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Suez and Sterling, 1956

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Queen's Economics Department Working Paper No. 1256

Suez and Sterling, 1956

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Suez and Sterling, 1956

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Abstract

Daily data on spot and forward dollar/sterling exchange rates and on Britain's foreign exchange reserves are used to reassess the financial history of the 1956 Suez crisis. We find that support of sterling at its Bretton Woods lower bound lost credibility as early as July. Reserve losses also are consistent with an exchange rate crisis. We provide the first econometric study of foreign exchange market intervention in the pre-convertibility phase of the Bretton Woods system. The Bank of England's interventions reacted strongly both to official sterling and to the transferable sterling market in New York, which suggests that convertibility was a central goal of policy.

JEL codes: F31, N24

Keywords: Suez crisis, Bretton Woods system, foreign exchange market intervention

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1. INTRODUCTION

On November 5, 1956, British and French paratroops landed at Port Said, at the head of the Suez Canal, to be followed by a naval armada. On the afternoon of the next day Harold Macmillan, the British Chancellor of the Exchequer, told the Cabinet that $280 million of foreign exchange reserves had been lost in the previous week and that the sterling exchange rate could not be held without help from the United States. The Eisenhower administration was strongly opposed to the invasion, so Macmillan persuaded his colleagues that there was no choice but to accept the UN demand for a cease-fire.[1]

This account was until recently the accepted explanation for the outcome of the Suez imbroglio. With the opening of the archives in recent years historians have drawn different conclusions. In particular Kunz (1989,1991) argued that there was no documentary evidence for a serious run on the pound in the week of the invasion and that less than $100 million were lost in the first week of November. The most recent comprehensive history of the Suez crisis by Kyle (1991) amplified Kunz's conclusions by suggesting that Macmillan's belief that sterling was under pressure reflected a 'sensational loss of nerve.'[2]

These claims suggest to us that the economic aspects of the Suez affair are ripe for re-examination. Neither Kyle nor Kunz made any detailed reference to reserve movements. Furthermore, the level of foreign exchange reserves is not the only indicator of pressure on a fixed exchange rate. The recent literature on target zones has yielded simple tests for credibility based on the position of forward rates in relation to an exchange-rate band. We analyze sterling credibility during the Suez crisis and supply a comprehensive description of the movements of British reserves. Our analysis uses daily data which allow a precise examination of the relation between economic pressures and political events.

Section 2 provides a brief historical background. We next document that there was a foreign exchange crisis. Section 3 analyzes sterling credibility during the crisis, and section 4 describes the behavior of reserves. We find that the weakness of sterling is underestimated by recent historical accounts.

Section 5 studies the reaction function of the Bank of England in defending the pound. The Bank's interventions can be modeled much like those of central banks during more recent dirty floats. We provide the first econometric study of intervention during the per-

convertibility phase of the Bretton Woods system. The convertibility of sterling at a fixed rate had been an official commitment since the Anglo-American financial agreement of 1946, though some researchers have questioned the strength of this commitment, pointing to debates within the Treasury and the Bank of England on this question (see Fforde, 1992, p. 221). Our results shed new light on this issue, for we find that the Bank reacted strongly to movements of both official and transferable sterling in New York, which suggests that convertibility was an important policy goal in 1956.

2. BACKGROUND

This section presents a thumbnail sketch of the events of the Suez crisis. Appendix A contains a more detailed chronology of events which may have influenced the foreign exchange market's perception of the strength of sterling.

On July 26 1956 Gamal abd-al-Nasir, Rais (President) of Egypt, whose relations with Israel had been sliding towards war, made a new set of enemies when he nationalized the Suez Canal, which was owned by an international firm under Anglo-French control. It is clear from all accounts that Britain and France were determined to reverse this action. Their governments were angry over the expropriation and regarded Egyptian control of the canal as a serious strategic threat to consumers of non-dollar oil supplies from the Middle East (see Kunz, 1991, p. 87).

During the next three months, Egyptian pilots proved that they could successfully conduct ships through the canal. Britain and France tried to regain control of the canal through negotiations, supported by sanctions and by the efforts of the United States and other interested parties. However, the failures of the Canal Users Conferences disappointed hopes of a peaceful solution attained by international cooperation. Two major complicating factors were the tensions between Israel and Jordan, which some observers thought could bring Britain into action against Israel as well as against Egypt, and the turmoil in Eastern Europe, first in Poland and then even more seriously in Hungary.

Eventually the British government agreed to a French plan that their joint forces would occupy the canal zone. The Israelis, acting in collusion with them, would supply the pretext for this invasion by occupying the Sinai peninsula. This subterfuge was worked

out in the notorious Sèvres agreement. Britain and France hoped to claim that they were merely separating the warring parties in order to safeguard an international waterway. The second and most acute phase of the Suez Crisis thus began on October 29 when Israel invaded the Sinai peninsula.

If Britain and France hoped for support from the United States the timing of the invasion could not have been less opportune, given that it coincided with the Hungarian uprising and the US election. The US administration opposed the invasion from the start. Once all parties had agreed to the cease-fire, the US used all the economic means at its disposal to force an unconditional withdrawal by the Anglo-French force. It was not able to immediately end the British and French action though, because the British Cabinet thought that the bridgehead its forces still held gave it a significant bargaining counter with Egypt. The US administration then used various economic means including blocking access to IMF credit and preventing Britain from using US government securities as collateral against new commercial borrowing.

Intense economic and diplomatic pressure first led to Macmillan's key statement to parliament on November 13 that the sterling parity could not be held indefinitely and then to Eden's withdrawal on November 23 on the grounds of ill health. When the US voted with the Eastern Bloc and the non-aligned nations in the Security Council on November 24 it became evident that the economic pressure would not cease. Britain and France gave way and withdrew from their bridgehead at the beginning of December 1956. In response to their withdrawal, the US immediately granted Britain an Export-Import (EXIM) Bank loan of $500 million and dropped its objections to Britain drawing the first two tranches of its IMF quota.

3. THE MORGENSTERN-SVENSSON TEST OF STERLING CREDIBILITY

We first examine the implications of the crisis for the credibility of the sterling-dollar exchange rate. The existence of upper and lower bounds for the nominal exchange rate under the Bretton Woods system allows us to use tools developed to study exchange-rate target zones. Define e_t as the value of the pound in U.S. dollars, i_t as the monthly nominal interest rate in dollars, and i_t^* as the sterling interest rate. Investors in New York could

buy pounds at rate e_t, invest them for one month at rate i_t^* then convert the proceeds back into dollars at rate e_{t+1} . The annualized, gross rate of return on this investment is:

$$(1 + i_t^*)\left(\frac{e_{t+1}}{e_t}\right)^{12}. \tag{1}$$

If the Bretton Woods bounds, $\underline{e} = \$2.78$ and $\overline{e} = \$2.82$, were credible, then e_{t+1} would lie between them, which places bounds on the gross returns on spot contracts:

$$(1 + i_t^*)\left(\frac{\underline{e}}{e_t}\right)^{12} \leq 1 + i_t \leq (1 + i_t^*)\left(\frac{\overline{e}}{e_t}\right)^{12}. \tag{2}$$

In 1951 the Bank of England had ceased to fix official forward rates and had allowed free forward dealing in all convertible currencies.[3] Thus an alternative strategy was to take a covered position, purchasing a one-month forward contract at the same time as the spot purchase. In that case the maturing investment in pounds could be converted to dollars at the known forward rate f_t^1. Suppose that covered interest parity held:

$$1 + i_t = (1 + i_t^*)\left(\frac{f_t^1}{e_t}\right)^{12}, \tag{3}$$

then it is easy to see that

$$\underline{e} \;\leq\; f_t^1 \;\leq\; \overline{e}. \tag{4}$$

If the Bretton Woods bounds were credible, then the forward rate should lie between them. Examining this condition yields Svensson's (1991) simplest test of target zone credibility, also suggested by Morgenstern (1959, ch. 7). This test does not require that uncovered interest parity holds. We examine condition (4) directly, rather than using interest-rate data, because we have daily data on exchange rates.

Giovannini (1993) argued that measuring credibility using interest-rate differentials or forward rates may be inappropriate because of the pervasiveness of capital controls during the first phase of the Bretton Woods system. However, capital controls do not appear to have had a large effect on interest rates. We have examined departures from covered interest parity (a measure of capital controls) in weekly data. These departures never exceeded 2 percent, a value comparable to Obstfeld's (1993) findings for the 1960s.

Furthermore, there was virtually no forward intervention by the Bank of England during this period, so the forward rate reflected the market's expectations.

Moreover, capital controls also could be avoided. Britain had resumed a range of exchange controls after its experiment with convertibility in July 1947. However, by 1956 capital-account restrictions were still in force only for UK residents and for holders of sterling whose balances had been blocked or restricted following the 1939-1945 war. Even these restrictions could be avoided by several methods. First, long-held sterling balances could be converted into dollars with the transaction represented as current. Second, UK residents could purchase dollar securities elsewhere in the sterling area, notably those owned by residents of Kuwait and Hong Kong.[4] Schenk (1994) documented the fall in the dollar value of sterling in Hong Kong during the Suez crisis. Third, speculation could take place through 'leads and lags', changes in the timing or invoicing of imports and exports. For example, dollar payments from sterling area residents could be hastened, and their dollar receipts delayed, in expectation of a sterling depreciation. These methods were widespread in the UK in July 1947, and so were well-known in 1956.[5] It appears that large investors faced no serious obstacles in purchasing dollars. The Midland Bank was thought to have purchased $20-30 million and Shell $53 million during the Suez crisis.[6] Moreover, the crisis ended without a tightening of capital controls, as reserves were replenished by loans from the IMF and the Export-Import Bank in December 1956.

The existence of exchange controls does preclude us from carrying out comparable analysis for France, though. France still had an extensive system of multiple exchange rates in 1956, as described by de Lattre (1958, ch. 2-4). In particular, the forward market was limited to trade finance only and the forward rate hardly fluctuated, changing its value only three times during the Suez crisis. Since the franc was not yet convertible, concepts which are designed to analyze convertible currencies are clearly not applicable. During the Suez crisis, Britain was more economically vulnerable than France because sterling was virtually convertible, and not simply because France drew on its IMF credit in advance of the invasion.

France's decision to draw on IMF standby credit is presented in the recent literature as evidence that the French government displayed greater realism and foresight than the

British (see Horne, 1988, p. 433 and Kunz, 1991, pp. 192-193). This conclusion ignores the economic circumstances of 1956. Unlike Britain, which had a small current account surplus in the first half of 1956, France already had a large deficit. This deficit justified the request strictly under grounds of the balance of payments. It is not clear what justification Britain could have given for such a request under IMF rules. British officials feared that an application to the IMF would put Britain "in the same category as France," whose currency was inconvertible and not an international vehicle currency.[7] Their preferred strategy was to request direct US aid, such as an EXIM Bank loan, because they believed that this aid would strengthen financial markets' confidence in sterling by demonstrating that the United States supported British policy towards Egypt.[8]

Giovannini (1993) plotted three-month forward rates and the Bretton Woods bands during the 1950s. He found a large movement in the franc in the autumn of 1956 and also that forward sterling lay outside the band during part of 1956.[9] It is notable that he found that the only other time that the pound lay outside the band was during the months before the devaluation of 1967. His data were monthly. We now use daily data, which allow a more precise description of the loss of credibility.

Figure 1 shows the sterling spot rate during the Suez crisis and in the months before and after it took place. Data are daily exchange rates in New York, described in Appendix B. The horizontal, dashed line shows the central parity, while the upper and lower edges of the figure coincide with the Bretton Woods band, $\{\underline{e}, \overline{e}\}$. In early July, sterling was below its \$2.80 parity, a condition attributed by *The Economist* to a balance of payments deficit in 1955 having reduced reserves, and to an expectation of grain imports from the dollar area later in 1956.[10] The nationalization of the canal triggered a decline in the exchange rate from above 2.79 to just above the bottom of the Bretton Woods band. *The Economist* described $\$2.78\frac{1}{4}$ as the effective support point and this floor is evident in figure 1.[11]

Figure 2 shows the rates for one, two, and three-month forward sterling in the New York market. The horizontal, dashed line again shows the central parity value of the spot rate, and the horizontal, solid line shows the lower edge of the spot rate band, $\underline{e}$. Some historians view July 19 as the beginning of the crisis, but there is little evidence of that in financial markets, except in three-month forward rates, which dropped a cent in New York

that day. All three forward rates show the same pattern, starting with a loss of credibility immediately after Nasser nationalized the canal on July 26. Only the one-month rate briefly rose above $\underline{e}$ at any time during the remainder of 1956. Credibility at all three maturities was not regained until the middle of January 1957. This restoration probably reflected Britain's successful repayment of the yearly installment of her interest payments due under the Anglo-American Agreement of 1946. As this was the major financial event at the end of the year, it seems that the British attempts to win a waiver from the US on war debt payments had caused a serious lack of credibility.[12] It also seems that the negotiations of October were regarded by the market as only postponing a sterling crisis, because only the one-month rate moved to the inside of the band then.

Comparing the forward rates with the spot rate makes it clear that the theoretical stabilizing properties of exchange-rate bands were not operating in this case. Target-zone theory predicts that reversion to parity is expected as the exchange rate nears the edge of the band.[13] In that case the pound should go to a forward premium when the spot rate falls below its central parity. In fact, during the Suez crisis forward rates moved in the same direction as the spot rate and moved outside the band when the spot rate was near its lower limit.

The daily data allow us to look in more detail at the effects of Anglo-French and Israeli operations on the foreign exchange market. The two- and three-month rates moved relatively little from the end of October to the last week of November. This fact confirms that the threat to the pound predated the operation and that the recent historical literature has been right to assert that nothing decisive happened during the first week of November. On the other hand the one-month rate shows a clear reaction to the Israel Defense Force entering Sinai on October 29, when the rate crossed the lower boundary of the band. The reaction comes before Britain and France vetoed the Security Council's censure of Israel on October 30 and shows that observers were linking Israeli actions to the canal crisis. The second major decline in the forward rates begins on November 23, the day that Eden removed himself to Jamaica, ostensibly for health reasons. Figure 2 also shows a spike in the forward rates on December 11, which most likely constitutes a response to the IMF grant of a standby credit to Britain.

It seems unlikely that the movements of the forward rate reflected a response to the Hungarian uprising as well as to the Suez crisis. Giovannini (1993), using monthly data, found that the three-month deutsche mark rate, which one would expect to respond to events in Hungary, remained well within the center of the Bretton Woods band during the two crises. This finding should be treated with some caution, though, because the convertibility of the mark in the dollar area was restricted in this period (see International Monetary Fund, 1957, p. 66). Unfortunately, the Swiss franc, which might be expected to appreciate in response to the crisis in Hungary, as a 'safe haven' currency, was also not fully convertible in 1956 (see International Monetary Fund, 1957, p 67). Both countries were members of the European Payments Union and so their currencies were not convertible for European residents. Neither country had an exchange rate arrangement comparable to the 'back door convertibility' introduced by Britain in 1955.

Overall the analysis therefore largely confirms the view of Kunz and others that there was no unusual occurrence in the first week of November. On the other hand we find that devaluation was considered likely by the market from the end of July onwards with a corresponding loss of credibility. Thus it is not correct to argue that there was no sterling crisis during Suez; it began well before the invasion.

4. RESERVES

We next examine daily data on Britain's foreign exchange reserves, as a further way to judge whether or not there was a sterling crisis in 1956. In addition, much of the controversy over Suez has revolved around the exact timing and magnitude of British reserve losses. Kunz, as discussed above, showed that Macmillan had overstated the size of sterling losses in the week before November 6. She also (1991, p.150) pointed out that the official figures seriously understate the size of the reserve losses. Table 1 provides an exact tabulation of the November balance sheet. The public was not informed that the official figure of $279 million reflected swaps and the sale of US Treasury bonds, and so did not know that $360 million was spent on market intervention. These swaps and Treasury bond sales were window dressing; these securities were not typically regarded as being part of the reserves.[14] Moreover, there was virtually no forward intervention during the

crisis. In November 1956 only $13m were spent on supporting forward sterling and only $30 million were spent in the year as a whole. For that reason, and because the dates of transactions under $100,000 are not recorded, our daily intervention data do not include transactions in the forward market. For November 1956, when the sales of part of the British government's portfolio of bonds and undelivered forward purchases are deducted from the total, losses emerge as $405 million or more than a fifth of the total reserves on November 1.

We have used the Bank of England traders' reports to reconstruct daily reserve changes for the second half of 1956.[15] Although access to the records of the Exchange Equalisation Account is not permitted, the dealers' reports provide an alternative source of information on high-frequency reserve movements. We judge this source to be reasonably accurate, because total reserve losses for November, as recorded in these reports, cumulate to $399.7 million, and total losses through intervention on the official market are $333.4 million, which are both very close to the figures in Table 1.[16]

Figure 3 presents total reserves on the basis of these daily data. The figure shows a steady decline in reserves after the canal was nationalized, interrupted only by the fortuitous sale of the Trinidad Oil Company for $177 million in August. Nevertheless October shows little decline in the reserves, a development which parallels the behavior of the one-month forward rate in that month.

Figure 4 presents market intervention. Positive entries represent increases in reserves, while negative entries represent losses of reserves. The massive intervention which began suddenly on 30 October is typical of a speculative attack on a currency. Taken together, the steady loss of reserves followed by an acceleration in reserve losses and intervention are typical of the other currency crises described by Bordo and Schwartz (1996) and Eichengreen, Rose, and Wyplosz (1996). Bordo and Schwartz found this pattern in 19 exchange rate crises (excluding Suez) from 1797 to 1994. Eichengreen, Rose, and Wyplosz documented the same pattern in 22 crises between 1967 and 1992.

On the basis of these data the loss in the first week of the crisis was somewhat higher than that mentioned by Kunz, being $116 million, but they confirm her conclusion that the magnitude was relatively small. Her statement that "no Treasury or Bank of England

official mentioned the reserve loss as primarily New York in origin until November 20" (1991, p. 132) is less accurate. In fact these reports on foreign exchange markets state that the "New York market was extremely disturbed on the news of Israeli penetration into Egyptian territory". Other reports the Bank forwarded to the Treasury also stated that on October 30 "in New York sterling was sharply offered".[17] It seems unlikely however that the Fed would have acted against sterling before Britain and France showed their hand by preventing the UN from censuring Israel, an event which took place on the night of October 30 (Kyle 1991, p. 364). Since one of these reports is specifically dated midday it is unlikely that the Fed initiated the attack. Thus Macmillan was correct that sterling was under pressure in New York, but probably not correct that the Fed was the seller.

As table 1 shows, market intervention was the overwhelming cause of the reserve loss. Thus it seems that commentators at the time placed too much emphasis on the minor attempts of Arab central banks to off-load sterling.[18] The efforts of the Bank of England to ascertain who sold sterling indicate a considerable role for currency speculation. The Bank's officials found that as much as $120 million of the loss could be accounted for by purchases of emergency reserves by oil companies. Also important, though much less so, were purchases of sugar ($6 million), tobacco ($8 million), aircraft ($3.5 million) and ferrous metals ($5 million).[19] Excluding these purchases, which were responses to the expected disruption of trade and oil supplies, and also excluding transfers to other central banks, there remain $215 million of reserve losses as a consequence of speculation or sales by panic-stricken holders of official and transferable sterling.

Figure 4 also shows that the situation became worse throughout November. It was in the last two weeks of November that "US pressure was at its height" (Kunz, 1991, pp. 57-9; Kyle, 1992, pp. 500-503). The official daily data suggest that the situation was worse than recent historians imagined. Kunz (1991, p. 156), Kyle (1992, p. 500), and Fforde (1992, p. 555) all stated that British officials believed that sterling parity could not be maintained without a reserve of $2000 million. This figure was arrived at in official discussions from 1946 to 1948 and reflected judgements concerning the needs of post-war reconstruction, the repayment of sterling balances held by members of the sterling area, defence expenditure, and colonial development.[20] An alternative explanation,

which reflects the fragility of sterling, is that this figure is slightly less than the value ($2240 million) of sterling balances held outside the sterling area, which could be readily converted to dollars (Fforde, p. 543). Kunz and Kyle observed that the authorities feared that reserves would drop below this threshold once the debt service on the post-war US and Canadian loans was paid in December. In fact figure 3 shows that this critical level had already been crossed by the end of the second week of November.

Comparison with previous sterling crises suggests that the authorities had reason for worry. Total reserve losses during the crisis between 26 July and 7 December 1956 were $655 million, not counting the swaps and sale of short-term US securities in November 1956. This contrasts with the small net gain to the reserves of $56 million in the first seven months of 1956. These losses would have been even higher had not $177 million been received for the sale of the Trinidad Oil Company, $54 million from Australia in October, and a further $47 million from South Africa in November.

Reserve losses during other crises may serve as a standard of comparison. We exclude the crisis of 1947, which ocurred in the exceptional conditions of full convertibility and post-war recovery. Between 1 April 1949 and devaluation on 18 September 1949 reserves fell by $564 million.[21] During the crisis of September 1951-January 1952 the reserves fell by nearly $900 million.[22] During the crisis of 1955 the loss was $428 million between July and December 1955. The average monthly loss during the Suez Crisis was thus greater than that which occurred during any other sterling crisis and the total size of reserve losses exceeded that in all crises yxcept that of 1951-2. The loss of $400 million in November 1956 greatly exceeded the highest loss in any single month during the previous crises ($254 million in October 1951). It is also worth noting that without the sale of the transfer of gold from Australia losses in August-October alone, before the invasion of the canal zone, would have been $483 million, comparable to those in the sterling crises of 1949 and 1955. When the large transfers of gold from Australia and South Africa, the sale of the Trinidad Oil Company and the US Treasury bill portfolio and the window dressing carried out by forward operations in November are all taken into account, the total underlying loss of reserves was $883 million. When one considers that this loss occurred over slightly more than four months, a shorter length of time than all the other crises, Suez emerges as the

most serious crisis of all.

The data we have uncovered on reserve movements thus indicate that Britain experienced a serious exchange rate crisis between July 26 and December 7 1956. This conclusion follows whether we compare the time path of reserve losses to those in other exchange rate crises (as documented by Bordo and Schwartz (1996) and Eichengreen, Rose, and Wyplosz (1996)), compare the rate of reserve loss to those in other sterling crises (as described by Dow (1964)), or measure the proximity of reserves to the authorities' 'action level' of reserves of $2000 million. The timing of reserve losses also corresponds with the loss of credibility in the forward market, summarized in the Svensson-Morgenstern test of figure 2.

5. REACTION FUNCTIONS

Sections 3 and 4 have argued that exchange rates (spot and forward) and reserve losses serve as measures of the financial crisis. It seems natural to try to link these two types of indicators statistically. To this end, we next focus on characterizing the reaction function of the authorities in defending sterling. The benchmark is the form of reaction function estimated in recent studies of intervention. Before summarizing those studies and presenting evidence from 1956, we first describe the multiple sterling/dollar exchange rates.

In 1956 there were four types of sterling: that held by residents of the sterling area, that held by residents of the dollar area (American account sterling), that held by residents of other countries (transferable sterling), and blocked or security sterling which was owned outside Britain and blocked or otherwise restricted during the 1939-1945 war.[23] American account sterling in turn consisted of official sterling, used in current transactions, and registered sterling, used in portfolio transactions with dollars or gold. Markets for transferable sterling had developed in Zurich and New York, where it traded at a discount, though in volume comparable to that of official sterling. During the Suez crisis, sterling was sold in Zurich by China and by several countries in the Middle East.[24]

In March 1954 the discount on transferable sterling was negligible, and capital account restrictions on transferable sterling were removed. It could then be used outside the

sterling and dollar areas, in the sterling area, or converted to dollars at a discount. In February 1955 the UK introduced 'back door convertibility' when the Exchange Equalisation Account began to support transferable sterling in New York and Zurich within 1 percent of the official rate, to discourage commodity arbitrage. As a result, the movements of the transferable rate closely paralleled those of the official rate during 1955 and early 1956. The transferable sterling market lasted until December 1958 when full convertibility was established. Figure 5 graphs the values of official and transferable sterling in New York. The dashed, horizontal line shows the central parity for official sterling, while the solid, horizontal line shows the lower edge of the exchange-rate band, $\underline{e}$. As the figure shows, the discount on transferable sterling rose above 1 percent during the Suez crisis. Transferable sterling provides valuable information in estimating a reaction function, for its fluctuations were not officially confined by the Bretton Woods bands.

Reaction functions, as surveyed by Edison (1993), Dominguez and Frankel (1993), and Almekinders (1995), typically take this form:

$$I_t = \beta_0 + \beta_1 I_{t-1} + \beta_2(e_t - e^*) + \beta_3(e_t - e_{t-1}). \tag{5}$$

Here I_t measures intervention and I_{t-1} is included to allow for serial correlation. The term e^* is a target level of the nominal exchange rate, while a reaction to $e_t - e_{t-1}$ represents leaning against the wind. Some studies also test for a reaction to time-varying exchange-rate volatility. Dominguez and Frankel also emphasized the need for daily intervention data, which are available for the U.S., Japan, Germany, and Switzerland in the 1980s. Studies which use such records include those by Eijffinger and Gruijters (1991), Goodhart and Hesse (1993), Dominguez and Frankel (1993), and Almekinders and Eijffinger (1996). In these studies the R^2 in equation (5) ranges from 0.20 to 0.40.

In daily data from 1956, the first reaction function we study is:

$$I_t = \beta_0 + \beta_1 I_{t-1} + \beta_2(e_{t-1} - 2.7825) + \beta_3(ez_{t-1} - 0.99e_{t-1}). \tag{6}$$

I_t measures daily market intervention by the Bank of England, measured as the resulting change in reserves and graphed in Figure 4. A negative value represents a sale of dollars. The terms e_{t-1} and ez_{t-1} are the dollar exchange rates on official and transferable sterling

in New York on the previous day. These are closing prices, so it was not appropriate to use current values (as in equation (5)) because the New York markets naturally close after those in London. The lagged dependent variable in equation (6) allows for autocorrelated news which influenced intervention. If we did not include this term, we might find a significant reaction to exchange rates simply because there was autocorrelation in both series.

The term $e_{t-1} - 2.7825$ gives the distance of the spot rate from the lower intervention point, illustrated in figure 1. The term $ez_{t-1} - 0.99e_{t-1}$ indicates that a reaction was triggered when the premium of official sterling over transferable sterling rose above 1 percent. For example, this premium rose when official sterling was on the Bretton Woods floor during most of November, and there was downward pressure on transferable sterling.

Table 2 contains the results of estimating equation (6) in daily data from June to December 1956. Saturdays and Sundays are omitted, as are December 25 and October 14, which were holidays in both countries. August 6 and December 26 were holidays in the UK and also are omitted because there was no opportunity for intervention. July 4, September 3, November 6, November 12, and November 22 were holidays in the US. On those days the New York prices used apply to the previous day. This selection leaves 148 days, or 147 observations given the use of a one-day lag in equation (6). Estimation is by ordinary least squares.

An inspection of the residual autocorrelation function revealed that the residuals are positively autocorrelated, with significant correlation coefficients at lags 5, 10, 15, and 20. The results of formal Lagrange multiplier tests, shown in the table, confirm that higher-order autocorrelation is present. Although the standard errors are robust to autocorrelation, this persistence in the residuals reflects some missing element in our modelling of intervention. Moreover, the stability test in table 2 suggests that the reaction function is not stable when the sample is split at 29 October, the date of the Israeli invasion of the Sinai peninsula. Thus, although one could use equation (6) to estimate the impact effect of a depreciation ($\hat{\beta}_2$) and the long-run effect of a depreciation ($\hat{\beta}_2/(1-\hat{\beta}_1)$) we defer making these measurements while we examine the dynamic specification.

Although we adopted the partial adjustment mechanism in equation (6) for compara-

bility with studies of more recent intervention, we next added lags with the hope of better capturing the dynamics. The equation estimated was:

$$\begin{aligned}\Delta I_t = \gamma_0 &+ \sum_{i=1}^{6} \gamma_{1i} \Delta e_{t-1} + \sum_{i=1}^{6} \gamma_{2i} \Delta ez_{t-1} \\ &- \sum_{i=1}^{6} \gamma_{3i} [I_{t-i} - \alpha_1 (e_{t-i} - 2.7825) - \alpha_2 (ez_{t-i} - 0.99 e_{t-i})].\end{aligned} \tag{7}$$

In this case, intervention may respond to exchange rate values of the previous seven trading days. Equation (7) is equivalent to a linear regression of I_t on six lags of itself and seven lags of the exchange rates e and ez. The error-correction specification is not necessary to ensure stationarity of the regressors in data from the Bretton Woods regime. When the exchange rate e_t is confined to a band $\{\underline{e}, \overline{e}\}$ it is stationary because all its moments exist. Similarly, ez_t is stationary provided that the transferable premium was bounded. However, writing this distributed lag model as in equation (7) has the advantage of isolating the long-run effects of the exchange rates on intervention, which are given by the parameters α_1 and α_2.

Table 3 contains the estimation and test results. Much of the residual autocorrelation is removed. By comparison with table 2, the Chow-test statistic reveals less evidence of instability after the invasion, although the statistic is significant at the 3 percent level. When we examine the two parts of the sample, the general pattern is that t-values are lower in the sub-sample of November and December 1956. Although the specification might still be improved, we base inference on this equation.

In Table 3 $\hat{\gamma}_{11}$ estimates the impact effect of a depreciation in official sterling while $\hat{\alpha}_1$ estimates the long-run effect. Both estimates are statistically and economically significant. They imply that a 1 cent decline in sterling in New York would lead to the expenditure of 11.7 million dollars the next day by the Bank of England (with a standard error of 4.6 million dollars). The long-run effect is an expenditure of 4.5 million dollars (with a standard error of 1.5 million dollars). Thus the dynamic reaction function suggests that the short-run reaction to a depreciation was considerably greater than the long-run reaction, and was partly reversed in the week following an intervention.

Notably, a separate role is identified for transferable sterling. The impact effect is both

small and insignificant. However, in the long run a 1 cent drop in the value of transferable sterling (towards 99 percent of the value of official sterling) forecasts an expenditure of 4.9 million dollars of reserves in its defense (with a standard error of 1.6 million dollars). In this case the initial reaction is smaller than the cumulative effect. We also tested for roles for forward premia in New York and for the same-day rate in London. None of these variables was statistically significant.

The findings can be compared to studies of intervention in the 1980s in several respects. First, there is a relatively small role for the lagged dependent variable, possibly because market participants did not directly observe I_{t-1}. In equation (6) the coefficient on I_{t-1} is 0.28 while the cumulative effect of the I_{t-i} in equation (7) is 0.371. Actual reserve losses were reported monthly, with a lag, and were the subject of rumor within each month. Second, the R^2 is comparable to those in studies of recent floats even though equations (6) and (7) are forecasting equations and involve no same-day explanatory variables.

During part of this period, and especially during November 1956, official sterling was at its lower intervention point. In this case, much of I_t does not represent discretionary intervention, but rather a loss of reserves required to defend the fixed exchange rate. Here the contribution of this study is simply to document for the first time the daily reserve losses, and relate them to news of the Suez crisis. But additional findings concern both the nature of intervention when sterling's value was above 2.7825 and the response to transferable sterling.

During the crisis the the Bank of England spent about $30 million on the direct support of transferable sterling, which table 1 showed was a small share of total intervention. However, table 3 shows that the Bank's support for official sterling also responded to the rate on transferable sterling. Our results suggest that transferable sterling can be thought of as a shadow exchange rate, when official sterling was at its floor.[25] The strong reaction of intervention to the discount on transferable sterling illuminates British financial aims during the crisis. This reaction reflected the importance attached by the Treasury and the Bank of England to maintaining fixed-rate convertibility, since the 1 percent spread between official and transferable sterling enabled 'back door convertibility'.

A question of interest to economists is why the authorities rejected alternatives to

defending the parity, in particular adopting a temporary float. The answer was given by Macmillan who told the Cabinet that this would lead to the break up of the sterling area and the end of sterling's role as a reserve currency. Direct warning of this danger was given by the heads of seven sterling area central banks and conveyed by the Governor to the Chancellor (Kyle, 1991, p. 453). The problem with such a strategy, which had maintained sterling credibility during 18th and 19th century wars, was that Britain had recently devalued. As George Bolton, the Executive Director responsible for the foreign exchanges, put it:

> Devaluation of sterling in 1949, while to some extent justified by the consequences of the war, dealt the sterling system a blow from which it has not yet fully recovered. If, in present circumstances, we tamper with the present untidy pattern of rates or tend to regard reserves as more important than the present official rate of exchange, the sterling system may be finally prejudiced.[26]

Another traditional method of dealing with pressure on the exchange rate was of course an increase in Bank Rate. Sir Roger Makins rejected this course of action, preferring, in the Keynesian spirit of the time, to plan for a budget surplus in the next fiscal year.[27] The contemporary economic orthodoxy held that Bank Rate changes were ineffective. The classic statement of official British Keynesian thinking on monetary policy, the Radcliffe Report, stated that "we have had little evidence of actual movements of funds in response to changes in shorter rates, or of any other measurable effects on the exchanges."[28]

6. CONCLUSION

This paper has analyzed the behavior of financial markets and Britain's foreign exchange reserves during the Suez Crisis. We find that recent historians have been right to downplay the significance of the run on the pound in the first week of November 1956. Although this triggered a massive loss of reserves, the event did not significantly affect forward exchange rates. The historians have been wrong however to assert that there was no financial crisis. From the moment the Canal was nationalized the sterling exchange rate ceased to be credible and such credibility as had been regained was decisively reduced by the invasion. At the end of November these pressures came to a head, as reserve losses and falling exchange-rate credibility coincided and reserves fell below $2000 million. Moreover,

the rate of reserve loss was greater than in other sterling crises.

In addition to providing new evidence on the credibility of sterling and the timing and scale of reserve losses, we have characterized the Bank of England's intervention tactics. The Bank's goal was to do everything possible to defend the current parity. If that failed, a float with unification of the official and transferable rates (rather than more controls) would have ensued, according to internal Bank and Treasury documents.[29] To the best of our knowledge, we have provided the first econometric study of intervention during the pre-convertibility period of the Bretton Woods system. Statistical evidence shows that the Bank used the Exchange Equalisation Account to react strongly to both the official and transferable sterling markets in New York.

In the Suez crisis, Britain was forced to abandon its political objectives in exchange for IMF credit. But the Bank of England and Treasury achieved a limited success in that they defended sterling without allowing a large discount on transferable sterling, until the negotiation of the IMF and EXIM Bank loans. A widening of the transferable discount would have been a significant retreat from convertibility. Our finding that the British authorities targeted this discount demonstrates that the they regarded convertibility as a priority in 1956, before the members of the European Payments Union formally adopted convertibility. The evidence also suggests that convertibility may have been regarded as more important than the foreign policy objectives of the Suez expedition.

Table 1: Movements of the Exchange Equalisation Account: November 1956

Type of transaction	Amount ($ millions)
EPU settlements	-30.6
US offshore purchases	4.2
US aid	1.1
sterling area central banks	-14.6
forward operations including swaps	84.5
market support: transferable sterling	-30.9
market support: official sterling	-330.7
sale of US Treasury bonds	36.4
other transactions	1.3
Total	-279.3

Source: BoE E1D 3/114: "Gold and Dollar Reserves".

Table 2: Daily Intervention Reaction Function: One Lag

$$I_t = \beta_0 + \beta_1 I_{t-1} + \beta_2(e_{t-1} - 2.7825) + \beta_3(ez_{t-1} - 0.99e_{t-1}).$$

1 June - 31 December 1956: $T = 147$

$\hat{\beta}_0$	-4.98	(5.42)
$\hat{\beta}_1$	0.28	(2.27)
$\hat{\beta}_2$	293.25	(3.72)
$\hat{\beta}_3$	219.33	(2.39)
R^2	0.30	
$LM(1)$	1.14	(0.28)
$LM(5)$	25.23	(0.00)
$LM(10)$	36.44	(0.00)
$LM(20)$	38.67	(0.01)
$F(4, 139)$	5.67	(0.00)

Notes: I_t is the daily reserve change, e_t is the official sterling exchange rate in dollars, and ez_t is the exchange rate for transferable sterling. Parentheses after coefficients contain t-values, based on heteroskedasticity and autocorrelation consistent standard errors. $LM(j)$ is the Lagrange multiplier test for jth-order residual autocorrelation and F is the Chow test statistic for stability, based on splitting the sample at 29 October. Parentheses after test statistics contain p-values. R^2 is the centered value.

Table 3: Daily Intervention Reaction Function: Seven Lags

$$\Delta I_t = \gamma_0 + \sum_{i=1}^{6} \gamma_{1i} \Delta e_{t-1} + \sum_{i=1}^{6} \gamma_{2i} \Delta ez_{t-1}$$
$$- \sum_{i=1}^{6} \gamma_{3i} [I_{t-i} - \alpha_1 (e_{t-i} - 2.7825) - \alpha_2 (ez_{t-i} - 0.99 e_{t-i})].$$

7 June - 31 December 1956: $T = 141$

$\hat{\gamma}_0$	-3.88	(2.88)
$\hat{\gamma}_{11}$	1167.43	(2.51)
$\hat{\gamma}_{21}$	20.23	(0.09)
$\hat{\alpha}_1$	450.63	(3.03)
$\hat{\alpha}_2$	485.42	(3.018)
R^2	0.52	
$LM(1)$	0.82	(0.37)
$LM(5)$	13.64	(0.02)
$LM(10)$	18.81	(0.04)
$LM(20)$	33.01	(0.03)
$F(21, 98)$	1.82	(0.03)

Notes: I_t is the daily reserve change, e_t is the official sterling exchange rate in dollars, and ez_t is the exchange rate for transferable sterling. Parentheses after coefficients contain t-values, based on heteroskedasticity and autocorrelation consistent standard errors. $LM(j)$ is the Lagrange multiplier test for jth-order residual autocorrelation and F is the Chow test statistic for stability, based on splitting the sample at 29 October. Parentheses after test statistics contain p-values. R^2 is the centered value.

APPENDIX A: A SUEZ CHRONOLOGY

Events which were secret, and unknown to markets, are in brackets.

19 July	Dulles announces that the US will not fund the Aswan Dam.
26 July	Nasser nationalizes the canal
27 July	Britain blocks Egypt's sterling assets
1 August	Dulles meets Eden and Macmillan in London on Suez
16-24 August	London conference of canal users issues declaration that the canal will be run by its association and the UN
1 September	Egypt announces that European pilots may leave Egypt
1 September	(Approximate date of arrival of French troops in British bases in Cyprus)
15 September	Egyptian pilots successfully guide ships through the canal
19-21 September	Second London conference of canal users fails to reach consensus
25-30 September	Macmillan discusses Suez in Washington
25 September	(France informs Israel they are ready for joint action against Nasser)
26 September	Britain and France request Security Council debate on 'unilateral action by the Egyptian government'
30 September – 1 October	(Secret French-Israeli conference at St. Germain to discuss military cooperation against Nasser)
5-9 October	Inconclusive Security Council debate in closed session
10-12 October	(Secret negotiations between Britain, France, and Egypt agree on six principles for settling the crisis)
10-11 October	Large-scale Israeli raid on Qalqilya, Jordan
14 October	Security Council accepts six principles but Russia vetoes powers to canal users association
17 October	France requests and is granted an IMF standby credit of $262.5 million
19 October	Russia agrees to Gomulka taking power in Poland, after earlier threatening to prevent this
21 October	Pro-Egyptian Nabulsi government wins Jordanian election
22 October	(Sèvres conference coordinates British, French, and Israeli plan of action against Egypt)

23 October	Hungarian uprising
29 October	Israel invades the Sinai peninsula
30 October	Joint British and French ultimatum orders Israel and Egypt to cease hostilities
31 October	British and French air strikes against Egyptian air bases begin
1 November	Emergency Security Council session
2 November	Dulles introduces a General Assembly resolution condemning Britain, France and Israel. Imre Nagy appeals to the West for active support.
4 November	General Assembly demands cease-fire and introduction of peace-keeping troops. USSR army enters Budapest.
5 November	Anglo-French force lands at Port Said. USSR prime minister threatens Britain and France.
6 November	Macmillan tells the cabinet of reserve losses, and recommends acceptance of the cease-fire, which is agreed.
7 November	Israel accepts the cease-fire.
8 November	Eden orders preparations for withdrawal.
12 November	Macmillan tells Parliament that sterling must be devalued if reserve losses continue at the current rate.
20 November	Tough oil rationing in Britain.
21 November	Hammarskjöld tells the General Assembly that the canal cannot be cleared until there is a full British and French withdrawal.
24 November	US votes for a Security Council Resolution calling for immediate and unconditional withdrawal.
3 December	Britain and France agree to withdraw.
6 December	Nixon praises Britain and France in a public speech.
10 December	IMF agrees to a UK drawing of $561.5 million and grants a standby credit of $738.5 million.
21 December	British and French troops complete their withdrawal.

APPENDIX B: DATA SOURCES

Sterling exchange rates were collected from the *New York Times* for 1 June 1956 to 31 January 1957. Prices are found in the box "Foreign Exchange Rates" and are closing values. The rates are the spot cable rate, 30, 60 and 90-day forward rates, and the transferable rate, decimalized, in U.S. dollars. Data are daily. There are no quotations on Saturdays, Sundays, and holidays listed in the text. French franc quotations were collected from the same source.

Sterling spot and one-month forward rates, for 1 June 1956 to 31 January 1957, also were collected from *The Economist*. Prices are found in the box "London Closing Exchange Rates and Gold Price." Differences between the rates in London and New York could be arbitraged away, for the U.K. belonged to the dollar and sterling areas and the European Payments Union. But we studied prices from both markets because (i) the London market was open on Saturdays; (ii) the London market closed earlier each day because of the time-zone difference; and (iii) *The Economist* reports a range of values whereas the *New York Times* reports a single value. We averaged the London values, which produces a smoother series than the New York series.

Market intervention by the Bank of England and other information on daily reserves were collected from BoE C8/9 *Foreign Exchange Dealers Reports* in the archives of the Bank of England.

Notes

1. This account follows Horne's (1988) authorized biography of Macmillan. See also Gorst and Johnman (1997, pp. 139-141) who reproduce Macmillan's pivotal memorandum to the Cabinet of 20 November 1956.

2. Kyle (1991, p. 465). He subtitles this section of the book, ironically, "Macmillan's Reserves Depart."

3. See BoE EC3/1: "A history of exchange control: An exercise by Mr. Ruddle", p. 295.

4. Sir Roger Makins, Joint Permanent Secretary to the Treasury, noted the problem of the Kuwait gap at the end of the Suez crisis: "We have felt inhibited from closing this gap because, unless we had the full cooperation of the Ruler, it would be very difficult to administer any form of control and because there would in any case be a serious danger of undermining the Ruler's confidence in sterling and in the advantages of the sterling connection. The only fully effective remedy is expulsion from the sterling area." BoE G1/99, 18 December 1956: "Policy if we do not succeed in holding the rate for sterling"; Appendix A, exchange control measures.

5. See Einzig (1968) and Obstfeld and Taylor (1997).

6. BoE E1D/3/411: "Action likely to have been taken in November" and "Gold and dollar reserves."

7. BoE G1/124, 2 November 1956: Sir Denis Ricketts to Sir Leslie Rowan; "Emergency action."

8. BoE OV/31/55, 12 September 1956: "US aid for the oil operation."

9. This behavior of the forward rate at monthly frequency was noted in studies conducted soon after the crisis but is neglected in general histories of the crisis. See Bank for International Settlements (1957, pp. 193-195) and Katz (1961, p. 8).

10. See for example "Strains on the Sterling Area", *The Economist* 16 June 1956, p. 6.

11. See for example "Sterling at Support Point," *The Economist* 1 September 1956, p.735.

12. See for example the discussion in BoE G124/1, 8 November 1956: "Crash action," and also Kunz (1991, p. 148). Sir Leslie Rowan stressed the importance of making these payments: "In present circumstances it would obviously be most damaging to sterling if we were openly branded as being in default." BoE G1/124, 13 November 1956: JHR (Rowan) to Sir Roger Makins, "Sterling."

13. Garber and Svensson (1995) supply a comprehensive survey.

14. See Kunz (1991, p. 150) and Fforde (1992, p. 558) for a discussion of these transactions.

15. BoE C8/9: "Foreign exchange dealers reports."

16. Total reserve losses, excluding forward operations and the sale of US Treasury bonds, were $405.2 million. The discrepancies probably derive from the fact that the data in the foreign exchange dealers' reports are rounded to the nearest hundred thousand dollars.

17. BoE C8/9, 30 October 1956: "Foreign exchange and gold markets." BoE C8/6, mid-day 30 October 1956: "Foreign exchange and gold markets." See also "Squeeze on Sterling," *The Economist* 15 November 1956.

18. Significant losses would have occurred through this channel had not $42.7 million in gold been made available by the South African Reserve Bank.

19. BoE E1D/3/411: "Action likely to have been taken in November" and "Gold and dollar reserves."

20. See for example PRO cabinet memorandum CP(46)401, 29 October 1946, in CAB 129/14. In 1948 the Government published a White Paper (CMD 7545) which declared that during EPU it would be necessary to maintain reserves at 550 million pounds ($2200 million).

21. See Cairncross and Eichengreen (1983, p. 147).

22. See Dow (1964, p. 73).

23. We rely on Fforde (1992) and the Bank of England's own internal history, BoE EC3/1: "A history of exchange control: An exercise by Mr. Ruddle." See also Scammell (1965) and *The Economist*, May 5, 1956, p.489.

24. See BoE C8/6 or *The Economist* 15 September 1956, p. 904. BoE C8/9 'Market report for 6th November 1956' noted that "transferable sterling was heavily offered in Zurich in a nervous and uncertain market."

25. Kunz (1991, p. 136) stated that transferable sterling was "an indicator of the strength of the currency." Dow (1964, p. 86) quotes Heathcoat Amory, Chancellor of the Exchequer in the late 1950s: "Some have argued I know, that ... we had the freedom to allow the discount to widen in times of strain ... but in practice that freedom has simply not been there. This is not only because a widening of the discount would have restored the profitability of commodity shunting; it is also because falls in the transferable rate – and this is very important – would have advertised a weakness in sterling." At the height of the

crisis the Bank of England's Executive Director, Sir George Bolton, stated that : "There is no doubt that the unofficial rates, particularly transferable sterling, influence foreign opinion; the movement of the rate is undoubtedly regarded as a better indicator of the condition of sterling than the official rate." BoE G1/124, 7 November 1956: "The foreign exchange market."

26. BoE G1/124, 7 November 1956: "The foreign exchange market." British officials regarded the potential internal and external results of floating as catastrophic: " This [floating] would be a catastrophe, affecting not only the cost of living, the level of wages *etc.* in this country but also having a disastrous effect on our external economic relationships, Sterling Area, Commonwealth, O.E.E.C., oil, *etc.*. Notes for Chancellor's statement in cabinet, 13 November 1956. Sir Leslie Rowan described floating as a "last resort"; BoE G1/124, 1 November 1956: "Emergency action."

27. "I believe there is no present case (subject to possible moves in overseas rates) for a rise in Bank Rate. But there seems to be a strong case for a definite decision (to be announced as soon as constitutionally possible) to work an overall budget surplus for 1957/8, and also for an immediate review of all Government commitments both on capital and on current account." BoE G1/124, 16 November 1956: Sir R. Makins to the Chancellor of the Exchequer.

28. Report of the committee on the working of the monetary system (1959, para 695).

29. Fforde (1992, p. 554); BoE G1/124 memo of Sir Roger Makins (Joint Permanent Secretary of Treasury) to the Chancellor and "Note on a meeting at the Treasury on Monday 19th November."

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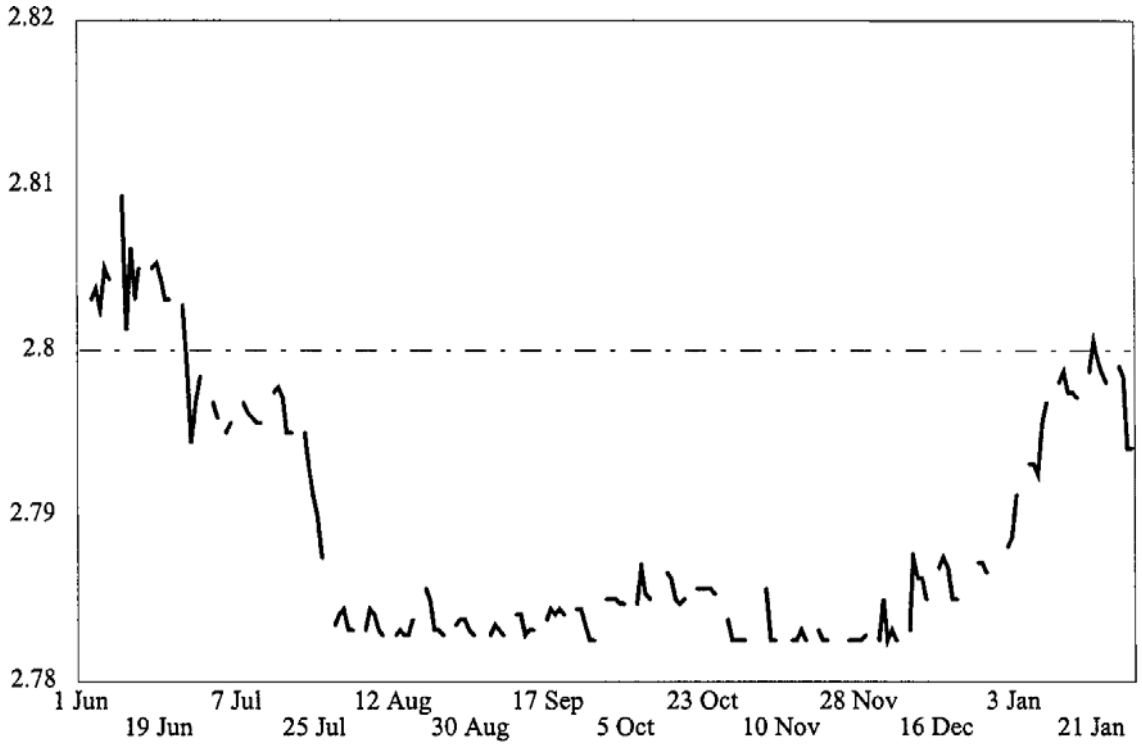
Figure 1: Spot exchange rate: Official sterling, New York

Figure 2: Forward exchange rates

Figure 3: Britain's reserves

Figure 4: Market intervention

Figure 5: Transferable sterling, New York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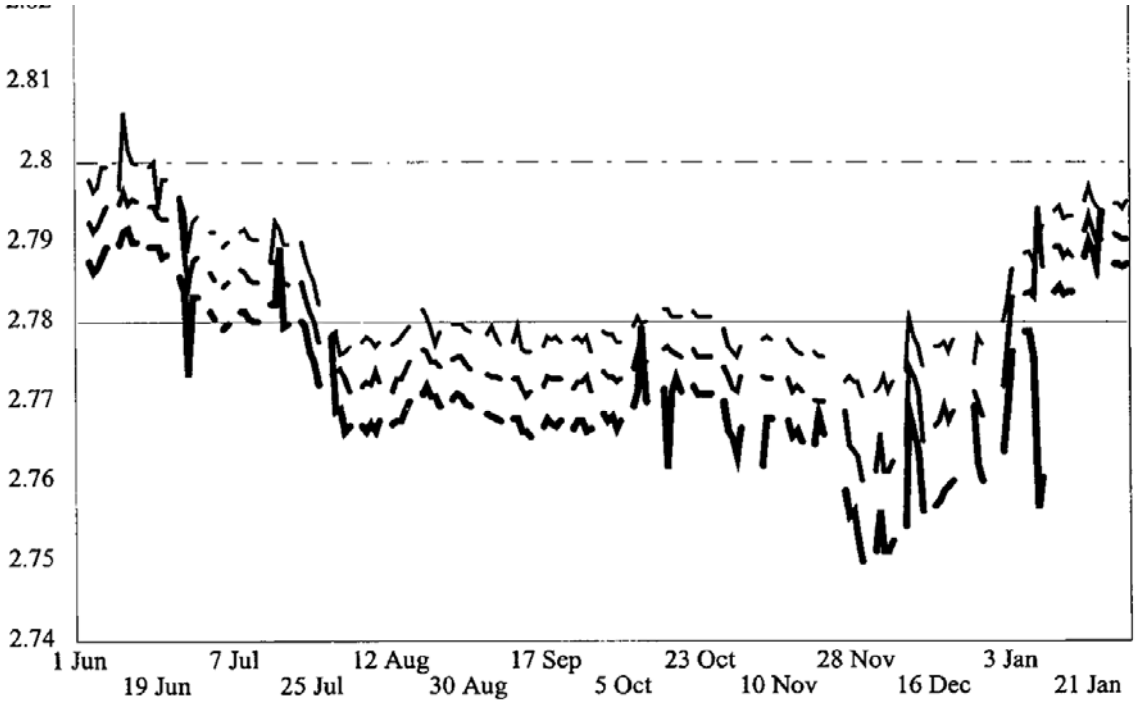
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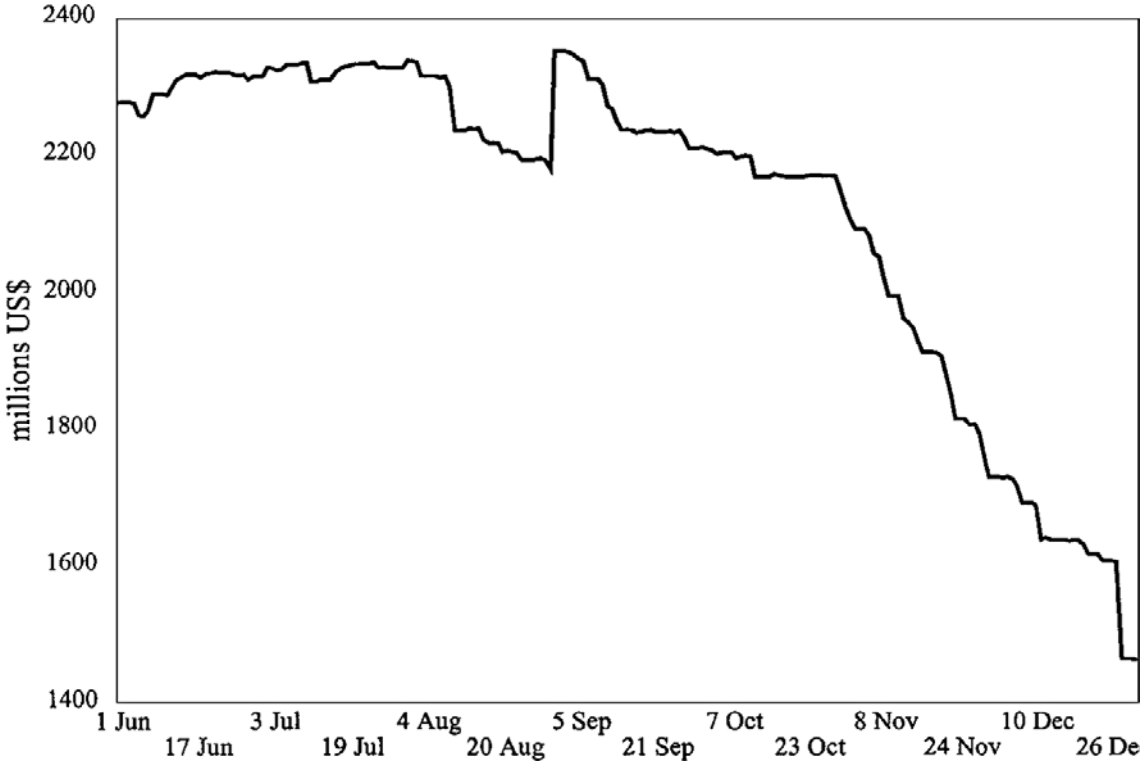
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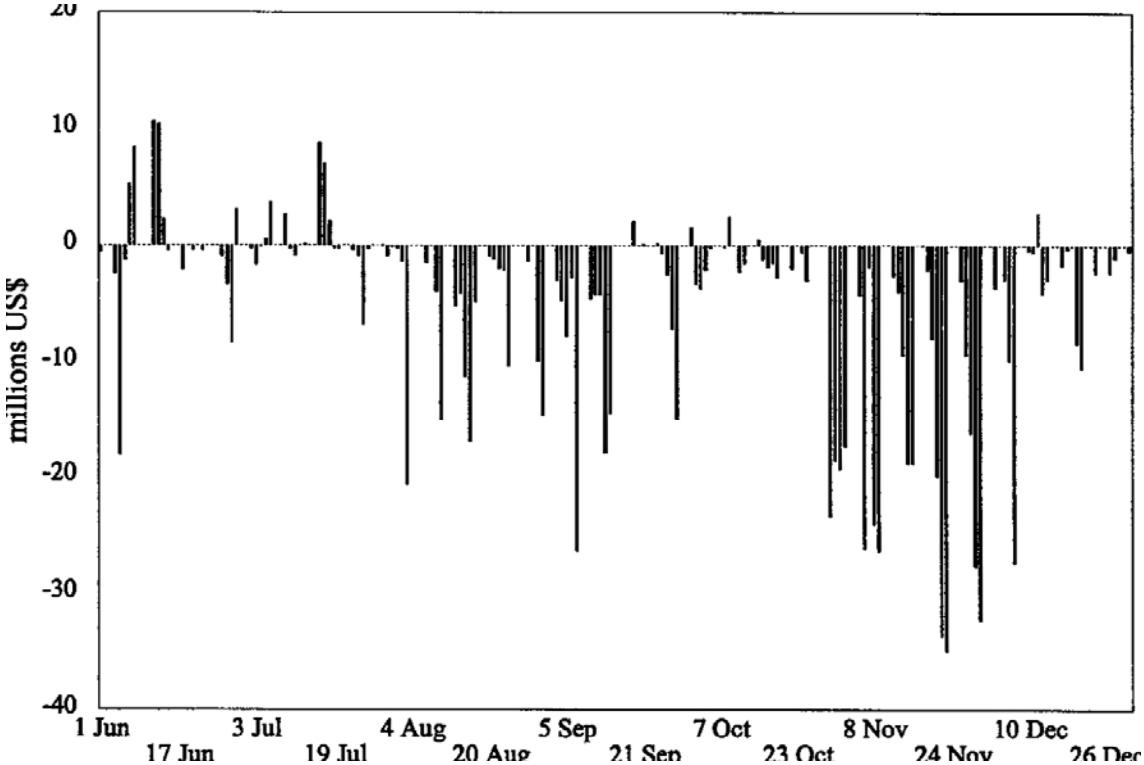
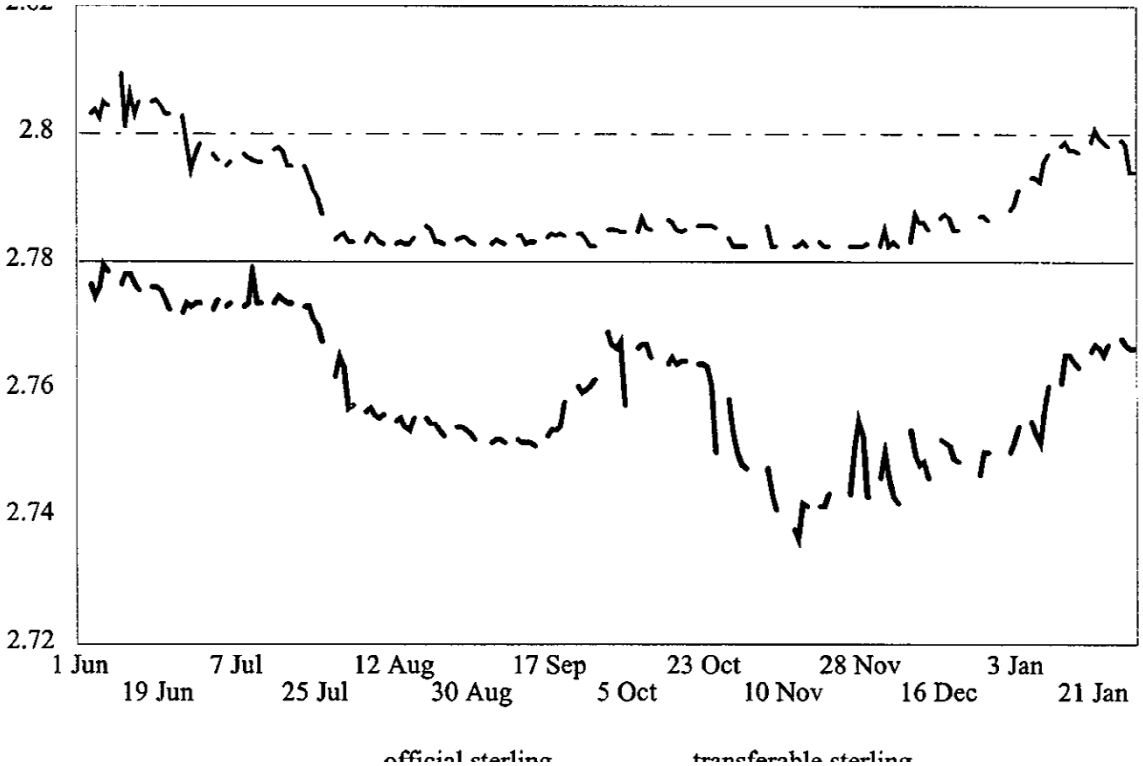

millions US$
20
10
0
-10
-20
-30
-40
1 Jun
17 Jun
3 Jul
19 Jul
4 Aug
20 Aug
5 Sep
21 Sep
7 Oct
23 Oct
8 Nov
24 Nov
10 Dec
26 Dec


2.8
2.78
2.76
2.74
2.72
1 Jun
19 Jun
7 Jul
25 Jul
12 Aug
30 Aug
17 Sep
5 Oct
23 Oct
10 Nov
28 Nov
16 Dec
3 Jan
21 Jan
official sterling
transferable sterling