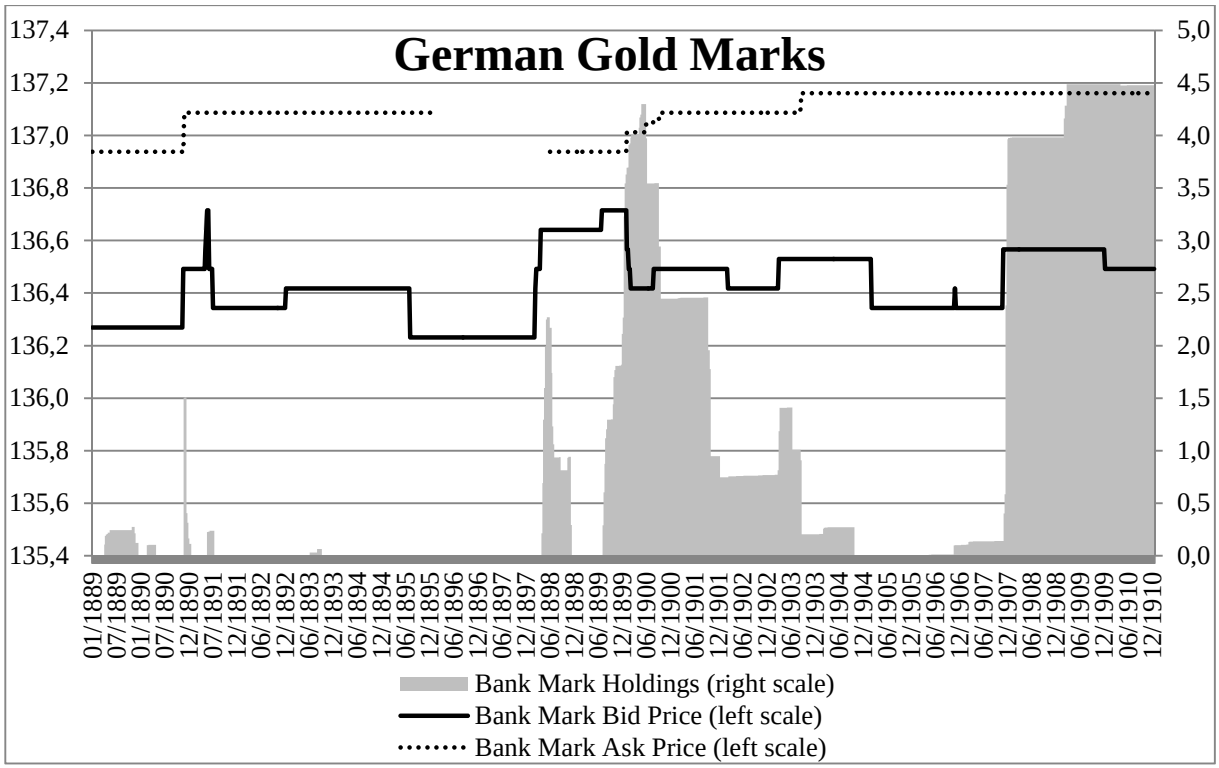

Figure 9: Bank of England's holdings of German gold marks (in million pounds, right scale) and Bank bid-ask prices for a kilogram of fine gold in the shape of German marks (in pounds, left scale). Source: author's database.

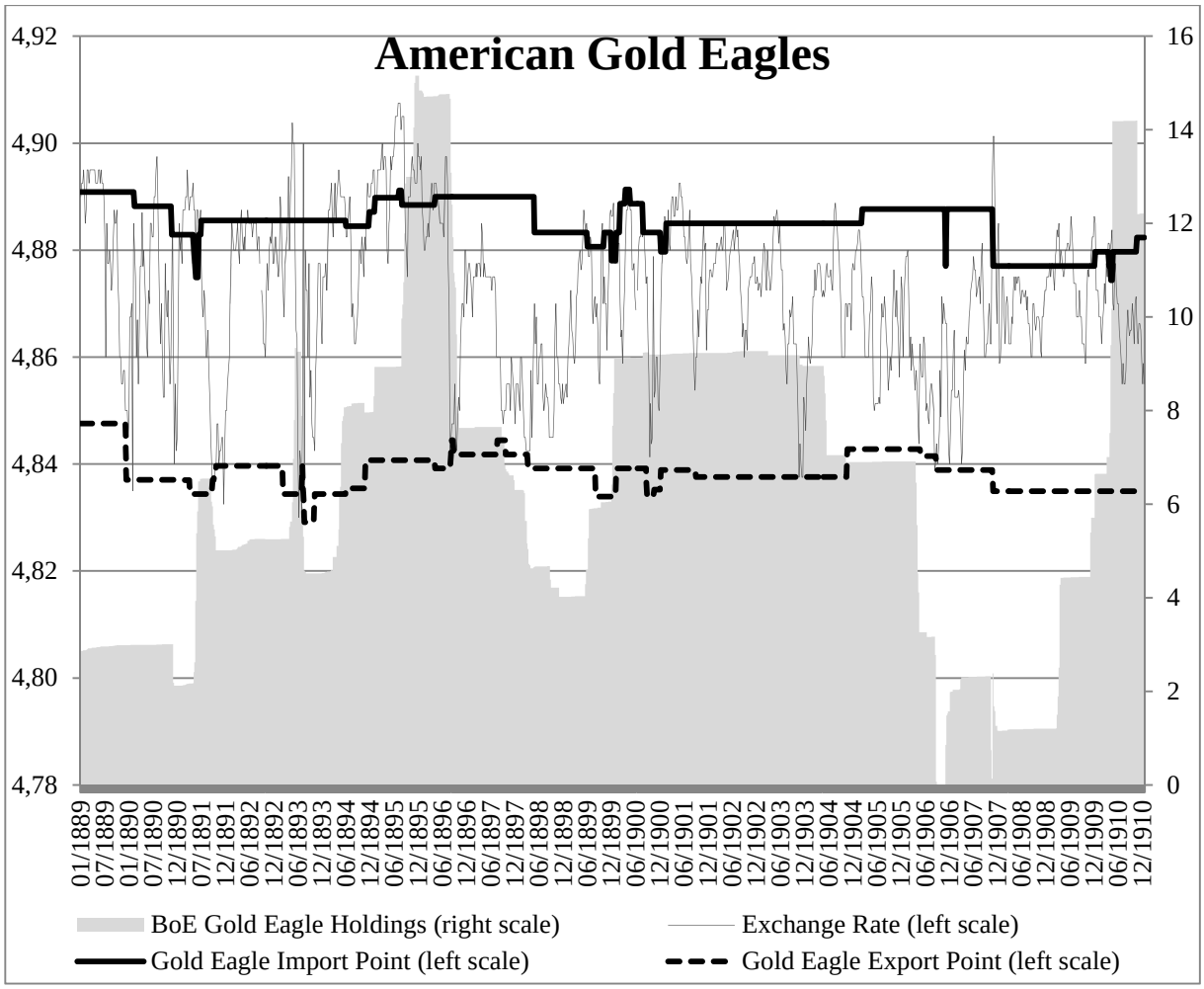

Figure 10: Dollar/sterling exchange rate and gold eagle import/export points (in U.S. dollars, left scale) *vis-à-vis* the Bank of England's holdings of American eagles (in million pounds, right scale). Sources: exchange rate from *The Economist* (1889-1910); transaction costs from Officer (1996, pp. 124-30); Bank's eagle bid and ask prices and eagle holdings from author's database.

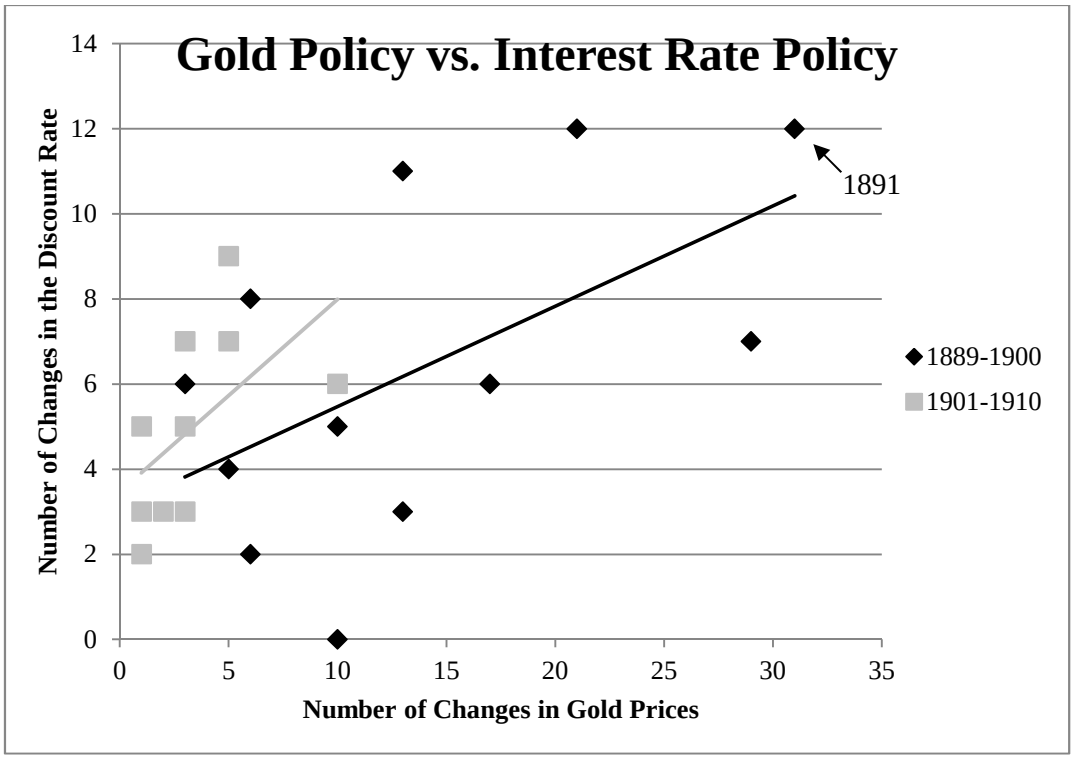

Figure 11: Yearly changes in the Bank's gold prices (horizontal axis) *vis-à-vis* yearly changes in the Bank's official discount rate (vertical axis). Sources: Bank rate from Clapham (1944, pp. 429-32); gold price changes from author's database.