Does Sterilized Central Bank Intervention Have Long Term Effects on Exchange Rates? The Case of the British Exchange Equalization Account, 1952-1972

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Abstract

Using over 40,000 new observations on intervention and exchange rates, this paper is the first study of Bank of England foreign exchange intervention between 1952 and 1972. The main finding is that the Bank was unsuccessful in managing the exchange rate independently from monetary policy in the long run. By estimating a reaction function, I find that the Bank of England failed to intervene on the forward market which was growing in importance. Analysing alternative exchange rates, I show how the Bank failed to maintain credibility in offshore markets. This lack of control led to window dressing of the reserve accounts figures and eventually the demise of the Bretton Woods fixed exchange rate system in Britain.

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This paper tests the effectiveness of British central bank intervention on the foreign exchange market during the Bretton Woods period. Using a success count methodology outlined in recent literature, this paper registers daily intervention episodes to measure the direct impact of intervention on the exchange rate. There is a debate in the empirical and theoretical literature on the effectiveness of sterilized intervention, or intervention followed by open market operations to offset the effect on the domestic money supply.[2] A previous consensus, challenged by recent findings, was that sterilized intervention does not work in practice. This does not explain why many central banks still use sterilized intervention on the currency market, especially in developing economies.[3] Does sterilized intervention work?

Limited research has been undertaken on the actual defence line of the Bank of England, namely the Exchange Equalisation Account (EEA). This account, set up after the 1931 sterling devaluation, is the institution the Bank of England uses to conduct all its operations on the foreign exchange market. This paper analyses daily ledgers dealers' reports from the EEA, two unique sources of secret information, to understand the effectiveness of Bank of England intervention.

The current literature on the period either considers narrative archival records to understand the actions by the Bank of England to defend sterling or analyses how other central banks dealt with unwanted sterling reserves.[4] Only limited research has been undertaken on the actual line of defence of the Bank of England, namely the Exchange Equalisation Account.[5] This account was established in 1932 to check

[2] See for example Bordo et al., *Strained Relations* for a critical view and Blanchard et al., 'Can Foreign Exchange Intervention' and Fratzscher et al., 'Evidence from 33 Countries' for a more favourable view.
[3] For a thorough literature review on the topic, see Bordo et al., *Strained Relations*, pp. 1-27.
[4] A narrative account is found in Capie, *Bank of England*. On unwanted reserves, see Schenk, *The Decline of Sterling* and *Britain and the Sterling Area*.
[5] For early literature on the account, see Hall, *Exchange Equalisation Account* ; Waight, *History and Mechanism*. The first comprehensive historical study is Howson, *Sterling's Managed Float*.

'undue fluctuations in the exchange value of sterling.'[6] The operations of the account were kept secret, allowing the Bank of England to defend sterling without informing the market of the true state of gold and dollar reserves. Therefore, the Bank could be considered as a currency trader with an informational advantage, knowing more than most market participants.

In this paper, I question the effectiveness of British central bank intervention on the foreign exchange market during the Bretton Woods period. This paper registers daily intervention episodes to measure the direct impact of intervention on the exchange rate.

I argue that, while the Bank of England managed to keep the exchange rate within the Bretton Woods bands, sterilized intervention cannot be described as successful. Before 1958, offshore and forward foreign exchange data show that the official exchange rate was not credible. After the introduction of convertibility in 1958, Swiss offshore markets stop showing a discount on sterling. However, sterling enters a period of crisis forcing the Bank of England to progressively manipulate its official reserve data. Over the whole period, by using a methodology counting daily intervention successes, I demonstrate that betting systematically against the Bank of England was a profitable trading strategy. Therefore, the Bank of England did not have any significant informational advantage on other market participants.

In the past two decades, a large amount of literature on the microstructure approach to exchange rates has modelled theoretical channels through which sterilized intervention could work, reopening the theoretical debate on the legitimacy of central bank intervention.[7] This theoretical shift in the literature has led to new empirical

[6] Finance Act, 1932.

[7] Lyons, *The Microstructure Approach* presents the main concepts of the microstructure approach and Sarno and Taylor, 'Official Intervention' for a specific review of the literature central bank intervention.

research on several countries and is painting a more optimistic picture.[8] The British experience with the EEA helps understand the effectiveness of sterilized intervention by providing a detailed account of British intervention policy between 1952 (the reopening of the London foreign exchange market) and 1972 (the end of the Bretton Woods system in Britain). This is essential because most evidence from developed countries only comes after the 1990s when interventions are very infrequent.

During the Bretton Woods period, the Bank of England's Quarterly Bulletins were the most important published statements of gold and foreign currency reserves. The Bank published these statements every three months and sometimes manipulated or "window dressed" the published numbers.[9] The Bank of England manipulated figures to ensure that the reserve levels were high enough the day before the official publication of the Bank's reserves. The Bank only publishing the asset side of the reserve positions and not the liabilities. Swaps and short-term loans (sometimes as short as overnight) from international financial institutions and central banks allowed the Bank to show higher reserves. The actual dollar and gold reserves of the EEA were logged in the Account's ledgers, which have not been exploited in previous literature. This paper uses these secret daily ledgers along with other new archival material to understand the effectiveness of Bank of England intervention during the Bretton Woods period.

The next section is an overview of the relevant empirical and theoretical literature. Section III presents the historical context as well as the institutional specificities of the EEA. Section IV presents the new data used. Section V presents the methodology and results. Section VI concludes.

[8] See Fratzscher et al., 'Evidence from 33 countries'.
[9] Capie, *Bank of England*, pp.165-166

II Literature

At the end of the 20th century, central bank intervention was vanishing as most central banks in advanced economies decided to pursue inflation targeting and let their exchange rate to float freely.[10] Central bank intervention can either be sterilized (with simultaneous open market operations to leave the money supply unaffected) or unsterilized (affecting the money supply). Put simply, unsterilized intervention has an effect on the exchange rate which is strongly reinforced through changes in the money supply. These changes affect the interest rate, making the currency more or less attractive. The effectiveness of sterilized intervention, on the other hand, has been long debated. The literature has taken different views over the years and the debate is still not settled.

The question of the effectiveness of sterilized intervention is controversial. The consensus in the 1990s was that sterilized central bank intervention was ineffective.[11] Recent research on the topic focuses mainly on developing economies highlighting that the theoretical framework established for developed economies cannot be used.[12] In a cross-country study analysing 35 countries, Blanchard et al. show that sterilized intervention can hinder unwanted currency appreciation via of capital inflows.[13] In a recent study, Fratzscher and coauthors argue that intervention 'is widely used and an effective policy tool, with a success rate in excess of 80 percent under some criteria'. This new study will influence the ongoing debate.

[10] Bordo et al. *Strained Relations*, p. 345 note that today, Australia, Canada, Japan, the euro areas, Sweden, the United Kingdom and the United States are all committed to free exchange rates.
[11] Dominguez and Frankel, 'Does Foreign-Exchange Intervention Matter'
[12] See Menkhoff, Lukas, 'Foreign Exchange Intervention' for a comprehensive survey on the research on foreign exchange intervention in emerging economies.
[13] Blanchard et al., 'Can Foreign Exchange Intervention'.

For developed economies, the current consensus in the economic literature is that sterilized intervention has only a short-term or an indirect effect, for example by signalling future interest rates changes. Dominguez and Frankel were the first to conclude that it is ineffective in affecting exchange rates in the long run.[14] Evidence of the effectiveness of sterilized intervention is inconsistent. According to Bordo et al., 'the results [of empirical studies] are often not robust across currencies, time periods, and empirical techniques. Intervention often seems more like a hit-or-miss proposition than a sure thing'.[15]

Sarno and Taylor present three ways sterilized intervention can affect the longer term exchange rate through a portfolio-balance channel, an expectations (or signalling) channel or a coordination mechanism.[16] The portfolio balance channel works by changing the composition of the portfolio of bonds held by the public. Take the example of the Bank of England defending sterling through sterilized intervention. The Bank not only increases the quantity of dollars in circulation by buying sterling, it also reduces the British treasury bills in circulation in the act of sterilisation. British and American treasury bills are not seen as perfect substitutes in this model. Because of this, investors will rebalance their portfolio to adjust their risk, and by doing this they affect the spot exchange rate.[17]

The expectation or signalling channel works via the central bank informing the market of future change in monetary policy. For example, the Bank of England could intervene one month before an expected Treasury interest rate change announcement to support speculation in the financial press about a future interest rate change. The

[14] Dominguez and Frankel, *Foreign Exchange Intervention*.
[15] Bordo et al., *Strained relations*, p. 13.
[16] Sarno and Taylor, *The Microstructure*, pp.6-15 offer the most thorough literature review. These three mechanisms are also discussed in Bordo et al., *Strained Relations*, pp. 7-13.
[17] For more details on all the assumptions behind the portfolio balance effect, see Lyons, *The Microstructure*, pp. 160-170.

signalling channel requires the central bank to be credible; if the central bank does not follow through with changes in the monetary policy, it will lose money *ex-post* as the currency moves in an unwanted direction.

The coordination mechanism comes into play when traders using macroeconomic fundamentals have suffered losses and lose confidence in fundamentals to predict the exchange rate. In this case, the central bank can intervene and give a coordinating signal to traders who are using analysis of macroeconomic fundamentals to instil trust in the market. For example, the Bank of England could heavily intervene after a global shock to signal that the currency will align with the country's macroeconomic fundamentals.

The issue with this empirical literature is the secrecy of intervention. Sarno and Taylor emphasise: 'intervention data still requires the reconstruction of the operations of the monetary authorities on the basis of reports of the financial press which, however, is not expected to be comprehensive of every secret operation, especially small ones which may not be identified even by traders in the foreign exchange market'[18]. This issue was understood by Harry Siepmann, former head of the EEA, in 1938 when he reported on the accuracy of the financial press: 'It is sometimes surprising to find how wide off the mark are the Press reports of the E.E.A. activity, as when on the 6th April we bought nearly Fcs. 200 million but were reported by the "Financial News" the next morning as having "retired from the Market soon after the opening".'[19] Assessing the effectiveness of central bank intervention requires detailed data. Fratzscher and coauthors stress the importance of data and emphasise that 'the bottleneck of research on foreign exchange intervention is data

[18] Sarno and Taylor, 'Official Intervention', pp.851-2. Menkhoff, 'High-Frequency Analysis', pp. 9-10 also flags issues with most studies relying on press reports.
[19] London, Archive of the Bank of England, Papers of Sir Henry Clay: Harry Arthur Siepmann – Memoranda, ADM22/21, 26 October 1938.

availability'.[20] If the data is not easily available to modern researchers as emphasised, the information is accessible to economic historians.

A few economic historians have directly tested the effectiveness of central bank intervention using econometric methods. Bordo et al. is the first econometric paper on foreign exchange market intervention for the United Kingdom during the sterling crises from 1964 to 1967. In this period, they argue that external assistance allowed Britain to maintain the peg with the dollar. The most comprehensive historical analysis of intervention is a recent book by Bordo et al., which focuses on the United States and finds that American intervention was successful during the Bretton Woods period by delaying the expected fall of the system.[21] Klug and Smith is an earlier attempt to test intervention effectiveness in the context of the Suez crisis.[22]

The main interest in analysing the case of Britain lies in the fact that the period corresponds to the decline of sterling as an international reserve currency. As early as the mid-1920s, the dollar overtook sterling as a leading reserve currency; however, the two currencies kept fighting for leadership during the interwar years.[23] The decline of sterling in the post-war years is not debated but the causes of the decline led to various interpretations. In a capital immobile world, Britain still pursued a relatively independent monetary policy, leading to pressures on sterling. These pressures were met with intervention on the foreign exchange market and reinforcement of capital controls. With convertibility reintroduced in 1958, the pressure amplified and the

[20] Fratzscher et al., 'When Is Foreign Exchange Intervention Effective', p. 1.
[21] Bordo et al., *Strained relations*.
[22] Klug and Smith, 'Suez and Sterling'.
[23] Eichengreen, and Flandreau, 'The Rise and Fall'

country was increasingly relying on short-term borrowing to support the currency through swaps with other central banks and international financial institutions.[24]

III The Exchange Equalisation Account (EEA)

The Exchange Equalisation Account (EEA) was established in 1932 after Britain left the gold standard to manage the exchange rate. The main purpose of the EEA was to manage the pound from 1932 to 1939 after the sterling float of 1931.[25] The Account was a part of the Treasury but did not have an executive arm, meaning that the Bank of England had to execute the orders of the Account. Figure 1 presents a schematic structure of the EEA.

The main role of the EEA was to buy or sell foreign currencies on the foreign exchange market mainly in London and New York to influence the exchange rates. The Account operated mainly in dollars and French francs until 1935, after which it introduced Dutch florins, Swiss francs, Belgian francs, Swedish kronors, Norwegian kroners, Canadian dollars, Argentine pesos and Indian Rupees.[26] During the Bretton Woods period, most of the interventions were in dollar with some intervention in gold, French francs, Belgian francs, Deutschemark and Canadian dollars. The Account kept important reserves in gold and used them to buy dollars on the London market when needed during crises. The goal of the account was to ensure 'the exchange rate did not vary by more than one per cent either side of the $2.80 parity value dictated by IMF membership'.[27]

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[24] On the 1960s crises see for example Bordo et al., 'Sterling in Crisis' or Schenk, *The Decline of Sterling* for a broader overview.
[25] Howson, *Sterling's Managed Float*, p.15.
[26] Howson, *Sterling's Managed Float*, p. 36.
[27] Capie, *Bank of England*, p.59.

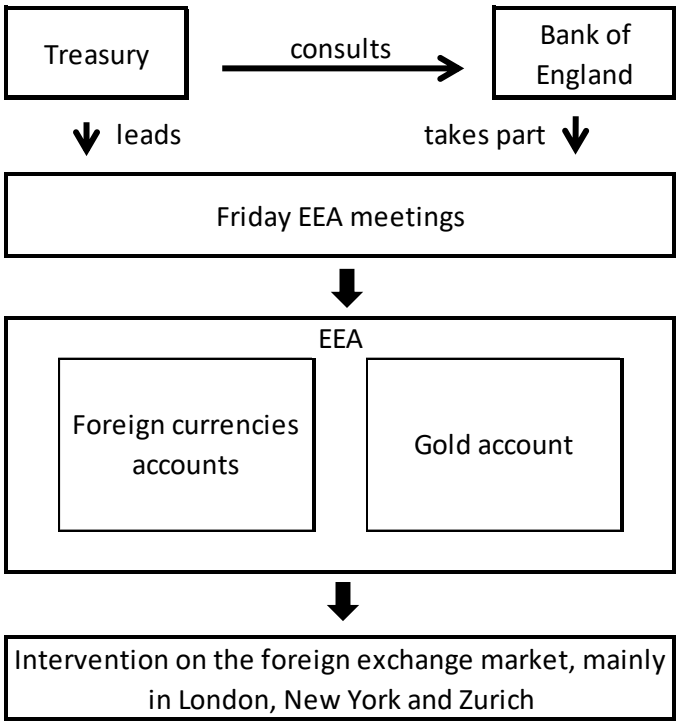

Figure 1 – Schematic structure of the EEA

Despite the leading role of the Treasury in the EEA's operations, the Bank of England still had a say in the running of the Account. Contrasting with other periods, the Bank had a clear mandate from the Treasury to keep the pound within the IMF band.

Susan Howson has shown how the EEA sterilized operations. The EEA would lend any excess cash reserves to the Treasury through British Treasury bill purchases. Howson argues that 'an EEA purchase of foreign exchange would both increase cash in the hands of the public and reduce the EEA's holdings of Treasury bills'.[28] Even if the sterilisation was not perfect, the EEA still offers a good case to study the effectiveness of sterilized intervention.

[28] Howson, *Sterling's Managed Float*, p.10.

During World War II, the EEA was the main market maker and any legal foreign exchange transactions eventually transited through the EEA via the main commercial banks, who were dealing at official rates. Almost all foreign exchange broking firms ceased activity and some of their employees were hired by the Bank of England to work on exchange control management.[29] This means that until 1947 there was no free foreign exchange market. 1947 marked the first attempt to establish convertibility which failed miserably.[30] After this failure, the market remained controlled until December 1951 when the foreign exchange market was reopened in London. 1952 is the beginning of the intervention activity of the EEA as opposed to simply controlling the market by making the prices through the commercial banks.

Different foreign exchange restrictions remained in place over the years and varied depending on the stress sterling was under. For example, in November 1945, an allowance for travel of £100 per year was introduced but it was completely withdrawn from October 1947 to May 1948 and the limit was moved to £25 in 1952.[31]

Before the restoration of convertibility, there were up to four different types of sterling: sterling held by residents of the sterling area that could not be transferred abroad, sterling held by residents of the dollar area (or American account sterling), transferable sterling that were held by residents of other countries, and blocked or security sterling that were held outside the sterling area but not transferable.[32] With convertibility in 1958, most of the restrictions on sterling disappeared even if residents were still not able to fully transfer their sterling holdings. Put simply, from 1946 to 1972, sterling goes through two main phases: a period of heavy controls on capital mobility progressing to a more capital mobile world. Even if the transition is

[29] Bank of England Quarterly Bulletin, 'The UK exchange controls', p. 250.
[30] Schenk, *The Decline of Sterling*.
[31] Bank of England Quarterly Bulletin, 'The UK exchange controls', p. 252.
[32] Klug and Smith, 'Suez and Sterling', pp.193-4.

somewhat progressive, 1958 offers a good point to divide the period as this is the date of the introduction of current account convertibility of the sterling area with the rest of the world.

IV Intervention, reserve and exchange rate data

This article uses three different data types: reserves data from the EEA ledgers, intervention data from the Bank of England's dealers' reports and exchange rate data from the *Financial Times*, the Bank for International Settlement and the Swiss National Bank.

First, the EEA ledgers at the Bank of England contain reserve data.[33] As the Bank was executing orders on behalf of the Treasury, it kept ledgers on all EEA activity. The daily data span October 1939 to March 1971. The ledgers of the EEA have not been used in previous studies, which calculate reserve levels from proximate sources or use monthly or quarterly data.[34] Figure 2 offers a monthly overview of the EEA largest holdings, namely gold, dollars, Canadian dollars and French francs holdings. It quickly appears that throughout the period, gold and American dollars were the account's main reserves. The appendix presents evidence of window dressing using the same reserve data. Three interesting features emerge from Figure 2. The first spike shows the effect of the 1949 devaluation on reserve building which then stops with the Korean war. After the Suez crisis in 1956 reserves seem to be dropping until 1958 when the convertibility allows the Bank to rebuild reserves. After 1961 it is striking to see gold reserves dropping while the account's reserves are

[33] Bank of England archives, Ledgers of the Exchange Equalisation Account, 2A141/1-17.
[34] Cairncross, and Eichengreen, *Sterling in Decline*, for quarterly data, Klug and Smith, 'Suez and Sterling' on using dealers' reports.

mainly made of dollars, borrowed from foreign central banks and international institutions through loans and swaps.

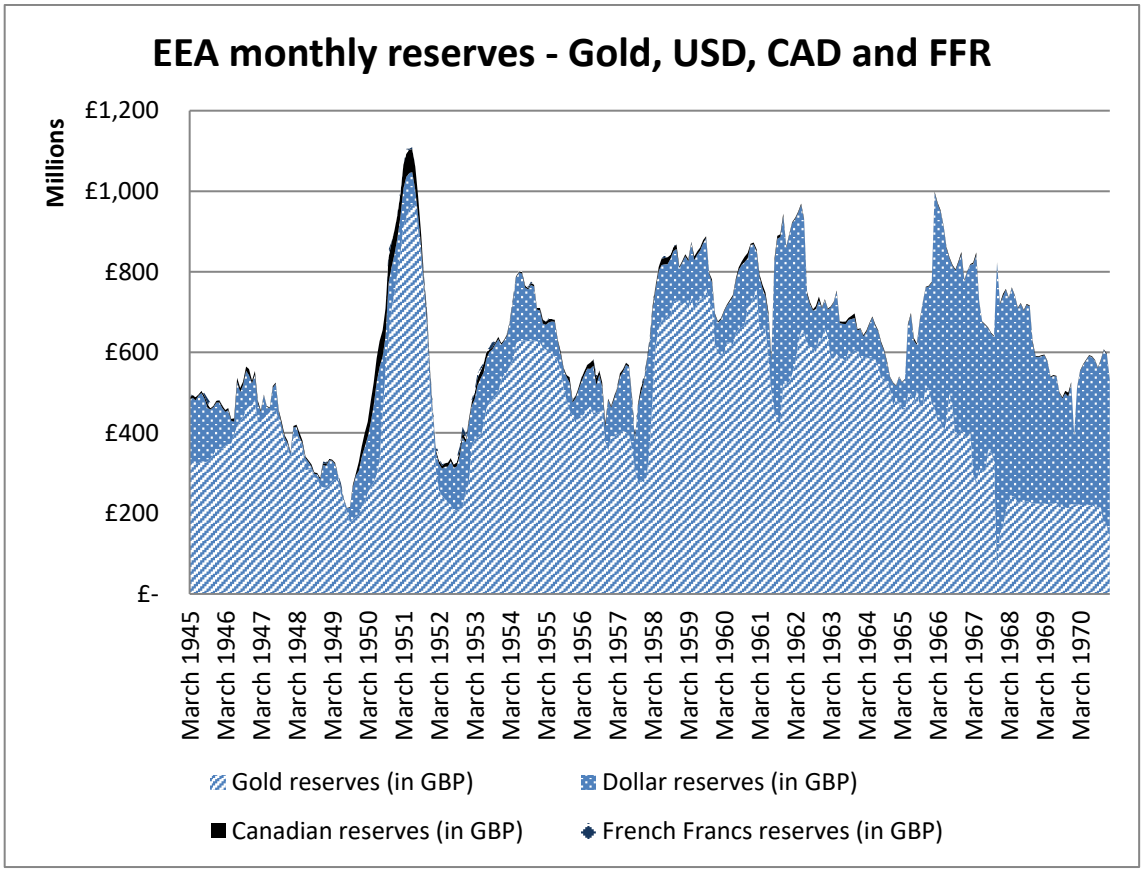

Figure 2 – EEA reserves between 1945 to 1971, monthly frequency from the Ledger of the EEA

The second source to measure intervention comes from the dealers' reports. These reports offer daily records on the cashier's department activities on the gold and foreign exchange market.[35] The reports start in 1952 and end in 1999 and report all the bank's foreign exchange operations, separated into market operations and customer operations. Customer operations are made on behalf of other central banks and the Bank of England acts as agent. This article only considers market operation as they are the operations made to influence the exchange rate and can, therefore, be considered as intervention.[36] These reports have been used by Bordo et al. to measure

[35] Bank of England Archives, Cashier's Department: Foreign Exchange and Gold Markets - Dealers' Reports, C8.
[36] This is in line with current literature for example Fratzscher et al., 'Evidence from 33 countries'.

intervention from 1964 to 1967 and Klug and Smith to understand the Suez crisis.[37] These two studies, however, use the reports to reconstruct the EEA reserve levels as they did not have access to the EEA ledger while this paper uses the intervention data from the reports along with reserve data from the ledgers.

As the Bretton Woods regime is one of fixed exchange rates, the London spot market offers little information on the credibility of the peg. Bordo et al. rely on the three-months forward rates from *The Times* to get a better understanding of the credibility of sterling.[38] This paper uses the forward rates from *the Financial Times* and offshore exchange rates from Switzerland. Estimates by the Bank of England in 1954 show that the biggest offshore market for sterling before convertibility was in Zurich, which was even bigger than New York in terms of volume.[39] However, data available at the Swiss National Bank does not offer direct sterling/dollar exchange rate and therefore cross rates are used. Most interesting is the bank note rate, which was the rate at which tourists could exchange currency at a bank counter.[40] These rates have both been recorded at a daily frequency by the Swiss National Bank which collected the rates from commercial banks such as *Credit Suisse*.[41] After 1958 with convertibility, Swiss exchange rates align closer with London rates. All these observations are collected for this article and presented for the first time in this article.

[37] Bordo et al., 'Sterling in Crisis' and Klug and Smith, 'Suez and Sterling'.
[38] Bordo et al., 'Sterling in Crisis'.
[39] Bank of England archive, Exchange control transferable sterling, C43/132.
[40] This market was probably also used by speculators and people illegally exporting currency from the Sterling area, therefore it can be identified as a black market, as it allows sterling area resident to illegally purchase dollars with sterling for example. These transactions were not illegal *per se*, but exporting large amounts of sterling was illegal.
[41] Swiss National Bank archive, Currency books (Devisenheft), 1949-1975.

V Testing intervention effectiveness

This paper plots alternative exchange rates to assess the credibility of the monetary authorities. It then presents a reaction function to better understand what the goal of the Bank of England was. In the following part, the success of reaching the policy goal is assessed using an event study. Success markers obtained in this procedure are then used in a probit/logit analysis to understand what factors lead to intervention achieving the wanted effect.

Was the pound credible?

Klug and Smith study the Suez crisis in 1956 and test if forward rates stayed within the Bretton Woods bands of the peg to ascertain the pressure on the Bank of England.[42] Bordo et al. use similar measures to assess sterling credibility between 1964 and 1967.[43] However, this study takes a more holistic approach by looking at the whole Bretton Woods period and testing different exchange rates.

As an illustration, Figure 3 plots the spot exchange rate along with the 1 and 3 months forward exchange rates from the *Financial Times*. The period starts after the 1949 devaluation and shows the effect of the market opening in December 1951. While the Bank of England was active on the spot market, forward interventions were timid. This was partly a legacy from Montagu Norman's reign, the governor of the Bank from 1920 to 1944, who saw the forward market as 'dominated by speculators' and was an 'anathema' for the Bank.[44] However, the chart shows that as soon as the market opened in December 1951, credibility was already questioned, as can be clearly seen with the forward rates breaching the Bretton Woods official bands.

[42] Klug and Smith, 'Suez and Sterling'.
[43] Bordo et al., 'Sterling in Crisis'.
[44] Quotations are from Sayers, *The Bank of England*, p. 420.

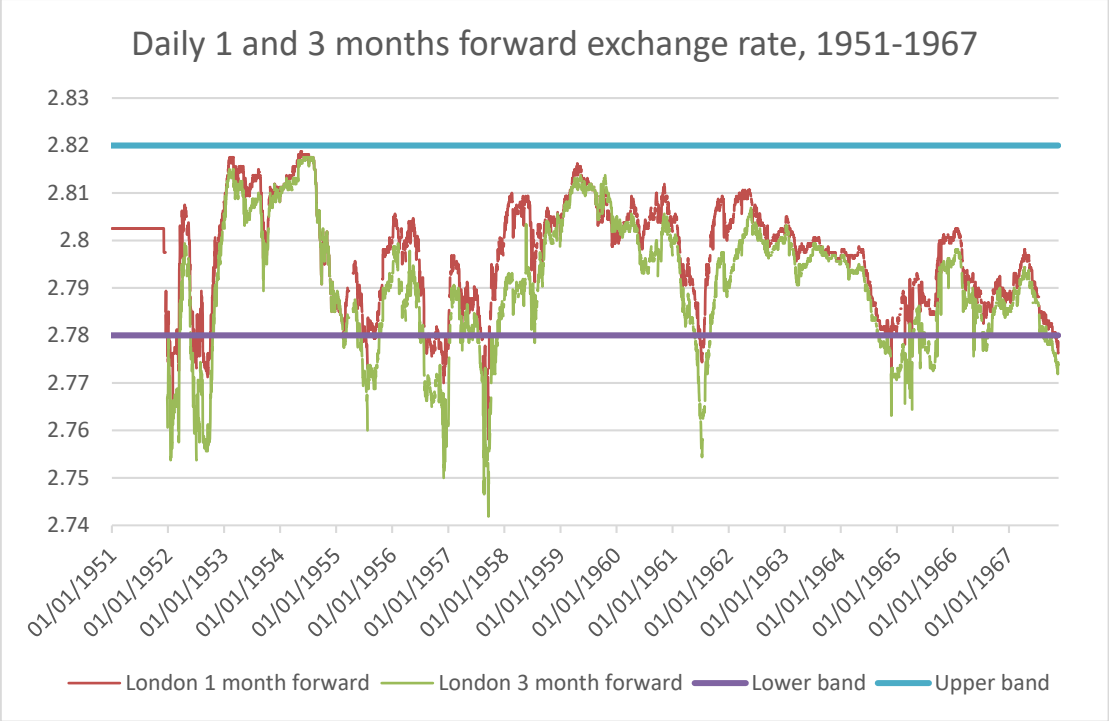

Figure 3 – Financial Times spot and forward exchange rate data.

Using forward rates to assess credibility in the foreign exchange market is interesting, however it can be problematic as the Bank of England intervened in this market. From December 1951 to 1972, there are 588 reported episodes of intervention on the forward market, which is just around 10% of all working days.[45] Therefore to get a more exogenous indicator of the pressure the Bank of England was under, transferable sterling markets, mainly in New York and Zurich, are more enlightening. In these markets, the Bank only intervened on 172 occasions during our period, or less than 3% of the working days.[46] Switzerland was the biggest market and free from intervention until the late 1950s. The Swiss market is a good choice to analyse pressure on sterling. Along with the transferable sterling rate, this study uses an even less controlled, yet smaller market, the over-the-counter banknote rate in Switzerland.

[45] This data is gathered from the dealers' reports but the actual figure is likely to be higher, as smaller interventions are not reported in the dealers' reports.
[46] These 172 interventions are between New York and Switzerland and it is not possible to differentiate for which market they are.

Figure 4 shows the banknote dollar-sterling cross rate in Switzerland along with the official Bretton Woods bands.[47]

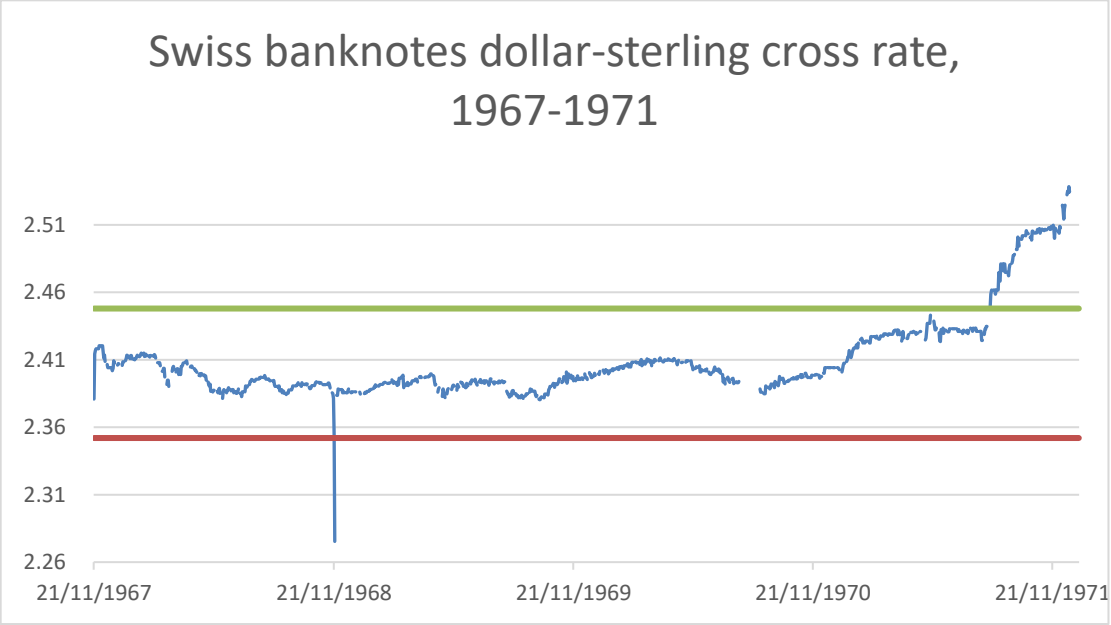

Figure 4 – Swiss banknote dollar sterling cross rate. Source: Swiss National Bank archive, Currency books (Devisenheft), 1949-1975.

The drop in the offshore banknotes cross-rate in November 1968 comes from a meeting by the finance Ministers of the Group of Ten around a potential revaluation of the Deutschemark and devaluation of the French franc as well as the opening of a $2000 million credit line to France.[48] The meeting lasted several days and included closing of foreign exchange markets in London and other major financial centres, with the British Treasury making announcements at 2:30am. Finally, the crisis was resolved without a change of parity, but other measures like a planned halving of the French deficit for the next year. The drop is not reported in the transferable sterling rates or in the London sterling rate as these were both closed. The offshore banknote rate is therefore useful to identify these crises.

[47] The bands were at +or- 1% of the official parities at $4.03, $2.80 and $2.40 per sterling respectively until 1949, 1967 and 1971.
[48] *Financial Times*, various articles, 21-23 November, 1968.

To summarise, Table 1 shows all breaches of bands by the different exchange rates used to assess the credibility of the Bank of England. The Bretton Woods period is divided into three parts relevant to the history of sterling: from the devaluation of 1949 to the introduction of convertibility in 1958; from convertibility to the 1967 devaluation; and from the devaluation to the suspension of the Gold window in August 1971.

		1949-1958		1958-1967		1967-1971	
		under	over	under	over	under	over
Financial time spot rate	# of breaches	0	0	0	0	2	3
	% of sample	0%	0%	0%	0%	0.2%	0.3%
Financial time 1-month forward	# of breaches	322	0	45	0	177	1
	% of sample	12.9%	0%	1.7%	0%	16.0%	0.1%
Financial time 3-months forward	# of breaches	582	0	443	0	457	1
	% of sample	28%	0%	16%	0%	41.3%	0.1%
Transferrable sterling rate	# of breaches	852	0	N/A		N/A	
	% of sample	68.7%	0.0%				
Offshore banknote rate	# of breaches	2575	2	0	11	2	129
	% of sample	91.1%	0.1%	0%	0.4%	0.2%	14.3%

Table 1 – Breaches official Bretton Woods band by different exchange rates. Sources: see part IV.

As expected, the *Financial Times* spot rates stay within the official bands during most of the period. According to this crude measure, the Exchange Equalisation Account did fulfil its mission of keeping the exchange rate between the official bands. However, the forward rates throughout the whole period often breach the official bands, highlighting a lack of credibility for the Bank of England exchange rate policy. These breaches show the passive stance of the Bank in this market, intervening only very infrequently.

Transferrable sterling is only in existence as a special rate until the 1958 convertibility and highlights the lack of credibility of sterling during that period.

Finally, the last row of Table 1 shows the Swiss banknote rate. This rate was completely out of the direct control of the Bank of England. The fact that the rate was systematically under the Bretton Wood bands until 1958 shows that the only free market at the time saw the pound as overvalued. Convertibility however aligned this market with the official spot rates and therefore shows no breach of the official bands.

By looking at alternative exchange rates, the main finding is that the Bank of England's exchange rate policy was not credible until 1958 as shown with the forward, transferrable and offshore rates breaching the official Bretton Woods bands. During 1958-1967, offshore rates were under control as there is no premium in holding offshore sterling with the removal of capital controls. However, forward rates were still not being controlled by the Bank who was reluctant to engage in this market and show that the pound was still lacking credibility.

Why did the Bank of England intervene?

In order to understand how central banks respond to exchange rate fluctuations, economists have estimated reaction functions.[49] Klug and Smith determine a reaction function of the monetary authorities and find that the Bank of England intervened in reaction to variations on the transferable sterling exchange rate during the Suez crisis. This shows that the Bank of England was not only worried about exchange rates in London but also abroad. Bordo et al. use a reaction function to study foreign exchange market intervention for the United Kingdom during the sterling crises from 1964 to 1967.[50] They show that the Bank of England not only reacted to lower-band of the exchange rate but also within the bands of Bretton Woods. In a fixed exchange rate system with multiple exchange rates, a reaction function can be used to determine which specific exchange rate was influencing the monetary authorities' policies.

When looking at the dealers' reports, it seems clear that the Bank of England dealers intervened to avoid sterling depreciation against the dollar (leaning against the wind). The dealers monitored both the official exchange rate in London but also transferrable sterling in New York and Zurich. Photographic evidence of the dealers' room shows that banknote rates in Zurich were visible on a board for dealers to see as they intervened over the phone. The reaction function helps determine which of these different rates was most important in shaping the Bank's policy decisions.

The reaction function relates several exchange rates to Bank of England intervention. To reduce issues associated with multicollinearity, the explanatory variables which relate to exchange rates are differences from the lower bound instead

[49] For a review of the literature on reaction functions, see Edison, 'The Effectiveness' pp.37-42, Neely, 'An Analysis', pp.2-3 and Ito and Yabu, 'What prompts'.
[50] Bordo et al., 'Sterling in Crisis'.

of being actual exchange rates. By taking the difference from the low band (which was 2.78 until 1967 and then 2.38 after the devaluation), the right hand side variables become much less correlated than is they are used as sterling-dollar exchange rates directly. It improves stationarity of the variables.

Transferable sterling is only relevant to the period before 1958 as it later disappeared as a separate sterling rate. As the dealers' reports start reporting transferable sterling from 1953, a reaction function for the subsample from 1953 to 1958 is reported. Below is the reaction function which is similar to other reaction functions in the literature[51]:

$$I_t = \beta_0 + \beta_1 I_{t-1} + \beta_2 \Delta S_{t-1} + \beta_3 \Delta_{low} S_{t-1} + \beta_4 \Delta_{low} S_{t-1}^{TRANS} + \beta_5 \Delta_{low} S_{t-1}^{NOTE} + \beta_6 \Delta_{low} S_{t-1}^{3FWD} + \varepsilon$$

where *It* is intervention in dollars taking positive value for purchase of dollars and negative value for sales of dollars, I_{t-1} is lagged intervention to allow for autocorrelation, $\Delta S_{t-1}$is the difference between the exchange rate at day t-2 and t-1 which is used in most reaction functions. The remaining four terms are the difference between the Bretton Woods lower band (2.78/2.38) and the four exchange rates considered: London spot rate, transferable sterling, Swiss banknote cross rate and 3-months London forward rate. After running a unit root test, the variables are stationary at level.

Three regressions are run, one for the full sample, one before and one after the instauration of convertibility in December 1958. The results are presented in Table 2.

[51] This function is mainly inspired by Ito and Yabu, 'What prompts' and Bordo et al., 'Sterling in Crisis'.

	(1) Pre-convertibility including transferable sterling (1953-1958)	(2) Post convertibility to devaluation (1959-1967)	(3) Whole sample (1952-1972)
Intercept	-3.35 (0.63)***	-9.81 (1.97)***	-2.89 (1.36)**
London spot sterling	171.01 (33.97)***	326.08 (97.23)***	171.62 (82.98)**
Transferable sterling	28.31 (9.75)***		
3-months forward	0.95 (25.67)	217.37 (85.90)**	47.49 (57.51)
Swiss offshore banknote cross rate	3.98 (3.33)		5.30 (3.22)*
Lagged intervention	0.35 (0.07)***	0.38 (0.03)***	0.35 (0.03)***
Previous day difference	513.10 (162.90)***	-260.70 (55.85)***	-283.39 (70.97)***
Adjusted R^2	0.321	0.258	0.194
Observations	1000	2249	4966

Table 2 – Standard errors are reported in parenthesis and they are robust to heteroscedasticity and autocorrelation using a heteroscedasticity and autocorrelation-consistent (HAC) estimators, using a Newey-West correction. *** signifies statistically significant at the 1% level of significance; ** at the 5% level of significance; * at the 10% level of significance.

The Bank of England was reacting to an increase in the spot exchange rate by buying dollars and to a decrease by selling dollars A decrease in spot rate by 0.01$ per sterling (for example 2.80$ to 2.79$ per sterling) would have led to the bank spending $1.71 million on any given day, all else remaining constant. Post-convertibility, the Bank would spend $3.26 million for a similar decrease in the spot rate. The direction of this relation was expected and is found to be the case in all three regressions. The monetary authorities also reacted to transferable sterling before the instauration of convertibility. This is consistent with findings by Klug and Smith during the Suez

crisis even if they find transferrable sterling to have a bigger impact.[52] For the pre-convertibility sample, the coefficient for transferable sterling exchange rate is significant but 6 times smaller than the one for official London sterling rate. This is consistent with evidence from daily phone conversations between the Fed and the Bank of England. [53] During most of the period between 1952 to 1972, Bank of England and New York Fed officials would talk at least once a day to discuss market conditions, including the state of transferrable sterling in New York.

What is interesting is that changes in forward rates trigger no reaction pre convertibility as the coefficient is not significant (row 1). Post convertibility, forward rates seem to play a role but the coefficient is barely significant (row 2). This highlights the intervention strategy of the Bank of England, shying away from any forward market intervention. This legacy from the reign of Montagu Norman who saw the forward market as a "speculative" market.[54] The Radcliff report published in 1959 stresses that 'operation in the forward market would not be an effective method of countering speculation against the pound'.[55] The policy of the Fed at the time was dramatically different as it intervened almost exclusively on the forward market.[56]

Finally, a more surprising result is that the offshore banknote cross rate in Switzerland does not seem to be a factor influencing monetary authorities' decision making. This could be due to the fact the this is a constructed cross rate and not a rate that was quoted anywhere.

[52] Klug and Smith, 'Suez and Sterling'.
[53] Archive of the Federal Reserve New York, Phone conversations between Bridge and Sanford, boxes 617015 and 617031.
[54] Quotations are from Sayers, *The Bank of England*, p. 420.
[55] The Radcliffe report, paragraph 707, p. 257.
[56] Bordo et al., *Strained Relations*.

Was the Bank of England successful?

To understand if intervention was successful, the policy goal of the Bank of England needs to be understood. As shown the previous part, the focus of the Bank was on the London spot market. The Bank's ability to influence that market needs to be assessed. The Bretton Woods agreement required sterling to be between official bands. However, in the context of a constantly declining pound[57], the Bank of England was rarely worried about a rising pound and this is reflected in archives. The goal of the Bank should be understood as to avoid spot sterling to go close to or below the lower bands defined in the Bretton Woods system (2.78 until 1967 and 2.38 afterwards). This means that purchases of dollars were not attempts to weaken sterling but were aiming to replenish dollar reserves.

The fundamental question when assessing the success of intervention is to understand whether intervention is a reaction of the central bank to adverse conditions when a "natural" reversal would be unlikely or a process that happens in martingale like context where the exchange rate randomly goes up and down.[58]

If intervention in floating exchange rate regimes is more likely to be an occasional reaction to adverse market conditions, intervention in a fixed exchange rate system such as Bretton Woods is more frequent. Therefore, intervention is more likely to be understood to interact with an almost martingale-like market, with central banks intervening frequently and merely to guide the exchange rate, not shock it into another direction.

Between 1973 and 1997 Bordo et al. test intervention effectiveness of the Federal Reserve and find that intervention did rarely beat random prediction in

[57] On the decline of sterling see Cairncross, and Eichengreen, *Sterling in Decline*, and, Schenk, *The Decline of Sterling*.
[58] The first view is exposed by Fratzscher et al., 'Evidence from 33 Countries' and the second by Bordo et al., 'The Federal Reserve'.

influencing the exchange rate. The methodology they use between 1973 and 1997 is presented below by relying on unused EEA archives. The methodology is adapted to count only appreciation of sterling as success and not depreciation of sterling. Between 1952 and 1972 the Bank was never trying to depreciate sterling. The assumption behind this (supported by archival evidence) is that the Bank only sold sterling for dollars to replenish reserves, not influence the exchange rate and was trying to avoid depreciating sterling when building up dollar reserves.

The methodology relies on three intervention success criteria (or SC). First, SC_1 measures whether intervention leads to an appreciation of sterling at the close. Second, SC_2 measures whether the exchange rate depreciates less after intervention, the so-called leaning-against-the-wind effect. A final criterion, SC_3, combines the first two. It measures either a successful appreciation of the exchange rate or a softening of the depreciation of the exchange rate. The three criteria take the form of a binary variable and are formalised in the three equations below:

$$SC_1 = \begin{cases} 1 & if\ I_t < 0, and\ \Delta S_t < 0 \\ 0 & otherwise \end{cases}$$

$$SC_2 = \begin{cases} 1 & if\ I_t < 0, and\ \Delta S_{t-1} > 0\ and\ \Delta S_t \geq 0, and\ \Delta S_t < \Delta S_{t-1} \\ 0 & otherwise \end{cases}$$

$$SC_3 = \begin{cases} 1 & if\ I_t < 0, and\ \Delta S_t < 0, or\ \Delta S_t < \Delta S_{t-1} \\ 0 & otherwise \end{cases}$$

where *It* designates Bank of England intervention on day *t* as recorded in the dealers' reports. Negative intervention values reported in the dealers' reports are sales of dollars. Therefore, a sale is expressed as $I_t < 0$ in the equations above. ΔS_t is the difference between the closing rate the day before the intervention and the closing rate the days of the intervention. It therefore shows the effect of the intervention during the

day. This makes sense as the effect of intervention is quite short lived and the Bank would intervene a lot in the last half hour at 5pm in London, as this would be information important to the New York foreign exchange market.[59] Dominguez also suggests that traders in the 1990s usually knew the Fed was intervening at least one hour before any news reports.[60] The methodology therefore captures the short term effect of intervention but does not capture any longer term effect. ΔS_{t-1} measures the difference between the rate the day before the intervention and the rate two days before the intervention.

The results of the success counts are then compared with virtual success, which are the successes of the different criteria, ignoring the effect of intervention. This makes sense because of the martingale nature of the market which is assumed to fluctuate daily, regardless of intervention. These values are then compared to the value obtained with the success criteria described below using a hypergeometric distribution (this is described in more details in the appendix). If the intervention success criterion is two standard deviations below the expected success, the intervention is said to have no exchange rate forecasting value. If the intervention success criterion is two standard deviations above the expected success, the intervention is said to have a positive forecasting value. Finally, in any other case, the intervention is said to have a random forecasting value.

Table 3 presents the result of the analysis for the whole sample from 1952 to 1972. The methodology is applied using intervention data from the dealers' reports and spot exchange rate data from *Global Financial Data*. The data are sorted by the three success criteria presented above. The first column shows the total number of

[59] This is well described in a letter to the Bank of France by M. Gouzerh from the Bank of France reporting on intervention practice at the Bank of England (Archives of the Bank of France, reference 1495200501/564, *Aide à l'Angleterre, généralités : note, télex, presse, correspondence, 1961-1977*).
[60] Dominguez, 'The Market Microstructure'.

days offering exchange rate data (6346) followed by the days on which the Bank of England sold foreign currency (2300).

	TOTAL	INTERVENTION SUCCESSES		VIRTUAL SUCCESSES		EXPECTED SUCCESSES	RANDOM RANGE	OUTCOME
	#	#	%	#	%	#		
Observations:	6346							
Criterion SC1								
Dollar sales (intervention)	2300	468	20%	1933	30%	701	between 665 and 736	**Negative forecast value**
Criterion SC2								
Dollar sales (intervention)	2300	478	21%	984	16%	357	between 329 and 384	**Positive forecast value**
Criterion SC3								
Dollar sales (intervention)	2300	946	41%	2917	46%	1057	between 1019 and 1095	**Negative forecast value**

Table 3 – Success counts according success criteria 1 to 3

Columns labelled "intervention successes" show intervention success according to the three criteria, both in number of successful days and in percentage. For example, the first entry shows that out of 2300 intervention days selling foreign currency, the Bank of England managed to get the exchange rate to appreciate on 468 occasions or 20%. The "virtual success" column shows that, ignoring the effect of intervention, when the exchange rate appreciated. This means that on 1933 instances, the exchange appreciated versus the previous day's close. The percentage of virtual successes (30%) is then used to establish the expected success. The Bank of England sold dollars on 2300 days, and therefore would be expected, by chance, to be successful at least 30% of the time or 700 times. The "random range" column then show the hypergeometric variance and standard deviation (details of the calculation are in the appendix). The actual number of successes (468), should lie two standard deviations above the expected success to show that the Bank had a positive forecasting value. However, 468 lies below the random range (665-736) and therefore show that the Bank had a negative forecasting value.

In other words, a trader systematically betting against the Bank after noticing an intervention would have made money on average. Or, if information about intervention would have been leaked on every given morning, betting against the Bank during the day would be profitable in the long run.

All but the smoothing criteria show negative forecasting value. The smoothing criterion shows that the Bank of England was successful in taming a depreciation, which was one of its policy goals. When compared with the findings by Bordo et al. for the Fed between 1973 and 1995, these results show that the Bank of England intervened more frequently, which was expected. The Bank of England was on the market almost every day or 85.2 % of the days if we include purchase and sales operations (as opposed to 15% and 3% respectively for Mark and Yen intervention in the Bordo et al. study). Compared to today, this is high as Fratzscher and coauthors find that between 1995 and 2011, developed countries' central bank intervened 8.7% of trading days and developing countries 34% of trading days. By intervening every day, success is expected to be lower as the intervention bears less signalling value, by not giving the market any new information.

The mission of the Bank in this period is to maintain a peg when the Fed in the post Bretton Woods period in the Bordo et al. study only periodically pursued exchange rate objectives. Resulting from this it is not surprising to see that success rates are lower overall. However, it still means that overall credibility of the Bank was low, as it rarely managed to move the market in the intended direction. It did however succeed in smoothing the fall of the exchange rate with intervention. The results obtained in this section are used in Probit/Logit regressions in the next section to understand what factors influence success.

What makes intervention successful?

To get a better understanding of what makes intervention successful, the success count variable can be used in a probit/logit regression to differentiate what elements contribute toward intervention success. Fratzscher and coauthors use this to understand the effect of intervention size and other variables on intervention success.

During the Bretton Woods period, Bank of England dollar sales are mainly going against the wind. When sterling appreciated, policy makers tended to use that free space to build up reserves which could then be used in the future to defend sterling or even in the short term to repay short-term commitments to foreign central banks. In this context, the success of going against the wind depends on two things, the strength of the intervention (which is explained by intervention size) and the "strength of the wind" going against the Bank. To measure the forces playing against the Bank, I use both short-term sterling trends and the distance of the exchange rate with fundamentals. To measure the distance with fundamental, literature mainly focusing on floating rates uses 3 years moving averages.[61] Moving averages perform poorly in showing fundamentals as intervention is constant and the exchange rate usually mean reverting over longer periods. The average exchange rate from 1952 to 1967 is almost 2.80[62], indicating that exchange rates probably only offer weak long-term trends. On the other hand, alternative exchange rates are a good proxy for the distance from fundamentals. The forward premium can prove useful. Finally, to emulate difficult conditions, volatility and distance from the lower band are used. Volatile times usually mean troubles on the market and make it difficult for the central bank to set the tone. Equally, the closer to the lower band, the more likely a

[61] See for example Fratzscher et al., 'Evidence from 33 Countries'.
[62] It is exactly 2.800219231 using daily data.

currency crisis is, and the more difficult it is for the Bank to reassure markets. The logit/probit equation reads as follows:

$$SC_t = \beta_0 + \beta_1 I_t + \beta_2 (S_t - S_t^{3FWD}) + \beta_3 TREND_t + \beta_4 VOLATILITY_{t-t10} + \beta_5 \Delta_{low} S_{t-1} + \varepsilon$$

where *SCt* is intervention success on day t, according to the three criteria presented above: reversal (SC1), smoothing (SC2) and smoothing or reversal (SC3). $S_t - S_t^{3FWD}$ is the forward premium. $\beta_3 TREND_t$ is the 10 days trend of the currency, computed as a sum of the differences of 10 day exchange rates. $\beta_4 VOLATILITY_{t-t10}$ is the 10-day local volatility. $\beta_5 \Delta_{low} S_{t-1}$ is the distance of the exchange rate from the lower band (2.78 or 2.38). Table 4 and 5 show the results.

The logit and probit regression yield qualitatively similar results (and the appendix shows an OLS regression using the same parameters and yielding similar results). The first striking feature of the results is that intervention size has a negative effect on success for reversal of exchange rate. The bigger the intervention the less likely it is to succeed to change the direction of the exchange rate. This is probably due to a reverse causality issue, as bigger interventions are happening at times of crisis, therefore being less likely to be successful. The biggest intervention in the sample happened the day before the 1967 devaluation, at a period where intervention was unlikely to fool market participants who were expecting and heavily betting on a devaluation (without any risk of a quick appreciation playing against them). Bigger intervention, however, seems to increase success when the Bank manages to smooth a depreciation. Or, to relate that to the first point, bigger interventions are not able to reverse exchange rates but might smooth depreciation.

PROBIT	(1) Reversal (SC1)	(2) Smoothing (SC2)	(3) Smoothing and/or reversal (SC3)
Intercept	2.087634 (1.09)*	-0.257456 (1.18)	0.493920 (1.07)
Intervention size	-0.003693 (0.001)***	0.001784 (0.0009)*	-0.000688 (0.0009)
Spot with past 2 weeks trend(1/0)	-0.028127 (0.08)	-0.902504 (0.08)***	-0.575096 (0.07)***
Distance from fundamentals (forward premium)	-30.42257 (11.43)***	-9.915652 (12.23)	-36.69833 (11.02)***
Local volatility	-1.093237 (0.39)***	-0.060694 (0.42)	-0.253147 (0.38)
Distance from the Bretton Woods floor ($S_{floor}-S_{t-1}$)	3.805926 (4.21)	4.406238 (4.17)	1.435952 (3.80)
McFadden R^2	0.02	0.09	0.04
Observations	1392 (1106 failures / 286 successes)	1392 (1066 failures / 326 successes)	1392 (890 failures / 502 successes)

LOGIT	(1) Reversal (SC1)	(2) Smoothing (SC2)	(3) Smoothing and/or reversal (SC3)
Intercept	3.538419 (1.82)*	-0.283482 (2.03)	0.816259 (1.77)
Intervention size	-0.006700 (0.002)***	0.003060 (0.001)*	-0.001146 (0.001)
Spot with past 2 weeks trend(1/0)	-0.045293 (0.14)	-1.558834 (0.14)***	-0.932841 (0.12)***
Distance from fundamentals (forward premium)	-52.41753 (19.32)***	-14.08064 (21.09)	-58.56352 (18.15)***
Local volatility	-1.839438 (0.64)***	-0.147274 (0.72)	-0.414884 (0.63)
Distance from the Bretton Woods floor ($S_{floor}-S_{t-1}$)	6.407218 (7.39)	7.931608 (7.16)	2.475688 (6.19)
McFadden R^2	0.02	0.09	0.04
Observations	1392 (1106 failures / 286 successes)	1392 (1066 failures / 326 successes)	1392 (890 failures / 502 successes)

Table 4 and 5 - Standard errors are reported in parenthesis and they are robust and a Huber/White correction has been applied. *** signifies statistically significant at the 1% level of significance; ** at the 5% level of significance; * at the 10% level of significance

If the intervention is going against the trend of the previous weeks, or if it is happening in a period of volatility, it is less likely to succeed as was expected. The distance from the lower band is not significant in any of the regressions

The forward premium seems to have an impact but the direction is puzzling. The higher the forward premium, the less likely the intervention is to be successful and, equally, the lower the forward discount, the more likely the intervention is likely to work. This is slightly puzzling as the expectation was that the more sterling is overvalued, the more difficult it would be for the Bank to make it appreciate. When running the regression for the sub-sample from 1952 to the 1959 convertibility, the expected relationship holds. Surprisingly however for the 1960s, with current model specifications, sterling's position against the dollar seems to be harder to improve when the market sees it as being worth less than it should.

These results, therefore need to be taken with caution. No clear trends emerge because of the frequency of intervention; the Bank was in the market over 80% of the days. Several coefficients are not significant, somewhat in line with similar studies.[63]

[63] Even with a much bigger sample, Fratzscher et al., 'Evidence from 33 Countries' have only few coefficients that are clearly explaining intervention success.

Conclusion

This paper presented new intervention data during the Bretton Woods period to assess whether Britain successfully managed its exchange rate with sterilized intervention. Regarding the crude goal of keeping the exchange rate within the approved bands, the Bank managed to fulfil its mission throughout the period if one assumes the 1949 and 1967 devaluations were exogenous government decisions. However, considering intervention in more detail, sterilized intervention during the Bretton Woods period cannot be described as successful. Before 1958, offshore and forward foreign exchange rates highlight the lack of credibility of the exchange rate, in a similar fashion that Hong Kong offshore exchange rates highlighted weaknesses in the Chinese Yuan in January 2016. After the introduction of convertibility in 1958, offshore markets stopped showing a discount on sterling, however, sterling enters a period of crisis forcing the Bank of England to progressively manipulate its official reserve data and undertake unsustainable international borrowing, in the context of the fall of Bretton Woods. The daily intervention data presented also shows how intervention cannot be portrayed as successful short-term tool, as any investor systematically betting against the Bank of England would profit from the strategy in the long run. However, to the Bank's credit, it managed to smooth exchange rate depreciation.

The reaction function shows that the focus of the Bank of England was mainly on the official spot exchange rate in London. Pre-convertibility, transferrable sterling was a worry for monetary authorities. Post-convertibility, forward rates progressively played a role even if the Bank probably underestimated the role of this important market in its policy.

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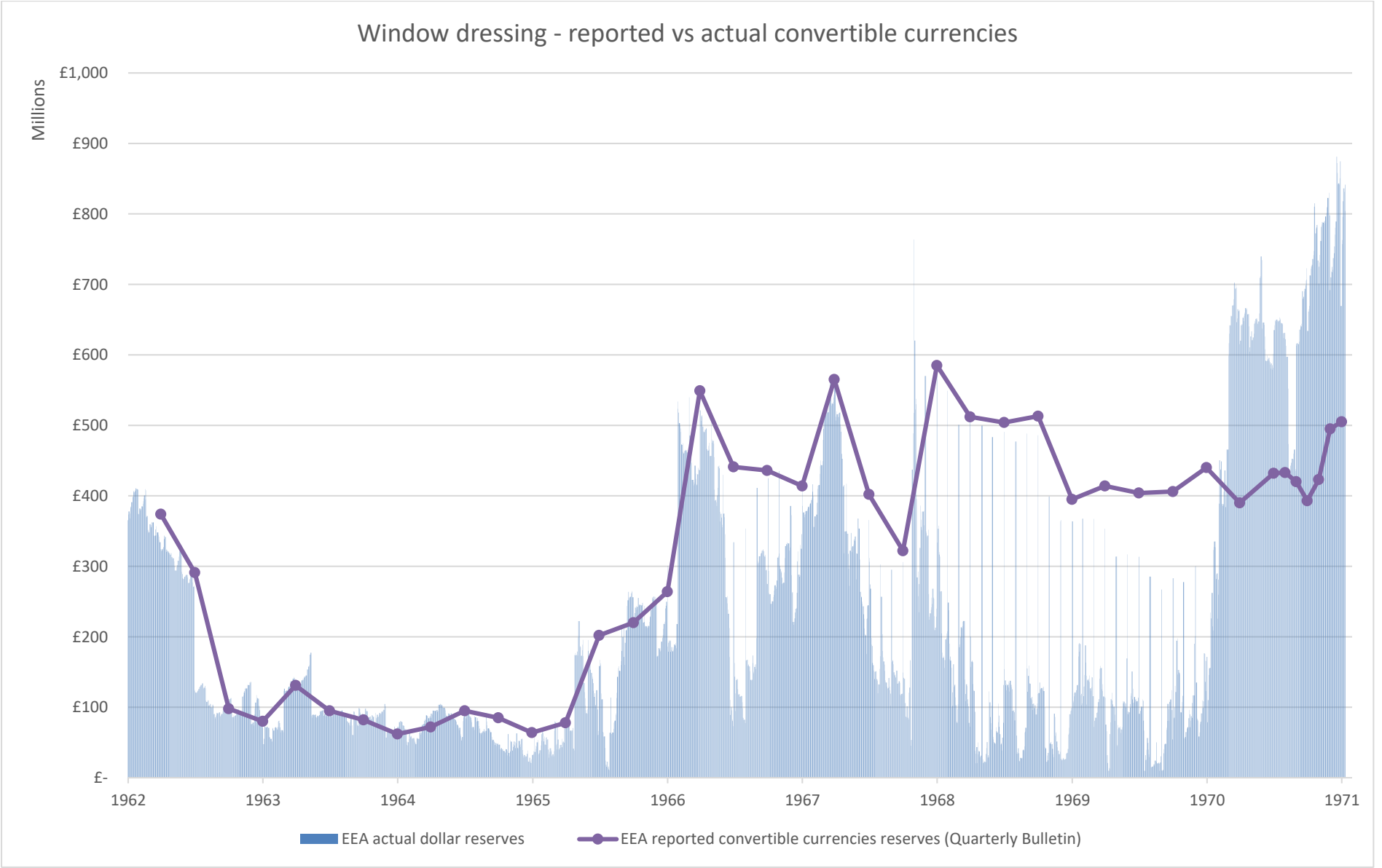
Appendix

Evidence of window dressing

The chart on the next page compares data from the EEA ledger with data published in the *Quarterly Bulletins*, where reserve data was published. Until 1968, the two numbers seem to be matching relatively closely and only minor difference probably due to reporting can be seen. After 1968, however, the actual reserves of the EEA drop far below the published reserves. This was done through short-term swaps and loans and only made possible by publishing only the asset side of the EEA's balance sheet in the *Quarterly Bulletins*, not the liabilities.



Appendix 1 – Exchange Equalisation dollar account versus published convertible currency reserves, 1962-1971.

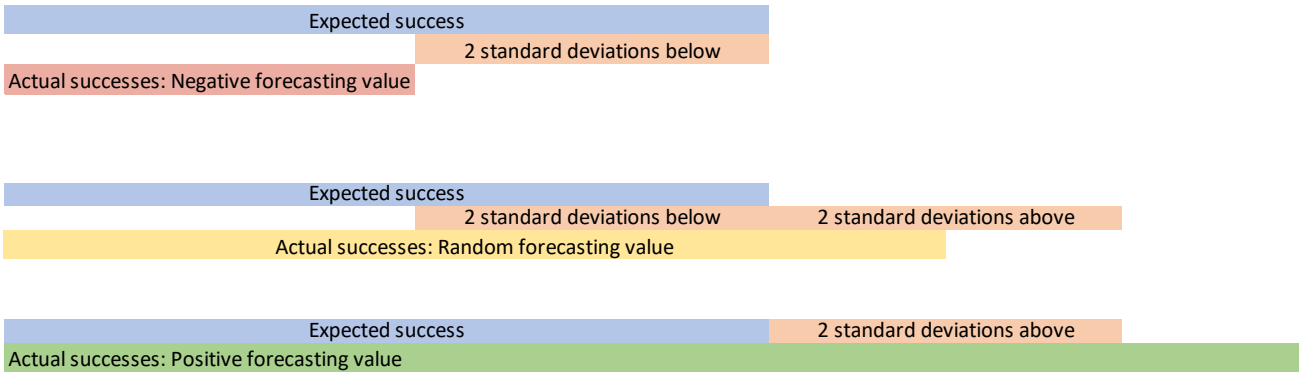
Hypergeometric distribution criteria

The testing methodology uses a hypergeometric distribution. The variance and standard deviation of the hypergeometric distribution are given below.

Variance = $n\frac{K}{N}\frac{(N-K)}{N}\frac{N-n}{N-1}$

N is the population size (total number of days with exchange rate data)
K is the number of expected successes (intervention virtual successes according to the three criteria $SC_{1\text{-}3}$)
n is the number of draws (total number of intervention with a buy or sell mark)
k is the number of observed successes (the actual number of successes according to the three criteria $SC_{1\text{-}3}$)

The null hypothesis that intervention has a random forecasting value. The null hypothesis is rejected if the number actual successes (k) are smaller by two standard deviation than the expected successes (*K*). This means the forecasting value is negative. The null hypothesis is also rejected if the number of actual successes (k) are bigger by two standard deviation than the expected successes (*K*). If the null hypothesis cannot be rejected either way, the forecasting value of the central bank is said to be random. [64] The three possibilities are schematically presented in the figure below.



[64] This is based on Bordo et al., 'The Federal Reserve'.

Robustness

OLS	(1) Reversal (SC1)	(2) Smoothing (SC2)	(3) Smoothing and/or reversal (SC3)
Intercept	1.127601 (0.37)***	0.408369 (0.26)	0.700321 (0.35)**
Intervention size	-0.000860 (0.0002)***	0.000545 (0.0003)	-0.000247 (0.0003)
Spot with trend past 2 weeks trend(1/0)	-0.007362 (0.03)	-0.269703 (0.03)***	-0.211500 (0.04)***
Distance from fundamentals (forward premium)	-9.030552 (3.56)**	-2.413668 (2.97)	-13.01312 (3.83)***
Local volatility	-0.345523 (0.13)***	-0.021642 (0.09)	-0.099966 (0.12)
Distance from the Bretton Woods floor ($S_{floor} - S_{t-1}$)	1.121695 (1.30)	1.293875 (1.03)	0.561208 (1.33)
Adjusted R^2	0.01	0.09	0.04
Observations	1392 (1106 failures / 286 successes)	1392 (1066 failures / 326 successes)	1392 (890 failures / 502 successes)

Table 6 - Standard errors are reported in parenthesis and they are robust to heteroscedasticity and autocorrelation using a heteroscedasticity and autocorrelation-consistent (HAC) estimators, using a Newey-West correction. *** signifies statistically significant at the 1% level of significance; ** at the 5% level of significance; * at the 10% level of significance