THE 1933 DECISION TO DEVALUE THE DOLLAR:

EFFECTS ON REAL OUTPUT AND REAL INTEREST RATES

by

ROBERT DALE MASON

Under the Direction of George Selgin

ABSTRACT

Recent literature presents conflicting views concerning the benefits from devaluing the dollar in 1933. Proponents of devaluing the dollar (Eichengreen 1992, Eichengreen and Sachs 1985, Bernanke 1995, and Temin and Wigmore 1990) suggest that devaluation hastened U. S. recovery by enhancing competitiveness, encouraging investment, and lowering real interest rates. Other researchers (Bordo and Kydland 1996, Bordo and Rockoff 1996, and Obstfeld and Taylor 2003), however, claim that devaluation may impede recovery by reducing output and investment while raising real interest rates. This dissertation presents a vector autoregression (VAR) estimate of the effects of the United States' decision to devalue the dollar on real interest rates and output. It finds that devaluation raised real interest rates while lowering real output, and thus offers support to the theories emphasizing devaluation's drawbacks.

INDEX WORDS: Depression, Currency Devaluation, Monetary Policy, Stabilization, United States, Britain, Exchange Rate Policy, Interest Rates, Output, Country Risk, Time Inconsistent Policies, Gold Standard, Economic History

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DEDICATION

This work is dedicated to my mother, who managed to avoid asking the very trying question, and to the memory of my father who did not live to see it answered.

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Among the many persons I owe a debt of thanks, I would like to single out four persons: George Selgin, who provided the original idea, his observations, and his critiques; Bill Lastrapes, who provided much more than I ever had the right to expect of a second committee member; David Kamerschen, who gave me encouragement by reminding me that even the best boxers have tasted the canvass; and my wife, Marianne, whom I love.

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CHAPTER ONE

INTRODUCTION

1.1 Overview

This dissertation assesses some consequences of the United States' decision to devalue the dollar in 1934, and of public anticipations of that decision:

1) How did devaluation of the dollar affect U.S. output and real interest rates?
2) How did expectations of that devaluation affect U.S. output and real interest rates?
3) How did devaluation of the dollar affect *British* output and real interest rates?
4) How important were the consequences of devaluation compared to those of devaluation-independent changes in the U.S. money stock and to changes in the federal deficit?

The first question especially is motivated by an apparent conflict in the literature concerning devaluation. On the one hand, Eichengreen and Sachs (1985) and Temin and Wigmore (1990), among others, claim that devaluation—and coordinated devaluation especially—promotes recovery. According to Eichengreen and Sachs (1985, p.238) the devaluations of the 30s promoted growth " ...by reducing real wages, enhancing competitiveness, promoting exports, and permitting the reduction of interest rates." Bordo and Kydland (1996, p.

86), argue, on the other hand, that the gold standard served "...as a commitment mechanism in preventing default on debt and ensuring that paper-money issues were not permanent." Their argument implies that devaluation—which amounts to reneging on the commitment—might hamper recovery, raising real rates of interest and reducing output by impeding devaluation nations' access to international capital and by discouraging domestic saving and investment.

The second question recognizes that the U.S. decision to devalue the dollar, unlike Great Britain's decision to devalue the pound in September 1931, was widely anticipated. An accurate reckoning of the full consequences of devaluation must take account of the existence and consequences of anticipated devaluation.

The third question addresses Eichengreen and Sach's (1986, p. 238) claim that unilateral devaluation had "beggar-thy-neighbor" effects:

> Though it is likely that currency depreciation (had it been even more widely adopted) would have worked to the benefit of the world as a whole, the sporadic and uncoordinated approach taken to exchange-rate policy in the 1930s tended, other things being equal, to reduce the magnitude of the benefits.

If devaluation of the U.S. dollar "beggered" any other nation, it is likely to have done so to Great Britain, which was then one of the United States' major trade partners.

The fourth question is aimed at determining whether devaluation really was, as Temin and Wigmore (1990, p. 501) claim, a "turning point" in the recovery. To answer this question one must isolate and compare the consequences of devaluation to those from other expansionary (monetary and fiscal) policies.

CHAPTER TWO

REVIEW OF THE LITERATURE

2.1 The Interwar Gold Standard

In February and early March of 1933 American citizens and foreign nationals responded to the growing belief that the United States would devalue its currency by running to convert Federal Reserve notes into specie and foreign currency. On March 6 President Roosevelt declared a bank holiday by invoking the Wartime Powers Act, an action that was codified on March 9, 1933 with the passage of the Emergency Banking Act. From April 1933 through January 1934 the dollar alternately floated freely or was supported at various but descending exchange rates, a policy now termed a "crawling peg." The vacillation among alternative monetary policies ended in February 1934 when the dollar was pegged at $35 per troy ounce of gold.

The Federal Reserve System shares some of the blame for this crisis. Among its duties, the Fed managed currency needs of the economy by redeeming commercial bank reserve credits at the Federal Reserve System in gold bullion, coin, and its own redeemable notes. To fulfill this duty, the Fed managed the United States' money stock through changes in Fed bank discount rates and through open market operations. Because many nations, including the U.S., were on a form of gold standard in the late 1920s and early 1930s, the Fed and other central banks did not enjoy unlimited monetary discretion. In particular, national price levels could not long vary independently from one another. When nations' price levels differed significantly from those of

trading partners, the system tended to remove these disparities, by causing gold to flow from countries with relatively high price levels to countries with lower price levels.

However, central banks, including the Fed, could temporarily subvert this automatic mechanism by "sterilizing" gold inflows and outflows. To sterilize gold inflows a central bank would sell some if its assets, primarily government bonds, and increase its discount rate. By taking these actions the central bank would induce a monetary contraction to offset expansionary gold inflows. To sterilize gold outflows a central bank would undertake the opposite policies. According to Friedman (1963, p. 617) and Eichengreen (1992, p. 205) central banks preferred to sterilize gold inflows, and preferred to not sterilize gold outflows, to accumulate and retain gold reserves. Eichengreen (1992, p. 206, note 43) finds that there was no difference between reserve centers, such as the United States and Britain, and other countries in their propensity to sterilize gold inflows.

Under this "managed" gold standard central banks were still obliged to ensure a fixed exchange rate of their currency into other currencies, if not directly into gold. Were the public to lose confidence in any central bank's ability to meet this obligation, it would be led to stage a run on that central bank's currency, and on bank deposits denominated in it.

Unfortunately, the practice of "asymmetrical" gold sterilization, when widely adopted, tended to destabilize the international monetary system by undermining the tendency for price level changes to regulate international trade imbalances: gold losses stemming from an adverse trade balance, instead of being checked in part by a rise in foreign money stocks and price levels, would be corrected only by means of domestic gold losses and deflation. Central banks responded to the conflicts inherent in a generalized "asymmetric stabilization" policy by means of largely informal rules, many of which were established at the International Economic

Convention held at Genoa in 1922. According to Kemmerer (1944, pp. 164-165), the purpose of this Convention was "...to centralize and coordinate the demand for gold, and so to avoid those wide fluctuations in the purchasing power of gold, which might otherwise result from the simultaneous and competitive efforts of a number of countries to secure metallic reserves." The chosen solution consisted of a scheme for economizing on gold through reliance upon a gold exchange standard. Central banks also agreed to coordinate their discount policies, and to lend funds among themselves, so as to better avoid the destabilizing consequences of asymmetric sterilization.

This managed gold standard was to prove far less robust than that envisioned at Genoa. Cassel (1936, p. 5) suggests that the gold standard functioned well from 1873 to 1913 because Great Britain, the center of finance at the time, allowed free trade and did not sterilize capital flows. After World War I, the center of world finance shifted from London to New York, and the openness that characterized the system before World War I diminished (see Cassel, 1936 pp. 53 and 60). After 1929 the Federal Reserve and other central banks actively sterilized capital inflows while national governments imposed trade restrictions. These shifts in policy led some researchers (e.g. Kindleberger 1973, p. 292) to believe central banks, the Fed in particular, could have mitigated the harm and magnitude of the Great Depression but were either unable or unwilling to take the steps necessary to restore stability.

Eichengreen (1992, p. 4) considers the claim that the gold standard was a source of stability but rejects it in favor of a view echoing Kindleberger's suggestion that central banks and international arrangements could have stabilized money markets and restored economic relations among nations had it not been for the restraints of the gold standard:

> The collapse of the international monetary system is commonly indicted for triggering the financial crisis that transformed a modest economic downturn into an unprecedented slump. So long as the gold standard was maintained, it is argued, the post-1929 recession remained just another cyclical contraction. But the collapse of the gold standard destroyed confidence in financial stability, prompting capital flight which undermined the solvency of financial institutions. The financial crisis leapfrogged from country to country, dragging down economic activity in its wake. Removing the gold standard, the argument continues, further intensified the crisis. Having suspended gold convertibility, policymakers manipulated currencies, engaging in beggar-thy-neighbor depreciations that purportedly did nothing to stimulate economic recovery at home while only worsening the Depression abroad. The world of finance was splintered into competing currency areas, disrupting international trade, discouraging foreign investment, and generally impeding recovery.
>
> The gold standard, then, is conventionally portrayed as synonymous with financial stability. Its downfall starting in 1929 is implicated in the global financial crisis and the worldwide depression. A central message of this book is that precisely the opposite was true. Far from being synonymous with stability, the gold standard was itself the principal threat to financial stability and economic prosperity between the wars.

The interdependence to which Eichengreen refers is what Kemmerer (1944, p. 170) calls the "pyramiding of gold reserves". Pyramiding of reserves occurred whenever one country used the currency of another as reserves for their own currency. The implicit belief was that because one currency was redeemable for gold, using that currency as a reserve was as good as gold.[1] Kemmerer, however, suggests these arrangements made the entire monetary system *more* prone to liquidity crises as gold reserves for one currency also acted as reserves for other countries. Kemmerer (1944, p. 171) writes:

> In some instances, the attenuation of these "foreign-exchange reserves," by way of pyramided credit, was much greater and, in extreme cases, it extended into rather "hot" money markets. To help meet this difficulty, and at the same time enable the respective foreign central banks to keep informed regarding the volume of the exchange-reserve investments in the markets for which they are

[1] Prior to the Civil War, the practice was called "shingling" in the United States as some banks used notes of other banks as reserves for their own note issue (see Mason, 1996, p. 82).

> responsible, it would be good policy for central banks operating gold-exchange standards at home to conduct exchange-reserve operations abroad only with and through central banks and the Bank for International Settlements.

The gold reserve ratio for the entire system was thus much smaller than the measured gold reserve ratios for each separate reserve currency.

Eichengreen (1992, pp. 264 –285) agrees that this interdependence made the system vulnerable to liquidity shocks that were transmitted among nations. He claims, though, that the European monetary troubles of the early 1930s were a direct result of central banks not coordinating their policies while the gold standard constrained most nations from taking unilateral steps to stabilize their economies. Eichengreen, in recounting the liquidity crisis that ultimately caused the devaluation of the British pound, begins by describing how the failure of Credit – Anstalt, the largest deposit bank in Austria, caused a run on the schilling. The Austrian central bank responded to the run by liquidating its foreign assets in favor of gold. These transactions caused other central banks to lose their reserves and forced a general economic contraction. The runs and monetary contractions eventually spread from Austria, Germany, and Central Europe to Great Britain and contributed to the economic forces that ultimately led the Bank of England to devalue the British pound. The pattern of suspension and resumption of the convertibility of national currencies led foreign nationals to hold American securities and gold to protect their financial assets where their central banks had failed to do so. Eichengreen finds that this increased financial interdependence of the dollar with other currencies eventually forces devaluation of the dollar.

Eichengreen, however, believes that had central banks cooperated with each other in the spring of 1931, the liquidity crisis need not have developed into a worldwide depression. Eichengreen argues that in the absence of such cooperation, countries with central banks that

failed to maintain the public's confidence were better off breaking their commitment to the gold standard. Eichengreen (1992 p. 393) points out, as evidence, that some countries after abandoning the gold standard were able to reverse their economic contractions by expanding their money supplies:

> At this point international cooperation should have come into play. By coordinating their expansionary initiatives internationally, governments could have circumvented the dilemma of choosing between reflation and the maintenance of gold convertibility. By offering international loans, they could have facilitated the provision of liquidity to banking systems in distress. But international political disputes, domestic political constraints, and incompatible conceptual frameworks proved insurmountable obstacles to cooperation. Given this failure to cooperate, abandoning the gold standard became a necessary precondition for economic recovery…. It was not so much devaluation in and of itself that mattered, in other words, but the expansionary policies whose unilateral adoption was facilitated by abandonment of the gold standard.

The United States' decision to devalue the dollar from 1933 to 1934 represented a compromise between protecting the gold standard and abandoning it all together. This in-between measure raises the questions as to whether the policy was a step towards recovery or whether it deepened the Depression. The literature suggests that either scenario was possible. The remainder of this chapter will address both stances.

2.2 The theory supporting the stimulus view

In his book *Golden Fetters,* Eichengreen (1992 p. 390) maintains that devaluation was a necessary step for recovery from the Depression. He writes:

> Problems with the gold standard contributed directly to the collapse of output and to the increase in unemployment that began in 1929. The downward spiral of output and employment exacerbated the difficulty of operating the gold standard,

> further depressing levels of economic activity. But as with the fever of a flu-ridden patient, a point came where the severity of the symptoms signaled imminent recovery. The collapse of output and employment had proceeded so far that the gold standard could no longer be supported. Once its provisions were finally removed from the international scene, economic recovery could commence.

Eichengreen further states that it was not enough to stabilize currencies of nations that re-established the gold standard in the 1920s. In his opinion, recovery required fundamental adjustments in nations' economies because some nations overvalued their currencies as they returned to the gold standard while other nations undervalued their currencies.

For countries with overvalued currencies, purchasing power parity required that prices and real wages decline. Countries with overvalued currencies that did not make these adjustments would lose gold owing to current account deficits that arise from relatively inexpensive foreign goods. For many countries, however, the labor market was resistant to downward adjustments. Eichengreen (1992, p. 204) writes, "This is not to say that wages were downwardly rigid in the 1920s. But they declined only gradually, by a total of 1.5 percent between April 1925 and January 1929."[2]

Countries with undervalued currencies would have to allow prices and wages to rise to eliminate their balance of payments surpluses. Central banks in these countries, however, tended to sterilize gold inflows to prevent the problems that came with inflation, as it was experienced in the first half of the 1920s. Eichengreen (1992, p. 300) remarks that inflation caused hardships in France, Belgium, Italy, Poland, and Central European nations:

> In all these countries, inflation had been symptomatic of the inability to achieve a consensus of the level of public spending and the distribution of taxes. It had

[2] Eichengreen cites Capie and Weber (1985 p. 62) as the source for this statistic but this is not correct, as Capie and Weber provide no such statistic in their work. Presumably the 1.5 percent decline is in nominal wages.

> been the market's way of reconciling incompatible claims. But inflation had redistributed income from creditors to debtors, polarizing society into competing factions dominated by the propertied and working classes. Failure to resolve the distributional conflict and control inflation had allowed political instability and financial turmoil to persist for nearly a decade. Compromise over the distribution of income and the burden of taxation had been achieved only at the end of a long, debilitating process.

According to Eichengreen, it was this sort of political turmoil that removed the "insulation" of central bankers from politics and pushed domestic concerns over concerns for international stability. This change in political dynamics diminished the credibility of the international gold standard and the international cooperation among central banks that Eichengreen found so important prior to World War I. Central banks avoided inflation by sterilizing gold inflows into their countries. This prevented the restoration of purchasing power parity among nations. The consequence was that gold ceased to be the exclusive internationally accepted medium of exchange. Smaller nations with balance of payment surpluses started to hold other nations' assets as reserves for their own currencies. Eichengreen (1992, pp. 204 – 206) describes how central banks of large nations with surplus balance of payments sterilized gold inflows domestically by selling domestic assets:

> When a gold-standard country ran a payments deficit, there should have been pressure for its currency circulation to contract. But if the country was a reserve center, the claims accumulated by its trading partners tended to return in the form of foreign deposits. If the United States ran a payments deficit against the rest of the world, other countries, starved for exchange reserves, deposited the dollars they accumulated in New York. The U.S. deficit was neutralized by the rise in foreign deposits, with no loss of gold reserves. There was no tendency for the U.S. money supply to contract, no fall in prices to eliminate the payment deficit. Thus, the external constraint did not bind for the reserve-currency country.

Although one might suggest that the rise of reserve currencies was a natural evolution in international finance, it occurred only because nations had appropriated control of their money supplies. Reserve currencies, primarily the United States' dollar, the British pound, and the French franc came to function as a preferred international media of exchange among almost all nations. The main difference between the use by nations of reserve currencies and the use of private clearinghouses to settle accounts among banks is that private clearinghouses acted more like a warehouse for gold, performing the limited accounting transactions of clearing notes and checks among their members and transferring the balance in gold deposits, and did not issue its own currency.[3] Nations of reserve currencies, on the other hand, used gold inflows from non-reserve currency countries as the basis for new currency issues. This made the reserve currencies more susceptible to changes in the world demand for gold because the gold backing these currencies had to satisfy the liquidity needs of non-reserve currency nations in addition to the domestic demands for gold.

Eichengreen's explanation of the Depression follows international capital flows. He claims that the reason the Depression first manifested itself in countries that had persistent balance of payment deficits is that the Federal Reserve system took steps to contract the United States' money supply in 1928. This policy caused central banks in countries with payment deficits to contract their own money supplies in an effort to maintain convertibility of their currencies. According to Eichengreen, this set the stage for the financial crises in 1929 as foreign central banks led the market's liquidation of United States' securities. These governments were forced to choose between taking actions to stimulate their economies and

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[3] Clearinghouses did issue loan certificates in times of liquidity shortages. See Friedman and Schwartz (1963) p. 160. The Bank for International Settlements could have been such a clearinghouse but only came into existence in 1930 and may have been undercapitalized to perform its duties. See Friedman and Schwartz (1963) p. 381, note 116.

maintaining their commitment to the gold standard. Eichengreen (1992, p. 393) sees virtue in devaluation because it allows nations to overcome the policy restraints imposed by the gold standard:

> Once they shed their golden fetters, policymakers had several new policy options available. They could expand their money supply. They could provide liquidity to the banking system at the first sign of distress. They could increase the level of government expenditure. They could take these actions unilaterally, without any need for assistance from foreign countries to neutralize the impact on the exchange rate…. It was not so much devaluation in and of itself that mattered, in other words, but the expansionary policies whose unilateral adoption was facilitated by abandonment of the gold standard. This is why the devaluation cycle of the 1930s, which by 1937 had restored the relative prices of different national currencies to 1931 levels, had beneficial effects despite having achieved no lasting change in bilateral exchange rates.

Eichengreen and Sachs (1985, pp. 223 – 226) develop four theories concerning the effect of devaluation on output. Their theories vary depending on the type of monetary policy followed after devaluation. Their hypotheses about the effect of devaluation on output vary based, first, on whether devaluations are unilateral or coordinated with other nations, and second, on whether the devaluation is sterilized. Eichengreen and Sachs define a sterilized devaluation as one that that leaves the nominal ratio of the monetary base to gold reserves unchanged.

Eichengreen and Sachs' first hypothesis is that a unilateral, sterilized devaluation would increase nominal domestic industrial production, reduce foreign nominal industrial production, and lower domestic nominal interest rates. Their second hypothesis is that a unilateral, unsterilized devaluation would increase nominal domestic industrial production but have ambiguous effects on nominal foreign industrial production, real domestic reserves,[4] foreign

[4] Measured as the gold stock valued in constant dollars based on the 1929 pre-devaluation gold content.

reserves,[5] and nominal domestic interest rates. Their third hypothesis is that a coordinated, sterilized devaluation would increase industrial production in all countries and lower domestic nominal interest rates in all countries. Their fourth hypothesis is that a simultaneous, unsterilized devaluation would produce no change in domestic industrial production, foreign industrial production, domestic reserves, foreign reserves or domestic interest rates. These theories are summarized in Eichengreen and Sachs' (1985, p. 224) Table:

Table 2.1

Impact of exchange-rate depreciation on endogenous variables, 1929-1935

Case		Domestic Output	Foreign Output	Domestic Reserves	Foreign Reserves	Interest Rate
I.	Sterilized devaluation	+	-	0	0	-
II.	Unsterilized devaluation	+	+ / -	+ / -	+ / -	+ / -
III.	Simultaneous devaluation, unchanged gold backing	+	+	0	0	-
IV.	Simultaneous devaluation, unchanged monetary base	0	0	0	0	0

Eichengreen (1992, p 393) claims that the policy options that are made possible by devaluation would stimulate an economy. That these policies options were made possible by devaluation raise questions as to what effects did devaluation, and the expectation of devaluation, themselves have on the economy? The answer requires an assessment of the importance of the "credibility" of the gold standard to which Eichengreen makes frequent reference.

[5] Eichengreen and Sachs do not define foreign reserves, but I presume these are nominal quantities.

Some researchers suggest that the anticipation of devaluation should have had a stimulating effect on output. Temin and Wigmore (1990, pp. 486 – 487), for example, claim that the economic environment had deteriorated to such an extent that few businesses were willing to borrow so as to undertake investment. They suggest that the expectation of devaluation could encourage businesses to borrow to expand output. Although Temin and Wigmore emphasize that expectations of devaluation would be sufficient to raise investment, Eichengreen and Sachs (1985, pp. 224 – 226) theorize that the growth in output generated by the optimism following devaluation would diminish if subsequent monetary expansion did not take place. Monetary expansion and rising prices could then sustain the increase in investment by alleviating the heavy real burden deflation put on debtors, as is described in Bernanke and Gertler (1989, and 1990).

The expectation of devaluation may also increase the public's preference for current consumption. Temin's (1976) version of Keynes' spending hypothesis suggests that a decline in consumption spending, rather than decreasing investment, were the main cause of the Depression. He divides the interwar years into three periods (1920 – 1929, 1929 – 1932, and 1933 – 1940) during which underlying economic relationships showed "not very much variation" (pp. 176 – 177). According to Temin, during the first period the United States' economy had two minor downturns, in 1924 and 1927, which did not affect consumer confidence. Temin (1976, p. 74) notes that during the second period consumer confidence had shifted towards pessimism:

> In 1929, most people expected good times to continue. By 1933, most people expected bad times to continue. Sometime in the interim, people's vision of what the next few years would bring changed. The question, therefore, is not whether expectations changed in the Depression, but when.

Although Temin (1976) does not address recovery from the Depression, it follows that Temin's autonomous decrease in consumption hypothesis should have a complimentary explanation for the recovery. If the start of the recovery begins at the trough of the Depression, it would be consistent with Temin's hypothesis to note that something remarkable happened in 1933 to change consumer confidence. The question is, why would devaluation cause a decrease in consumption spending? An examination of the stabilization literature provides a possible explanation.

A subset of the stabilization literature employs a business-cycle approach to explain the macroeconomic fluctuations that result from a government's decision to finance its fiscal deficit with debt rather than with money creation. Calvo (1986, pp. 1323 - 1325) develops a cash-in-advance model with an infinitely lived, Ramsey-type family that has perfect foresight and access to asset markets with perfect capital mobility and one-consumption good. Calvo (1986, pp. 1323-1325) shows that the family optimizes utility by equating the marginal utility of consumption with the marginal utility of income times the price of the good. The price of the good in the model includes the opportunity cost of money held per unit of the consumption good. His model shows that as inflation rises, so does the marginal utility of consumption. Hence, the family will consume more of the good in the current period than in future periods so as to avoid the capital loss associated with holding money.

Calvo and Vegh (1993) modify this theory to allow for changes in the relative demand for traded and non-traded goods when price adjustments are staggered rather than uniform across all goods and services. They show that a government's lack of credibility to avoid money creation could lead to a gradual depreciation of the currency. This currency depreciation could drive the observed business cycle. Mendoza and Uribe (2000) expand on Calvo and Vegh's

(1993) work to allow for uncertainty in the policy reversal date. Mendoza and Uribe (2000, p. 241) argue that this uncertainty causes fluctuations in the velocity of money and in the level of consumption and are the main cause of the fluctuation in the observed business cycles. Each of these studies holds that a lack of a credible commitment by a government not to create money affects consumption and trade. Because the lack of credibility to commit to a stable money supply results in the public expecting the government to devalue its currency, the expectation of devaluation may affect consumption and international trade.

2.3 Empirical tests of the stimulus view

The works of Choudhri and Kouchin (1980), Eichengreen and Sachs (1985), Bernanke and James (1991) and Bernanke (1995) are the primary works that discuss the effect of devaluations on output in the 1930s. Choudhri and Kouchin estimate, in the earliest of these studies, how United States' industrial production and price level changes affected industrial production and price levels in countries with fixed exchange rate regimes (Poland, the Netherlands, Belgium and Italy), flexible exchange rate regimes (Spain), and mixed exchange rate regimes (Denmark, Finland, and Norway) during the period from 1928 through 1932. They estimate this relationship as follows:

$$X = a + b(X_{US}) \; . \qquad (2.1)$$

In the above expression, a is a constant, X is the nominal industrial production and the price level of each country, and X_{US} is United States' industrial production and price level. The researchers conclude (p. 573) that flexible exchange rate regimes offered countries some protection from

international business cycle fluctuations. Their results present tentative evidence that devaluation could beneficially insulate a country from the business cycle fluctuations of a dominant country. Their study, however, does not account explicitly for exchange rate changes. Instead they infer beneficial effects of exchange rate flexibility from the regression results for the three groups of countries.

Eichengreen and Sachs (1985) use panel data to estimate the effect of devaluation on industrial production, real wages, export volume, the discount rate, Tobin's q, and gold reserves. The regressions take the following form:

$$Y_{i,j,t} = \alpha_j + \beta_j G_{i,t} + \gamma_j D_t + \mu_{j,t}. \qquad (2.2)$$

In equation (2.2) $Y_{i,j,t}$ are the *j* variables (the real industrial production, the real wage, export volume, and Tobin's q) for each of the *i* countries in their sample set at time *t*; α_j are constants associated with each of the *j* variables in *Y*; β_j, γ_j are vectors of coefficients; $G_{i,t}$ are the currency prices of gold for each of the *i* countries; D_t is a dummy variable representing the tight control of the German economy beginning in 1931; and $\mu_{j,t}$ are stochastic error terms.

Although Eichengreen and Sachs distinguish four different types of devaluation (see Table 2.1), their panel study does not make distinctions by type of devaluation. Their method compares changes in output in countries that devalue their currency with changes in output in countries that did not devalue by 1935. They vary their regressions by both including and excluding the United States and the period under consideration. Using annual data for the period from 1929 through 1935 and excluding the United States from their regressions, they find (p.

229) that nominal domestic production increased 0.69 percent for a one percent increase in the currency price of gold.[6] Alternatively, including the United States in their analysis changes the estimated relationship to an increase in output of 0.59 for a one percent increase in the currency price of gold. Shortening the time period from 1929 – 1935 to 1932 – 1935 and including the United States in the regressions increased the estimated effect to 0.97 percent gain in output for a one percent increase in the currency price of gold. The authors claim (p. 235) that the increase in industrial production came about because devaluation "promoted growth not through one but through each of the major channels: by reducing real wages, enhancing competitiveness, promoting exports, and permitting the reduction of interest rates."

Eichengreen and Sachs (1985, p. 237) recognize some limitations of their research. They note "Currency depreciation was only one of several instruments of external economic policy, along with exchange controls and trade restrictions. Moreover, internal economic measures – notably fiscal policy – can and should be incorporated into the model…". Eichengreen and Sachs, (1985, p. 225) add that their model makes no distinction between foreign and domestic interest rates or between real and nominal interest rates. They also note that the results of their model are conditioned on the public holding no expectations of exchange rate changes.

Eichengreen and Sachs' study also does not account directly for the effect of monetary changes. The authors, perhaps owing to data limitations, use central banks' nominal gold reserves as a proxy for monetary changes even though they differentiate between sterilized and unsterilized devaluations. Alternatively, the authors could have used each country's quantity of

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[6] The authors do not explicitly state that their indexes of industrial production measure real values in their data set. In other places they are careful in places to discuss the effect of devaluation on real wages, noting that nominal wages were deflated by the wholesale price index. No such statement is made regarding industrial production. The reader is left to assume that the indexes of industrial production measure real output. Otherwise, the regressions might not be measuring anything other than inflation arising from ex post devaluation expansionary policies.

base money as either of these would have directly incorporated the acts of sterilizing changes in nominal gold reserves. Further, the authors could have used each country's M1 money supply so as to account for both central banks' choices as to the quantity of base money and for the publics' decisions affecting money multipliers.

The Bernanke (1995) study, which is an extension of Bernanke and James (1991), also uses panel data to assess the effects of leaving the gold standard. Bernanke estimates these effects using the following equation:

$$Y_{i,j,t} = \alpha_j + \gamma_j T_t + \beta_j D_{i,t} + \mu_{j,t} \ . \qquad (2.3)$$

In equation (2.3) $Y_{i,j,t}$ consists of each *i* country's *j* variables: manufacturing production, wholesale prices, M1 money supply, the M1 currency to deposits ratio, nominal wages, real wages, employment, nominal interest rates, ex-post real interest rates, relative price of exports, and real share prices; α_j are constants; γ_j, β_j are estimated coefficients; T_t are time dummy variables; and $D_{i,t}$ are dummy variables for each j country's gold standard adherence.[7]

Bernanke (1995, p. 14, Table 3) finds that going off the gold standard increased manufacturing production by approximately seven percent, wholesale prices by approximately nine percent, the money supply by approximately five percent, the M1 currency to deposits ratio by approximately three percent, nominal wages approximately two percent, employment six percent, nominal interest rates by approximately 122 basis points, real exports by seven percent and real share prices approximately three percent. The relative price of exports decreased by approximately five percent, real wages decreased by approximately six percent, and ex-post real

[7] The list of variables as reported in Bernanke (1995, Table 2, p. 13).

interest rates decreased approximately 270 basis points. Bernanke (1995, p. 19n17) extends his study to include a variable named “panic,” which he defined as the number of months each year that a country suffered a banking crisis, to test whether its inclusion in estimation would significantly alter estimated coefficients. He finds that the inclusion of the “panic” variable does not significantly alter the other estimated coefficients.

Bernanke’s study has several limitations: first, it does not distinguish between the economic size of the countries that devalue their currencies. If large countries, or reserve currency countries, have a different experience with devaluation than small countries, or non-reserve currency countries, the presence of many small countries in a panel study will tend to dominate the estimation results and thus mask the large countries’ experiences. Second, Bernanke’s study does not account for the magnitude of the devaluations except, to a limited extent, through the “panic” variable. The study, by not accounting for the magnitude of devaluation, does not consider the possibility that there might be a level of devaluation below for which devaluation has no beneficial effects. Third, the study presumes by using ex-post real yields that expected inflation was perfectly anticipated and that no country’s devaluation was a surprise. Finally, the study, by assuming that every country’s devaluation was anticipated, does not take into account that the observed effect each country’s devaluation had on its industrial output may be owing to adjustments made by manufacturers and the public for errors in anticipating the magnitude of the devaluation ahead of its execution. Hence, Bernanke does not account for the public’s response to the anticipation of devaluation which may be of equal or greater importance.

2.4 The theory supporting the depressive view

Defenses of the gold standard generally extol its long-term benefits that would be sacrificed if its commitment is broken. It is often argued that reneging on a gold standard commitment entails at least a temporary loss of these benefits of the gold standard. Bordo and Kydland (1996, p. 87) articulate a representative version of this general argument by stating that governments found the gold standard to be in their interest, provided the governments treated the gold standard as contingent contracts:

> We have suggested a number of reasons why the gold standard rule was so successful as a commitment mechanism before 1914. First, as a contingent rule it permitted nations to have access to revenue in times of wartime emergency. The commitment to return to gold parity after the war would enable the authorities to issue debt and to collect seigniorage at more favorable terms than otherwise.
>
> Second, in England and possibly in other countries, gold emerged early on as a way of certifying contracts. This certifying characteristic of gold carried forward to the relationship between the private and public sectors. Abandoning gold convertibility was viewed as a serious breach of contract. The gold standard emerged in the stable political environment of England after the 17th century, where the rule of law sanctified private contracts. Only a few countries had comparable stability. Countries fraught with more unstable internal politics found it more difficult to refrain from running budget deficits, ultimately financed by paper-money issue (for example, Italy and Argentina), although the benefits of convertibility placed some constraints on their behavior.
>
> The gold standard was also successful as an international rule: by pegging their currencies to gold, countries became part of a fixed exchange rate system. The international aspect of the gold standard may have reinforced the domestic commitment mechanism because of the perceived advantages of more favorable access to international capital markets, by the operation of the "rules of the game," and by the importance of England as a hegemonic power.

Here the benefits of the gold standard are that it creates a stable environment for persons to conduct business, to save, to lend and borrow, and to maintain trust between the public and

governments. This view does not necessarily deny that reneging on the commitment to gold could generate short-term gains, but it suggests that short-term gains are not the best measure of the value of the gold standard. Such a view, however, does not escape the political realities that Eichengreen (1992, p. 390) discusses. Few unemployed persons in the 1930s would have been comforted by the suggestion that generally, over the long run, they would be better off if the gold standard were maintained if it meant that they were unemployed at that time. It follows that, if defenders of the gold standard could not persuade the unemployed that maintenance of the gold standard was in their interest, then the gold standard itself becomes vulnerable to political whim. If the long-term survivability of the gold standard comes into question, then the argument that the gold standard provides stability to both a government and an economy becomes weaker. Therefore, any argument for the benefit of the gold standard must first address the short-term effects of devaluation.

The literature supporting the theory that devaluation could have lowered real output is fragmented because each theory tends to focus on a particular factor in the determination of output. The more prominent theories suggests devaluation would be contractionary because there would be an interest rate penalty associated with devaluation. Bordo and Kydland (1996) note that a country's commitment to the gold standard facilitated long-term lending by protecting the public from random shocks to the money supply and from capital losses from inflation. Prior to World War I, arbitrary increases in the money supply were largely self-correcting through the price-specie-flow mechanism. During the interwar period, commitments to the gold standard were much more tenuous. After a country devalued its currency, the public could withhold lending in the absence of additional compensation for the risk of future capital losses. The public demands additional compensations because they realize that the government's policies are

time inconsistent. The public comes to realize that the government has given in to the temptation to raise taxes on existing capital, in this case through devaluation, while promising not to impose similar taxes in the future.[8] The public, not wanting to be fooled by this game a second time, becomes reluctant to hold the currency or invest in a country that does not credibly commit to maintain convertibility without sufficient compensation for the added risk of future devaluations. The resulting higher real interest rate reduces investment.

Skepticism of the country's commitment to the new monetary standard is not limited to its own citizens. A government's gold standard policy affected its perceived "country risk." Nagy (1979) defines country risk as "the exposure to a loss in cross-border lending caused by events which are, at least to some extent, under the control of the government of the borrowing country." This broad definition encompasses more than sovereign loans; it connects private risk with public policy. As the perceived risk of investing in a country rises, the volume and structure of new debt issued in that country changes because foreign nationals and domestic residents have become reluctant to hold that country's domestic assets. Most researchers exploring country risk, e.g., Baer (1984), Bird (1986), Ciarrapico (1992), and Saini et al. (1984), focus their attention on identifying indicators of changes in country risk. Other researchers, e.g., Eaton et al. (1986) and Del Castillo (1992), focus their attention only on factors that affect sovereign loans so as to remove general business failure risk.

The public's reluctance to invest in a country could change both the term to maturity and the duration of new debt and the term structure of interest rates. These two dimensions are closely related through a general risk-return relationship. Klein (1975a, 1975b, and 1978) investigates this relationship by estimating the effect monetary and price level uncertainty had on

[8] The problem is discussed as the Ramsey tax problem and also within the context of rules versus discretion in monetary policy. See Kydland and Prescott (1977).

the term structure of real interest rates. He suggests that if both borrowers and lenders have the same inflationary expectations, inflation should not affect the real term structure because all parties would be willing to adjust their contract rate to account for the nominal changes. However, even though the rate of inflation is neutral on the real return, Klein found that an increase in the variance of the rate of inflation, i.e. the uncertainty of inflation, changed the term structure of interest rates. Applying Klein's logic to the United States' 1934 devaluation, the change in the value of a troy ounce of gold from $20.67 to $35 should be neutral on real interest rates, but the increase in uncertainty about the commitment to the new price of gold should raise real interest rates.

Klein (1978) found a negative correlation of price level uncertainty with both the duration and maturity of high-grade industrial bonds using data from 1900-1972. Klein (ibid, p. 443) defines a measure of short-term price level uncertainty (*SE*) as the standard error of a one period moving average of the first difference of the price level. He defines (p. 447) long-term price level uncertainty (*SL*) based on a six period moving average:

$$SL = \frac{SE\left[\left(1+\sum_{t=1}^{5}\rho^{t}\right)^{2}+\left(1+\sum_{t=1}^{4}\rho^{t}\right)^{2}+\left(1+\sum_{t=1}^{3}\rho^{t}\right)^{2}+\left(1+\sum_{t=1}^{2}\rho^{t}\right)^{2}+(1+\rho)^{2}+1\right]^{0.5}}{\sqrt{6}}.$$

In the above expression ρ is the one-period autoregressive parameter. Klein (ibid, p. 451) estimates the relationship between new corporate debt maturity and a constant, the ratio $\left(\frac{SL}{SE}\right)$, and a six period forecast of the expected price level and finds that a one percent increase in the ratio of long-term uncertainty to short-term uncertainty decreased the average maturity of new

corporate debt issues about three and a half years. He found similar evidence of a negative correlation of a rise in the ratio of long-term uncertainty to short-term uncertainty with the average duration of new debt.

The shortening of both the duration and weighted average maturity of new debt raises the risk of business failure by increasing periodic payments and increasing frequency of refinance. The more frequently debt comes due and the greater the periodic payment, the more likely it becomes that the debtor will experience trouble paying off or refinancing its debt. Spread out over thousands of firms, business failures will rise as the average term to maturity of loans shortens. The shortening of duration can be explained from the investor' perspective as a rational response to uncertainty. Hopewell and Kauffman (1973, p. 749) note "For a given basis point change in market yield, percentage changes in bond prices vary proportionately with duration and are greater, the greater the duration of the bond". Simply put, creditors want to reduce their risk in light of price level uncertainty by shortening the duration of the bonds they hold.

The relevance of the debt maturity structure has received a fair amount of attention. Stiglitz (1974) argues that debt structure is irrelevant if securities markets span state-space, that is, there is complete contracting over all contingencies, and there are no taxes or bankruptcy costs. Barnae, Haugen and Senbet (1980) and Myers (1977), by backing away from Stiglitz's sterile world, argue that the presence of agency costs (changes in tax liability resulting from changes in bond prices) results in the existence of an optimal debt maturity structure. Boyce and Kalotay (1979) show that if personal and corporate tax rates differ, and if the term structure is not flat, then an optimal structure exists. Similarly, Brick and Ravid (1985) find an optimal structure with the presence of the possibility of default, agency costs, and a non-flat term

structure. The research relaxing Stiglitz's assumptions supports the general argument that devaluation makes the post-devaluation capital structure sub-optimal until firms and creditors restructure their capital. Furthermore, research (e.g. Ben-Shahar and Cukierman 1973, Estrella and Hardouvelis 1991, Laurent 1997, and Stock and Watson 1989) suggests that the term structure holds evidence of future inflation and economic activity. Therefore, changes in the term structure resulting from devaluation reflect changes in the general business environment and changes in the level of uncertainty regarding the price level.

There are two other notable versions of the time inconsistency problem. First, the public's skepticism about a government's commitment to a new monetary standard could affect decisions beyond the choice of consumption versus saving. In presenting a trade-withholding version of the Ramsey problem, Palyi (1972) claims that because devaluation will raise the nominal price exports earn and imports cost, the anticipation of devaluation should worsen the trade balance as merchants would withhold exports in anticipation of higher nominal payments after devaluation, or at least to avoid a capital loss, and increase imports to beat the expected exchange rate adjusted price increase. The result would be a worsening of the trade balance that would in turn reduce gold inflows, or increase gold exports, needed to sustain the balance of payments. The reduction of gold imports (or the increase in gold exports) would fuel speculation of the impending devaluation heightening the anticipation of devaluation.

The second notable version of the time inconsistency problem is a labor version of the Ramsey problem. Obstfeld (1997, pp. 69 – 70) claims that while it is theoretically possible to raise welfare with departures from the gold standard, the practical problem of designing, instituting, and enforcing rules governing departures from the gold standard are nearly impossible to overcome:

> Why should multiple equilibria arise at all? The answer lies in the policymaker's inability, under discretion, to forswear credibly the accommodation of expected depreciation. A rise in expected depreciation on date $t - 1$, other things the same, can push the economy farther from full employment on date t; as Eq. (4) shows, the policy maker will create some date-*t* inflation to mitigate this employment effect….

He shows that the government's limited credibility to restrain fiscal discretion leads workers to withhold labor until they receive compensation for an anticipated or actual devaluation. The result is a reduction in employment and a decrease in real income. Consequently, he argues that a gold standard with an escape clause may well lead to a permanently inferior equilibrium.

Lastly, an argument can be made that devaluation will lower consumption at all points rather than increase consumption at first and then reduce it, as is suggested by Calvo (1986 pp. 1323-1325). For instance, Palyi (1972, p. 282) points out that the United States was a net creditor to world markets, and a depreciated dollar amounted to a capital transfer to international debtors because these loans were repaid with dollars that had reduced real value dollars. Assuming the U.S. public engaged in consumption smoothing, the decline in the real value of these loans should have reduced United States' domestic expenditures. The subsequent rise in the price level also would diminish the wealth of domestic creditors, even on loans that had "gold clauses" requiring repayment in currency equivalent to a specified quantity of gold.

These clauses had uncertain legal standing reflecting two parallel but conflicting lines of case law: the constitutionality of gold clauses and the constitutionality of legal tender laws. Prior to 1933 the Supreme Court had directly upheld the constitutionality of gold clauses in Bronson v. Rhodes (1904) and Trebilcock v. Wilson (1871), but the Supreme Court also established the right of Congress to issue fiat currency and to make these notes payable for all debts, public and private, in the legal tender cases: Hepburn v. Griswold (1870), Knox v. Lee (1871), and Julliard

v. Greenman (1884). Collectively these five cases allowed citizens to enforce gold clauses except against devaluation because devaluation altered the nominal value of gold.[9] Congress attempted to clarify the situation on May 6 and June 5, 1933 by passing joint resolutions abrogating the gold clause in all public and private contracts, past and future. There were four legal challenges to these Congressional resolutions (Norman v. Baltimore (1935); United States v. Bankers Trust Co (1935); Perry v. United States (1935); Nortz v. United States (1935)) that were consolidated before the Supreme Court. Ultimately the Court upheld the constitutionality of the resolution abrogating the gold clauses. The long process to resolve gold's legal standing may have extended the public's expectations of further devaluations.

The nominal value of all securities bearing gold clauses was substantial. Green (1986) reports that over $100 billion Liberty bonds issued during World War I contained gold clauses while Macaulay (1938) and Friedman and Schwartz (1963, p. 468) report that nearly all long-term corporate debt also contained such clauses. The abrogation of gold clauses transferred wealth from creditors to debtors, and the confiscation of gold transferred wealth from the holders of Federal Reserve notes to the United States Treasury. These explicit wealth transfers, however, did not entirely account for the loss of reputation incurred by violating the gold standard.

Researchers have found that the fear that a government would not honor its commitment to redeem its currency for gold at its statutory defined rate raised the interest costs its citizens paid for access to international capital markets. Bordo and Rockoff (1996, p. 1) argue that prior to strong central bank intervention in capital and money markets, the gold standard facilitated international access to European capital markets by removing the currency risk (the loss of

[9] See Christainsen (1988), Knox (1900), Nussbaum (1939) and Sumner (1896) for additional general discussions of these cases

purchasing power) associated with national monetary units. They found that during the period from 1870 to 1914 capital markets attached significant weight to gold standard adherence. Governments with long-term commitments to the gold standard had lower long-term bond yields than countries that had mixed records of adherence. Obstfeld and Taylor (2003, pp. 260-265) found that gold standard adherence signaled credibility and reduced the lending – borrowing spread by 30 to 60 basis points.

The limitation of the theory that loss of wealth from devaluation caused a decrease in consumption, which in turn lowered aggregate demand, is that devaluation simultaneously increased the wealth of debtors and lowered it for creditors. However, if it were the case that the marginal propensity to consume was higher with debtors than with creditors, then devaluation may have increased nominal consumption. In this case domestic debtors would have increased their consumption more than domestic creditors decreased theirs.

2.5 Empirical tests of the depressive view

The empirical work on the depressive view is limited to the works of Bordo – Rockoff (1996) and Obstfeld – Taylor (2003). These authors compare changes in the interest rates of countries that devalue with the interest rates in countries that maintain their commitment to the gold standard. Using panel data, these studies define the penalty as the change in the spread between the yield on individual countries' long-term bonds and the yield on British consol bonds that arises once gold standard adherence is violated. Both studies found that devaluation carries a penalty in the form of higher interest rates. The researchers estimate this model as follows:

$$SPREAD_{it} = \alpha_i + \beta_i SPREAD_{W,t} + \gamma X_{it} + u_{it} . \qquad (2.4)$$

In equation (2.4) $SPREAD_{i,t}$ is the difference between the annual yield on British consol bonds and the return on long-term government debt for a particular country; $SPREAD_{W,t}$ is the difference between a GDP-weighted average world yield on long-term debt and the yield on British consol bonds, α_i are regression constants, u_{it} are stochastic error terms, and $X_{i,t}$ are explanatory variables.

The Bordo and Rockoff (1996) study uses annual data for nine countries for the period from 1870 to 1914. The authors group the countries into four groups: Australia and Canada which were always on the gold standard during the period; the United States and Italy which went off gold but returned at parity; Spain and Portugal that were on gold prior to 1870 but were not on gold during the sample period; Argentina, Brazil, and Chile which were intermittently on gold but at altered parities. In this study $X_{i,t}$ consists of a dummy variable for gold standard adherence for country (*i*) at time (*t*), a second variable that is the net of the money growth rate less the growth rate of GNP, and a third variable that is the national government deficit divided by nominal GNP. The authors claim that the estimated beta is analogous to the beta in the CAPM; hence countries with high estimated betas exhibited more risk than countries with low betas.

Bordo and Rockoff note two problems with estimating separate equations for each country. First, some countries were always on gold and some countries were always off gold. Hence, if the authors were to include both sets of countries the dummy variables for each would appear to be no different than the constant term for those countries. Second, they hypothesize that there may be some cross-correlation of interest rates among countries and serial correlation of individual interest rates. To overcome this potential problem, they employ a seemingly-

unrelated-regressions (SUR) model which pools data for a number of countries, includes one lag of the interest rate for country *i*, and includes the current observation of the interest rate for the other country. They applied the SUR model separately to samples of only gold bonds from seven countries and to samples of only paper bonds from five countries. Two sets of regressions were run for each model. In the first set $X_{i,t}$ only included a dummy variable for gold standard adherence. In the second set, $X_{i,t}$ includes a dummy for gold standard adherence, a second variable that is the net of the money growth rate less the growth rate of GNP, and a third variable that is the national government deficit divided by nominal GNP. The principal finding of this study is that Argentina and Brazil had betas greater than 1.4, Spain and Portugal had three betas greater than 1.22 and one equal to 0.49, the United States and Italy had betas approximately equal to 1.0, and Canada and Australia had betas less than 0.75. The conclusion the authors draw is that countries with gold standard adherence experience less variation in their deviation from the British consol rate than countries with inconsistent adherence; hence gold standard adherence made investing in a country less risky. With respect to the significance of the gold dummy variable Bordo and Rockoff (1996, p. 413) write: "Indeed, if we were to single out one number to represent our findings with respect to the significance of the gold-adherence dummy it would be 40 basis points…. In other words, all other things equal, the rate on the gold bond would be 40 basis points lower if the country were on the gold standards."

In the Obstfeld and Taylor (2003) there are two periods under consideration: the 1870 – 1914 prewar period, and the interwar period from 1925 – 1931. In their study, $X_{i,t}$ consists of a dummy variable for gold standard adherence, the lagged debt ratio, the lagged inflation rate, and "possibly other control variables" (Obstfeld and Taylor, 2003, p. 250). Obstfeld and Taylor, like Bordo and Rockoff, also allow for possible autoregressive parameters in each member of the

panel. The principal findings of these papers is that bond yields of countries that adhered to the gold standard had smaller deviations from British consol bond yields than countries that did not adhere to the gold standard. Obstfeld and Taylor (2003, p. 253) also find that gold standard adherence reduced borrowing costs between 30 and 40 basis points during the prewar period, and 45 basis points during the interwar period (p. 260). Variations on their base model generate other penalties for violating gold standard commitments from 14 to 165 basis points (p. 254).

One main limitation of the Bordo and Rockoff and the Obstfeld and Taylor studies is that by using a dummy variable for gold standard adherence the researchers treat all devaluations, regardless of magnitude, as equal events. This limitation excludes the possibility that a country may have had a substantially different experience based on the magnitude of that country's devaluation. For instance, Canada devalued its dollar half as much as Britain devalued its pound. By doing so, Canada positioned itself between Britain and the United States. Friedman and Schwartz (1963, p. 362) comment, "In the countries that remained on the gold standard or, like Canada, that went only part way with Britain, the depression dragged on." Marcus (1973, p. 192) noted about the Canadian experience, "Despite the depreciation against the United States, exports and industrial production plunged downward after September 1931 – exports with a lag – and recovered after April 1932, only to suffer a relapse in the second half of the year and the first months of 1933." The implication of Friedman and Schwartz' and Marcus' comments is that the *magnitude* of devaluation may matter. If it is possible that the Canadian experience depended on the magnitude of devaluation, then it is possible that the United States may have had a different experience than the other countries in the Bordo – Rockoff (1996) and Obstfeld – Taylor (2003) studies.

A second problem with the Bordo – Rockoff (1996) and the Obstfeld – Taylor (2003) studies is that neither study distinguishes countries based on the size of their economies. Consequently, the authors do not consider the possibility that small countries may have been more reliant on foreign sources of finance and hence suffered greater variation in their interest rates than large countries. Small country devaluations were more common than large country devaluations and therefore it may be misleading to suggest that a large country, such as the United States, would experience the same penalty as a small country.

A third problem with the Bordo – Rockoff (1996) and Obstfeld – Taylor (2003) studies is that they cannot determine whether interest rates rise because pessimistic savers remove their funds from financial institutions, or because interest rates rise owing to optimistic investors increasing the demand for loanable funds, as is suggested by Temin and Wigmore (1990). The studies also do not account for devaluation expectations. Hence, if devaluation expectations substantially affected interest rates prior to devaluation, the studies will not accurately account for the total effect of devaluation.

Lastly, the Bordo and Rockoff study does not account for inflation, except imperfectly, by including the net of the money growth rate less the real GNP growth rate. The Obstfeld and Taylor study presumes that lagged inflation accounts for anticipated inflation even though the two may not be correlated.

2.6 The general problem with the panel study method to answer the questions posed by the dissertation

The empirical works evaluating the effects of devaluation during the Depression employed panel data. Panel studies as used by Choudhri and Kouchin (1980), Eichengreen and

Sachs (1985), Bernanke and James (1991), Bernanke (1995), Bordo and Rockoff (1996), and Obstfeld and Taylor (2003) assume that out of the experiences of many nations comes the norm. However, the inferences drawn from these studies may not apply to the United States if the United States was an exceptional case. Eichengreen (1992, pp. 264 – 285) notes that the bank failure of Credit-Anstalt in Austria in 1931 causes the collapse of the pyramided system of foreign currency reserves. The banking crisis in the United States in late 1932 and early 1933, in contrast, had "complex political roots" (Kindleberger, 1973, p. 197). Kindleberger (1973, p. 197) suggests Hoover may have sparked the speculative attack in December 1932 by calling on the President-elect "to commit himself to stabilizing currencies and forswearing funny money." Kindleberger further writes "Whether markets reacted to the inflationary suggestions or to Hoover's calling them to national attention is not self-evident, but bank failures spread in the Middle West in December, and more widely in January." Bordo, Choudhri, and Schwartz (2002, pp. 6 and 9), on the other hand, ascribe the panic to speculation that the United States would devalue the currency and not to any shortage of gold reserves at the Fed.[10] If it is true that the panic that followed the election was inspired by statements by politicians, and not out of any economic exigency, and if it is correct that the Fed had sufficient reserves to engage in expansive monetary policy provided the Board of Governors was willing to suspend its reserve requirement, then it is possible to conclude that the United States' devaluation was unusual because it was a matter of policy choice.[11] In this case, analyzing the effect the United States'

[10] Eichengreen (1992, p. 323) is one of the few voices declaring that the banking panic of 1933 was the result of the cumulative effects of the Depression.

[11] There is some debate about this point. Eichengreen (1992, p. 295) suggests that the Fed did not engage in expansionary monetary policy because it feared losing reserves necessary for redeeming its notes. Eichengreen (p. 296) later states that "Assuming no change in the demand for money, $2 billion of open market purchases would have led to $2 billion of reserve losses and force the United States off the gold standard." Alternatively Bordo, Choudhri and Schwartz (2002) conclude that the panic need not have forced devaluation: "The United States had the largest economy in the world, held massive gold reserves, and hence was not constrained from using expansionary policy to offset banking panics" (p. 24).

devaluation had in 1933 – 1934 may not be well explained by panel data derived primarily from European and South American nations.

How one views the origins of the panic of 1933 affects the interpretation of the Bank Holiday in March 1933. For those who believe that the panic was the result of the Depression, the Bank Holiday may signal what Temin and Wigmore (1990, p. 501) refer to as the "turning point" of the Depression. If this interpretation is correct, the United States' decision to devalue should show that devaluation led to an increase in industrial production, as observed in the panel studies for other countries. However, if the panic of 1933 was unlike the crises that earlier spread through Europe, then the chosen policies, to close banks temporarily and allow the dollar to float through January 31, 1934, could have produced different effects on industrial production than those observed by the panel studies cited perviously. The panel data studies, which account for neither the economic size of countries nor the magnitudes of their devaluations, would statistically swamp the United States' experience by including numerous small countries whose devaluations arose from inadequate reserves and not as a matter of policy as it seems to have occurred in the United States.

The same problem in interpretation could arise with respect to interest rates. Countries forced to devalue their currencies because of inadequate reserves may have incurred lasting market penalties associated with elevated risks of future devaluation. If the United States' third banking panic originated solely with statements by politicians, the United States may have escaped lasting market penalties that other countries experienced with devaluation simply because the public could have believed that the policy choice had been made and no further devaluation would be implemented. Such a belief would have been, in retrospect, rational because the United States' large gold reserves would have made further devaluations

unnecessary, at least for the next three and a half decades. Again, the response of United States' interest rates to devaluation may not be captured in a panel study.

The termination of the United States' devaluation provides further evidence of the potentially different nature of that devaluation. The nominal exchange rate was near its final legal redefinition approximately two months before the new definition took effect. Given that the President had the authority to set the new value of the dollar, it appears that market forces largely determined the dollar's legal redefinition. Had the redefinition of the dollar occurred six months later, the market (and legal) exchange rates could have been substantially different. This, however, was not a common method for redefining and setting the value of currencies by devaluing nations. Again, a panel study approach to answer the questions posed by this dissertation may generate misleading results.

Panel studies also have a technical limitation in that they do not allow for simultaneous relationships whereby changes in one endogenous variable immediately affect other endogenous variables, or for past innovations of the endogenous variable to affect its future values. Eichengreen and Sachs' (1985, p. 228), for example, treat the nominal exchange rate as an exogenous variable, claiming this approach is justified on several grounds:

> First is a matter of timing. In all cases, devaluation preceded the beginning of the recovery, judged on the basis of annual data. Second is a matter of logic. It is hard to make the case for reverse causation, that faster growing countries were pushed into devaluation. Indeed, we will demonstrate that the faster growing countries were absorbing, not losing, gold, so that it would be tricky indeed to make the case that fast growth forced countries off their gold parities. Third is a matter of history. Exchange rates in the 1930s depended not merely on economic pressures but on national attitudes towards the monetary standard, where the attitudes towards the standard were predetermined relative to the events of the early 1930s.

Although these arguments may after all be valid, the VAR approach renders them unnecessary.

CHAPTER THREE

EMPIRICAL MODEL AND ESTIMATES

3.1 Reason for using the VAR method to determine the effects of devaluation and its anticipation on real output and real interest rates

I have chosen to use an unrestricted VAR to estimate the effects of the United States' devaluation and its anticipation, changes in the M1 money supply, and changes in the federal deficit, on the time paths of the United States' output, British employment (as a scale variable for British economic activity, and both countries' real interest rates. This method has the advantage of treating all endogenous variables symmetrically, allowing each to contemporaneously affect the others. The VAR, for this reason, is better at capturing the dynamics and persistence of shocks to the economic system than panel data. In using a VAR, I can generate impulse response functions that show changes in the time paths of United States output, British employment, and both countries' interest rates in response to economic shocks.

3.2 Choice of variables

I will estimate a VAR with nine endogenous variables: United States' industrial production, British employment measured as the sum of the number of persons employed in the British producers' durable goods trade, the number of persons employed in the British consumers' durable good trade, and the number of persons employed in the British consumers' non-durable trade, both countries' price levels, interest rates, and M1 money supplies, and the real dollar – pound exchange rate. I include British data to account for world trends that may influence United States' variables. The real exchange rate, in particular, is influenced by events

in Britain. I include each country's M1 money supply to account for the degree to which the Fed and the Bank of England sterilize their respective devaluations. I include the federal deficit as an exogenous variable under the assumption that it is a policy choice variable. I include three dummy variables: the first represents the period from January 1933 through March 1933 for which it is likely that devaluation expectations were heightened; the second represents the unofficial period of devaluation from April 1933 through January 1934 during which time the dollar was not redeemable for gold and floated against other currencies; the third takes a value of one during the first and second banking crises in the United States to account for the loss of confidence in the banking system. Lastly, I include the dollar price of gold that takes a value of 20.67 for all periods prior to February 1934 and 35 thereafter. The dollar price of gold is the magnitude of devaluation.

I assume, for estimation purposes, that the relationships among the variables in *z* are linear and that contemporary values of the variables depend, in part, on their own past variables. I assume that the VAR can be estimated using the following standard reduced form model:

$$z_t = A_0 + A_1(L)z_{t-1} + Hx_t + e_t . \tag{3.1}$$

In equation 3.1, $z_t = \begin{pmatrix} Y_t \\ Y_t^* \\ M1_t \\ M1_t^* \\ i_t \\ i_t^* \\ P_t \\ P_t^* \\ \theta_t \end{pmatrix}$ which are period *t* observations of output in the United States (*Y*), British employment (Y_t^*), United States' nominal M1 money supply ($M1_t$), British nominal M1 money supply ($M1_t^*$), United States' nominal interest rate (i_t), British nominal interest rate (i_t^*), United States price level (P_t), British price level (P_t^*), and the real exchange rate (θ_t), A_0 is a

vector of constants, $A_1(L) = A_1L + A_2L^2 + ... + A_PL^P$, L is the lag operator, p is the optimum number of lags, H is a matrix of coefficients, x_t is a vector of exogenous variables that contains the following: DE_t, which is the dummy variable representing the period for which devaluation expectations in the United States were heightened; FL_t which is the dummy variable representing the period the dollar was not redeemable for gold and floated against currencies; POG_t which is the dollar price of gold; FD_t, which is the nominal U.S. federal deficit; and CON_t, which is the dummy variable representing the periods of the United States first and second banking crises. Lastly, e_t is a vector of reduced form stochastic shocks.

A vector autoregression (VAR) estimation of equation (3.1) generates the standard impulse-response function (IRF) equal to $(1 - A_1(L))^{-1} \cdot e_t$, and also generates the responses of the endogenous variables to changes in the exogenous variables, which is calculated as follows:

$$D = (1 - A_1(L))^{-1} \cdot H \,. \tag{3.2}$$

From the nominal interest rate and price level impulse response functions I am able to generate the real interest rate response function. I calculate inflation expectations following an approach used by Lastrapes and McMillin (2004, p. 900). They calculate expected inflation as a moving average expected change in time path of the price level in response to a shock:

$$\frac{\partial \pi_{h,t+k}}{\partial e_{j,t}} = \left(\frac{1}{h}\right) \cdot \left(\frac{\partial P_{t+k+h}}{\partial e_{j,t}} - \frac{\partial P_{t+k}}{\partial e_{j,t}}\right). \tag{3.3}$$

In equation 3.3, $\pi_{h,t+k}$ is the h period forecast of inflation and is set to the same length of time as the maturity of the underlying security, in this case three months. The forecast occurs at time $t + k$ period for h periods into the future in response to the reduced form shock $e_{i,t}$ at time t. Here j

represents the particular type of shock: the expectation of devaluation, the float of the dollar, the official change in the dollar price of gold, changes in the money supply and changes in the exogenous federal deficit. If the public forms its expectations from the VAR, equation 3.3 shows how the public will revise its inflation expectations in light of these shocks. The calculation of the public's inflation expectation in response to monetary and federal deficits shocks, during the period the dollar floated, is scaled by the accumulated change in the M1 money supply and federal deficit for the entire period. The expected inflation will be subtracted (element by element) from the nominal interest rate response to the same shock $\left(\frac{\partial i_{j,t}}{\partial e_{j,t}}\right)$ to yield the real interest rate response to that shock.

3.3 How the VAR will answer the questions posed in Chapter One

The first question posed in Chapter One is "How did devaluation of the dollar affect U.S. output and real interest rates?" Eichengreen and Sachs (1985, p. 224) contend that a sterilized devaluation will raise output and lower interest rates, and that an unsterilized devaluation will raise output but have an ambiguous effect on interest rates. Therefore, if the impulse response function of real output to devaluation shows an immediate and permanent increase, this would be evidence in support of Eichengreen and Sachs' contention, that devaluation would help recovery from the Depression, regardless of how the real interest rate responds. These results would also be consistent with Temin and Wigmore's (1990, pp. 486 – 87) optimistic investor theory that holds that output should have some long-term gain as a result of devaluation.

If, on the other hand, the impulse response function of real output to devaluation shows an immediate and permanent decrease in real output in response to devaluation, and if the real interest rate shows an immediate and permanent increase in response to devaluation, this would be evidence in support of Bordo and Kydland's (1996, p. 87) view that the gold standard

conferred benefits on an economy, and that violating the commitment makes a country worse off. Rising real interest rates would provide evidence of the public's perceived increase in country risk as is described by Nagy (1979), Baer (1984), Bird (1986), Ciarrapico (1992), Del Castillo (1992), Eaton et al. (1986), and Saini et al. (1984). This would also be consistent with Klein's (1975a, 1975b, 1978) theory that devaluation would increase real interest rates, assuming borrowers and lenders formulate identical inflation expectations. A decrease in output would also be consistent with Palyi's (1972) theory that merchants would withhold trade in anticipation of higher prices, and that consumption should decline in anticipation of wealth losses. Lastly, a decrease in output would be consistent with Obstfeld's (1997, pp. 69 – 70) theory that labor would withhold its services in anticipation of higher nominal wages.

The second question posed in Chapter One is "How did expectations of that devaluation affect U.S. real output and real interest rates?" Temin and Wigmore's (1990) optimistic investor theory suggests that the VAR should produce dynamic multipliers showing both real output and the real interest rate rising in response to devaluation expectation. Calvo's (1986) theory suggests that the dynamic multipliers should show that both real output, and the real interest rate, increase in response both to devaluation expectations and to the float of the dollar because the representative family seeks to spend off excess monetary balance. Calvo's theory would further hold that the official change in the dollar price of gold should cause both output and the real interest rate to decrease because the representative family increases its savings to pay for the previous period's consumption. Klein's (1975a, 1975b, 1978) theory holds the anticipation of devaluation should raise real interest rates because the expectation of devaluation increases financial uncertainty. Klein's theory, therefore, suggests that the dynamic multipliers should

show a decrease in real output and an increase in the real interest rate in response to devaluation expectations.

The third question of Chapter One is "How did devaluation of the dollar affect *British* output and real interest rates?" If the impulse response function shows a decrease in British real output in response to the United States' devaluation, this is evidence in favor of the "beggar – thy – neighbor" quality of devaluation. If devaluation improves the domestic economy but harms the foreign economy, it provides support for Eichengreen's (1992, p.393), and Eichengreen and Sachs (1985, p. 235) contention that devaluation should have been coordinated. On the other hand, an impulse response function that shows British output increasing in response to devaluation and its anticipation supports Palyi's (1972) contention that foreign merchants would sell their goods prior to devaluation in the domestic market to beat the price decrease.

If devaluation and its anticipation produce decreasing British real interest rates, this would support Bordo and Kydland's (1996, p. 87) notion that the gold standard reduced financial uncertainty. The implication is that a country, maintaining its gold standard, could benefit from capital flight arising from the expectation that another country will devalue its currency. Rising interest rates, on the other hand, would provide some evidence in favor of the "beggar – thy – neighbor" quality of devaluation. Rising interest rates may reflect a decrease in the supply of loanable funds owing to a current accounts deficit that is precipitated by a shift in the terms of trade against the non-devaluing country.

The fourth question posed in Chapter One is "How important were the consequences of devaluation compared to those of devaluation-independent changes in the U.S. money stock and to changes in the federal deficit?" The VAR will generate impulse response functions and dynamic multipliers for the effects of devaluation, changes in the M1 money supply, and changes

in federal deficit as is describe in section 3.2. Similarly, the response of the real interest rate to changes in the M1 money supply and the federal deficit can be calculated by subtracting expected inflation that arises from the change in the M1 money supply and federal deficit from the appropriate nominal interest rate response function. Here, I use equation 3.1 to create the respective expected inflation rates that arise from monetary and federal deficit changes.

The purpose of comparing the effects of devaluation and its anticipation on real output and the real interest rate with the effects changes in the money supply and federal deficit had on real output and the real interest rate is to assess whether the combined monetary, fiscal, and devaluation policies produced stimulating or depressing effects. This analysis only measures the policies undertaken and does not suggest further counterfactual analysis as to what the best policy combination would have been.

3.4 Description of the data

The data consist of seasonally-unadjusted monthly observations for the period of 1924:1 through 1936:12 and were chosen to be as similar as possible across the United States and the United Kingdom. Comparable sequences were found for the M1 money supply, the price level, and nominal interest rates. Most of the data come from the NBER macroeconomic history data set with the exception of the following: nominal exchange rates, which were taken from the *Wall Street Journal* using the recorded exchange rate on the first of the month or the soonest business day thereafter; United States M1 data, taken from Friedman and Schwartz (1963, Appendix A, Table A-1); the United Kingdom M1 data, constructed by adding Capie and Webber's, (1985, pp. 140 – 42 and 176 – 79) separate figures for currency held by the public (pp. 176 – 79) and demand deposits (pp. 140 – 42); and the British three-month (prime) bank bill rate which was

obtained from Capie and Webber (1985, pp. 516 – 18). The real dollar - pound exchange rate series was constructed by multiplying the nominal exchange rate series by a corresponding U.S. / U.K. price level ratio series. Appendix I provides a more detailed description of the data.

The proxy for United States' output is the index of industrial production, NBER series m01175. Because I could not obtain British output data I use the sum of three British employment series as a scale variable for British economic activity: the number of persons employed in the British producers' durable goods trade (NBER series m08135), the number of persons employed in the British consumers' durable goods trade (NBER series m08136), and the number of persons employed in the British consumers' non-durable goods trade (NBER series m08137). Note that because the scale variable for British economic activity is different from the proxy for United States' output, the proxies may differ in both magnitude and timing in their response to devaluation.

The interest rate sequence for the United States is constructed from two NBER series: M13029a and M13029b, both of which are labeled "U.S. Yields On Short-Term United States Securities, Three-Six Month Treasury Notes and Certificates, Three Month Treasury." Because these two series overlap, one must choose when to switch from one sequence to the next. For my base model, I combined the two sequences by dropping the first 47 observations from series M13029b so as to use all observations from series M13029a. I have designated this interest rate series A. I also created a second interest rate sequence by dropping the last 47 observations of the first sequence (M13029a) and including the first observation of the second sequence (M13029b). I have designated this interest rate sequence B. I compare the estimation results for both series in a section that reviews the robustness of my findings. I also, as a further test of

robustness, re-estimate each model after including a pulse dummy variable for the dates of the switch from one interest rate series to the other.

All of the above variables are treated as endogenous in the VAR model. The baseline model also includes seven exogenous variables: a constant, a time trend dummy variable, the United States federal deficit, the dollar price of gold, the dummy variables representing the presence of positive devaluation expectations, a dummy variable for the period the dollar floated on the foreign exchange market, and a dummy variable representing a lack of confidence in the banking system.

3.5 Assigning the dates for positive expectations of devaluation

Unlike the British decision to devalue the pound, the United States' decision to devalue the dollar was widely anticipated. However, there is no consensus as to when devaluation expectations first became widespread. I consider two likely dates: November 1932, which corresponds with President Roosevelt's election, and January 1933, which is the date Friedman and Schwartz (1963, pp. 324 and pp. 338 chart 33) give as the start of the third (and final) banking crisis of the Depression. The pattern of changes in the United States' M1 money supply make a good case for using the November 1932 start date for devaluation expectations. The pattern shows that the second banking crisis, which began in March 1931, was over by July 1932, long before the November 1932 election.[1] From July 1932, M1 grew until the November 1932 election at which time it begins a steady decline until the end of April 1933.[2] From May 1933 through January 1934, M1 fluctuates until devaluation is codified on February 1, 1934. In

[1] During this second banking crises (March 1931 - July 1932) M1 declines from $24,758 million to $20,152 million (see Friedman and Schwartz, 1963, p. 713.)

[2] M1 reaches its height in November 1932 at $20,555 million, and then it declines to $19,039 million in April 1933 (Ibid).

addition to the changes in M1, Kemmerer (1944, p. 123) points out that Roosevelt, in contrast with President Hoover, failed to take a strong stand for sound money. This bolsters the interpretation that the expectation of devaluation gained acceptance with Roosevelt's election.

Alternatively, there is an abundance of anecdotal evidence to collaborate the bank run with hints from the President-elect's staff that devaluation may be necessary. Eichengreen (1992, p. 327) points out that one of Roosevelt's advisors, George Warren, favored stabilizing dollar prices of commodities at higher prices if necessary. Eichengreen characterizes this proposal as tantamount to devaluation in the absence of "reflation" by other gold standard countries. Further, Eichengreen writes that senators from agricultural states, notably Connally of Texas, were pressing in early 1933 for a plan to reduce the gold content of the dollar and to issue "unbacked" currency sufficient to raise prices to their 1921 – 1928 levels. Kindleberger (1973, p. 197) points to a January 1933 letter from Hoover to Roosevelt, in which Hoover, on the recommendation of senators from the South and the West, notably Connally of Texas, encouraged the President – elect to take a strong stance against inflationary measures. Kindleberger claims that regardless of whether markets were reacting to the inflationists' calls for policy change, or whether Hoover's calling attention to the inflationary policies incited panic, bank failures spread. Owing to this evidence, I will use January 1933 as the start of devaluation expectations for my base model and the November 1932 date as a test of robustness.

The VAR estimates are aimed solely at assessing *overall* (that is, equilibrium) effects of devaluation and devaluation expectations. No attempt is made to estimate behavioral relationships among the represented variables, or to construct a structural econometric model that is capable of yielding such estimates. For this reason, I do not attempt to test for unit roots or cointegrating vectors. Instead, I assume that these are likely to be present, and I proceed to

estimate the model in logged first-differences rather than levels for all endogenous variables except the interest rate series which are only differenced.

3.6 Degrees of freedom and lag length constraint

The study involves 155 (as opposed to $13 \cdot 12 = 156$) usable observations, owing to the differencing of the data. I constrain the model to 12 lags (estimating 113 parameters) so as to reserve no fewer than 30 degrees of freedom. Therefore, even though they may be unlikely to exist, this model will not capture long-term relationships that take more than a year to manifest themselves.

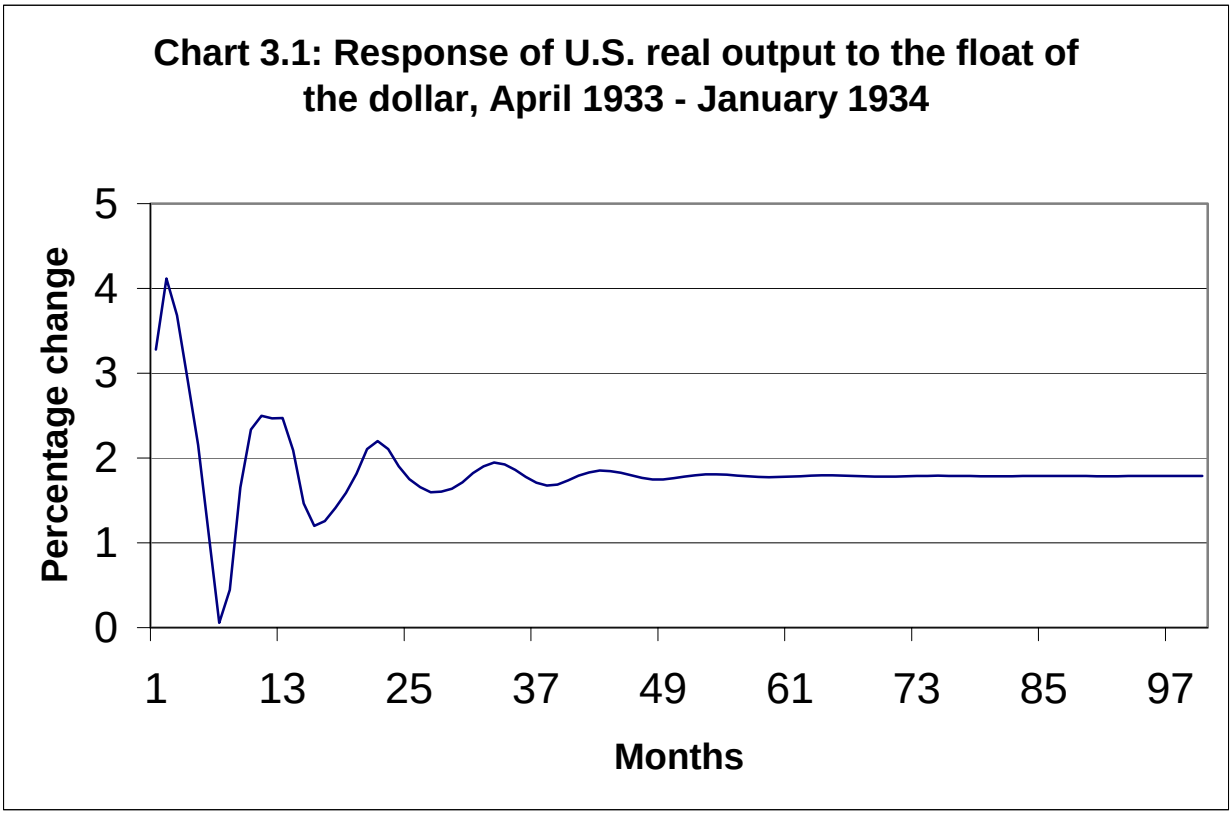
I have chosen for my base model to use interest rate A and *CF*1 for the capital flight portion of devaluation expectations that begin in January 1933. Visual inspection of the residuals from the estimation of the 12 lag base model VAR suggests that the residuals are independently and identically distributed (i.i.d.). To verify the visual inspection, I tested the residuals for serial correlation by calculating Ljung and Box modified Q-statistics for the correlation coefficients and compared them with critical values of the chi-squared distribution at the 95 percent level. The null hypothesis of serial correlation of the residuals could not be rejected for the estimated model with 12 lags. However, residuals from estimated models with lag lengths of two, six, eight and nine plus an exogenous 12^{th} lag appeared to be independently and identically distributed and had modified Q-statistics that allowed me to reject the null of serial correlation. The estimated model for lag length of eight lags had impulse-response functions (IRFs) that showed explosive roots and was discarded. I chose the model with six lags to be my baseline model because this model generates results that are representative of the other models tested.

3.7 Results and discussion

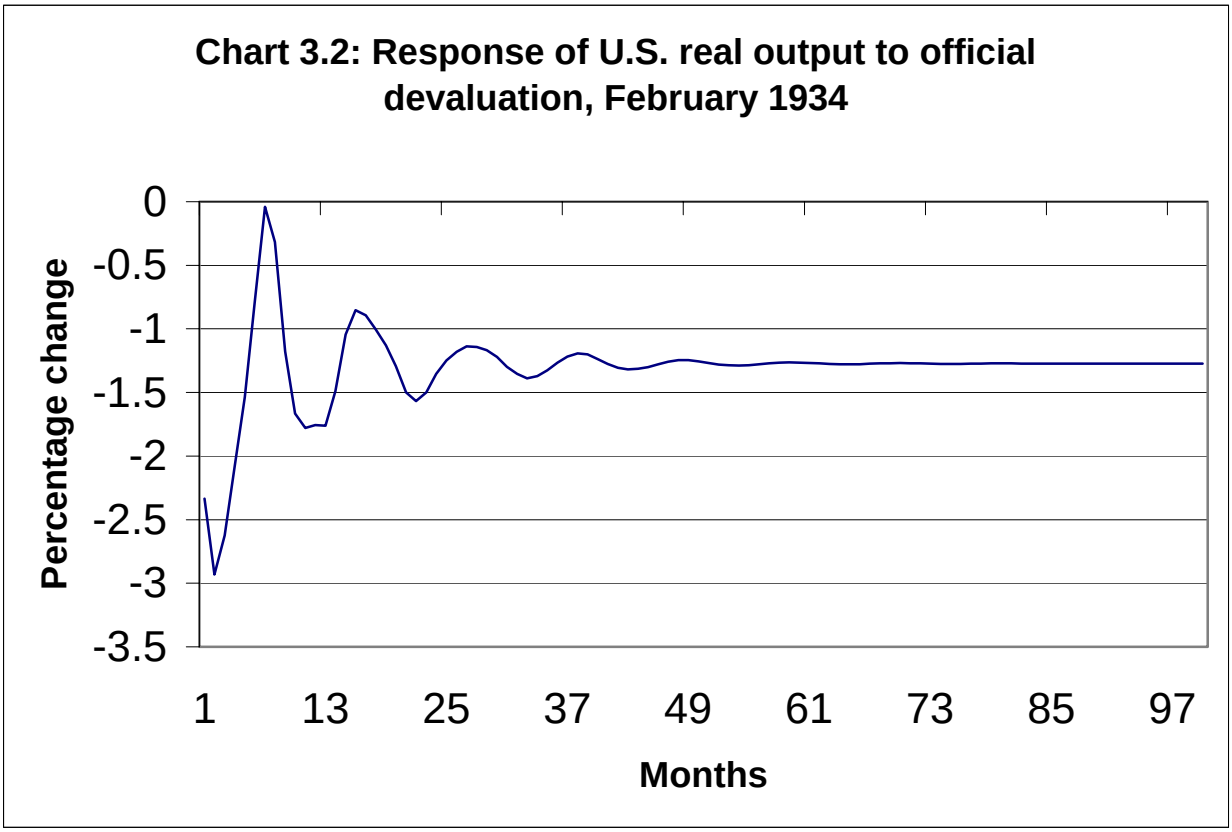
In the next sections I will answer the four questions I posed at the beginning of the dissertation. In answering these questions, I will evaluate the effects devaluation had on the United States' and British economy. I will also address the relative effects of fiscal and monetary policy, and the role of expectations on each economy.

3.7.1 How did devaluation of the dollar affect U.S. output and real interest rates?

Eichengreen and Sachs (1985, pp. 224 -226) claim that devaluation was a good policy option for a country to improve its economy unilaterally. Temin and Wigmore (1990, pp. 486 – 487) claim that devaluation will encourage businesses to undertake investment. The estimation of my base model provides some support for these claims. In my model, unofficial devaluation occurs with the float of the dollar and causes output to *increase* in the long-run by 1.78 percent, as shown in chart 3.1.

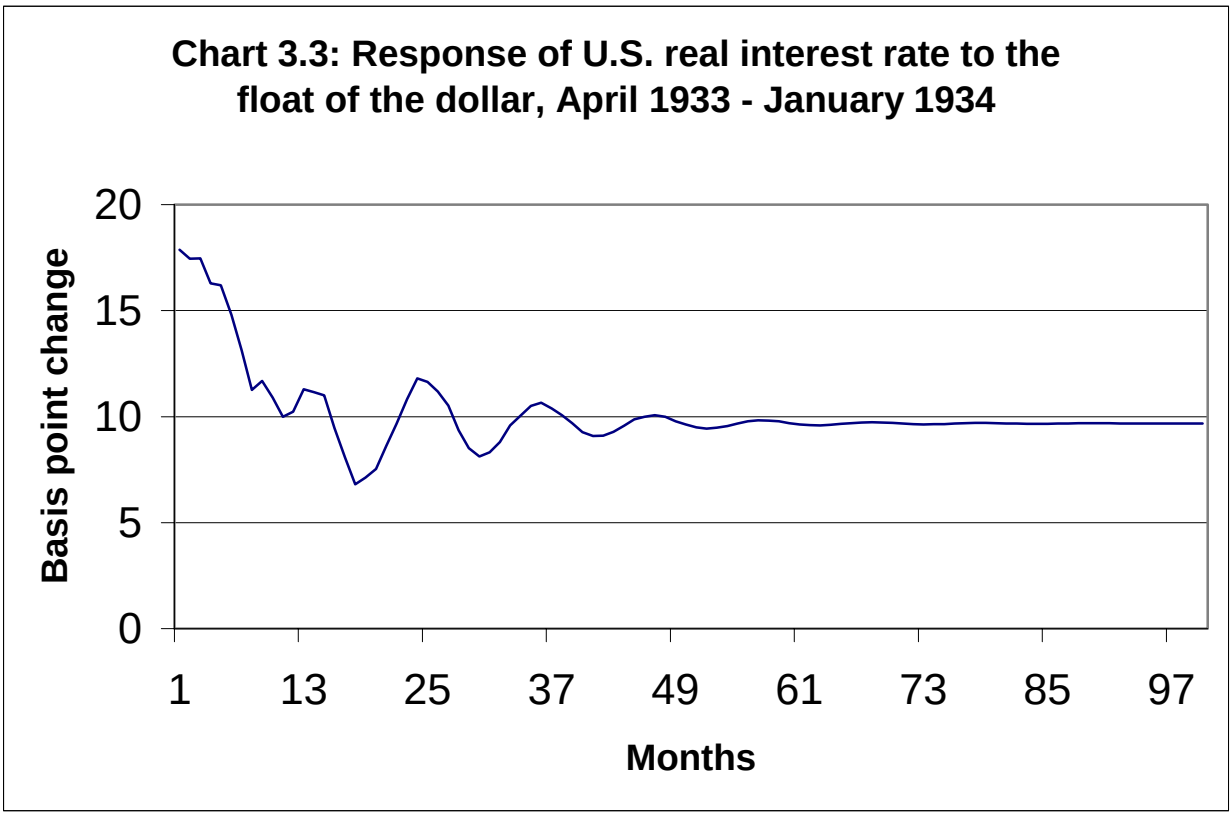


This result supports Temin and Wigmore's (1990, pp. 500) claim that devaluation was the turning point of the Depression, and Eichengreen and Sachs' contention that devaluation would stimulate output. Official devaluation, brought on by the change in the dollar price of gold on February 1, 1934, however, lowers output by 1.27 percent, as is shown in chart 3.2.



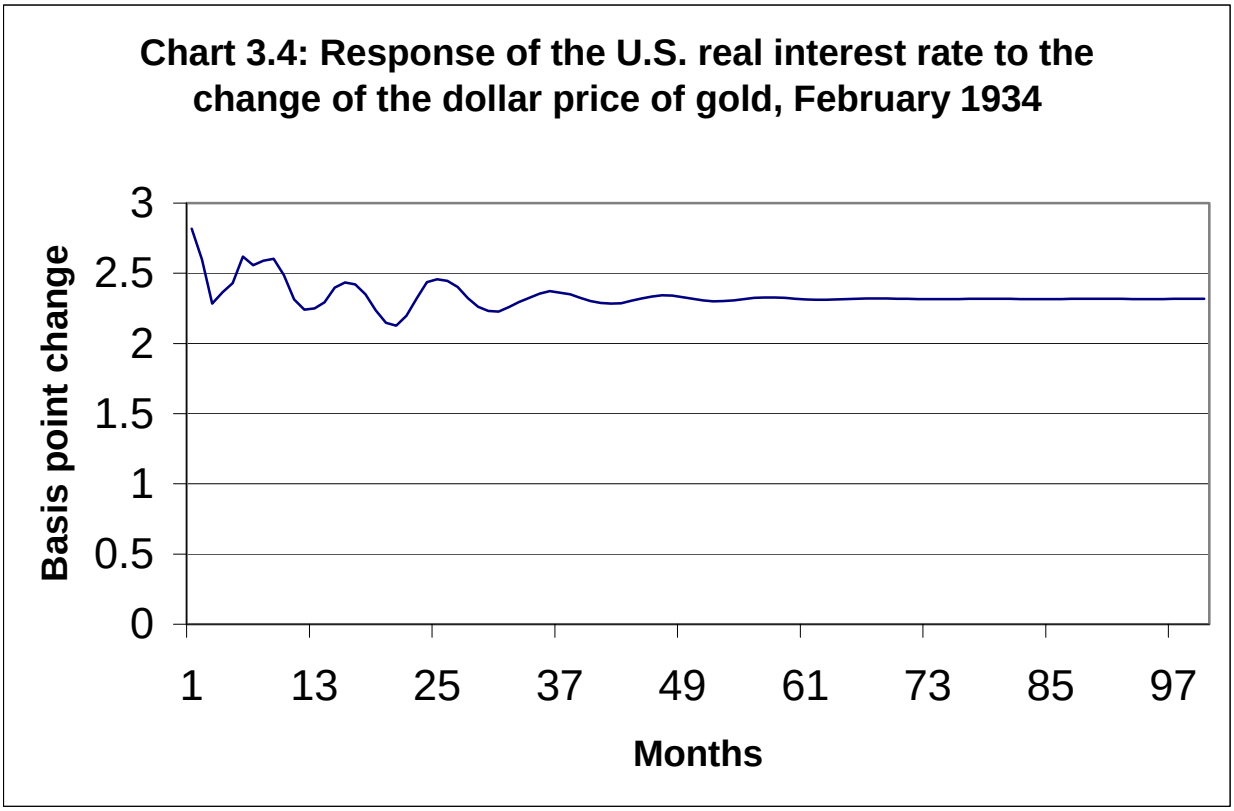
Although the model does not identify the factors that cause this lower level of output, my results are not consistent with Calvo's (1986, pp. 1323 – 1325) theory. He suggests that consumption will spike prior to devaluation and be permanently lower after devaluation. I observe Calvo's output and interest rate pattern, but, overall, output is permanently higher by 0.53 percent owing to the combined float and official devaluation effects.

The rise in output may be partly a result of increased investment. An increase in the demand for loanable funds could be responsible for the 9.7 basis point increase in the real interest rate, as is observed in Chart 3.3.



Higher interest rates, however, are consistent with markets imposing penalties on countries for violating their commitments to the gold standard. Bordo and Rockoff (1996, p. 413) find that violating the gold standard causes increased variability in returns on government debt. They suggest that their model is analogous to the CAPM model, and that therefore increased variability is a measure of risk. Under a risk – return relationship, such variability should raise real interest rates. These results are at odds with Eichengreen and Sachs' (1985, pp. 235) contention that devaluation would promote growth by "permitting the reduction of interest rates." My results are consistent with Bordo and Kydland's (1996, p. 87) claim that devaluation would discourage international lending owing to the risk of capital losses from devaluation. My results are also consistent with Klein's (1978, p. 443) claim that price level uncertainty raises

risk and therefore should raise real interest rates. Interestingly, official devaluation causes a very mild 2.3 basis point increase in the real interest rate, as is show in Chart 3.4.



Bordo and Rockoff (ibid) find that violating the gold standard raised real interest rates approximately 40 basis points. Obstfeld and Taylor (2003, pp. 253 and 260) find that violating the gold standard raised bond yields between 30 and 45 basis points. I observed these effects in my results but to a lesser degree. Overall, I find that the combined effects of the float of the dollar and the change in the dollar price of gold caused the real interest rate to increase by 12 basis points.

3.7.2 How did expectations of that devaluation affect U.S. output and real interest rates?

Calvo (1986, pp. 1323 – 1325) posits that the anticipation of devaluation would cause individuals to increase consumption to avoid capital losses on monetary holdings. If his theory is correct, the expectation of devaluation should produce an increase in real output and an increase in real interest rates. Observationally, this would be equivalent to changes in output and the real interest rate that would occur if Temin and Wigmore's (1990, pp. 486 – 487) optimistic investor theory were correct. My results support both Temin and Wigmore's and Calvo's hypothesis, as is illustrated in Chart 3.5.

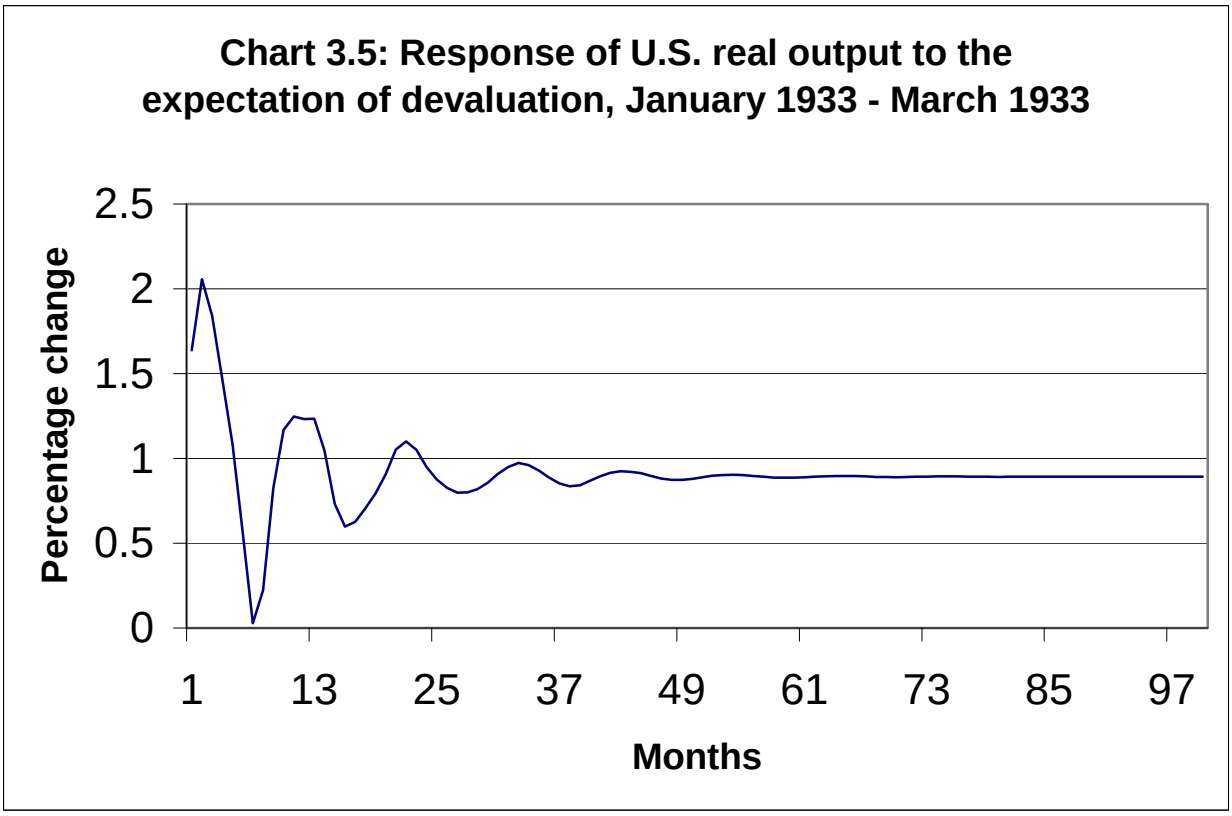
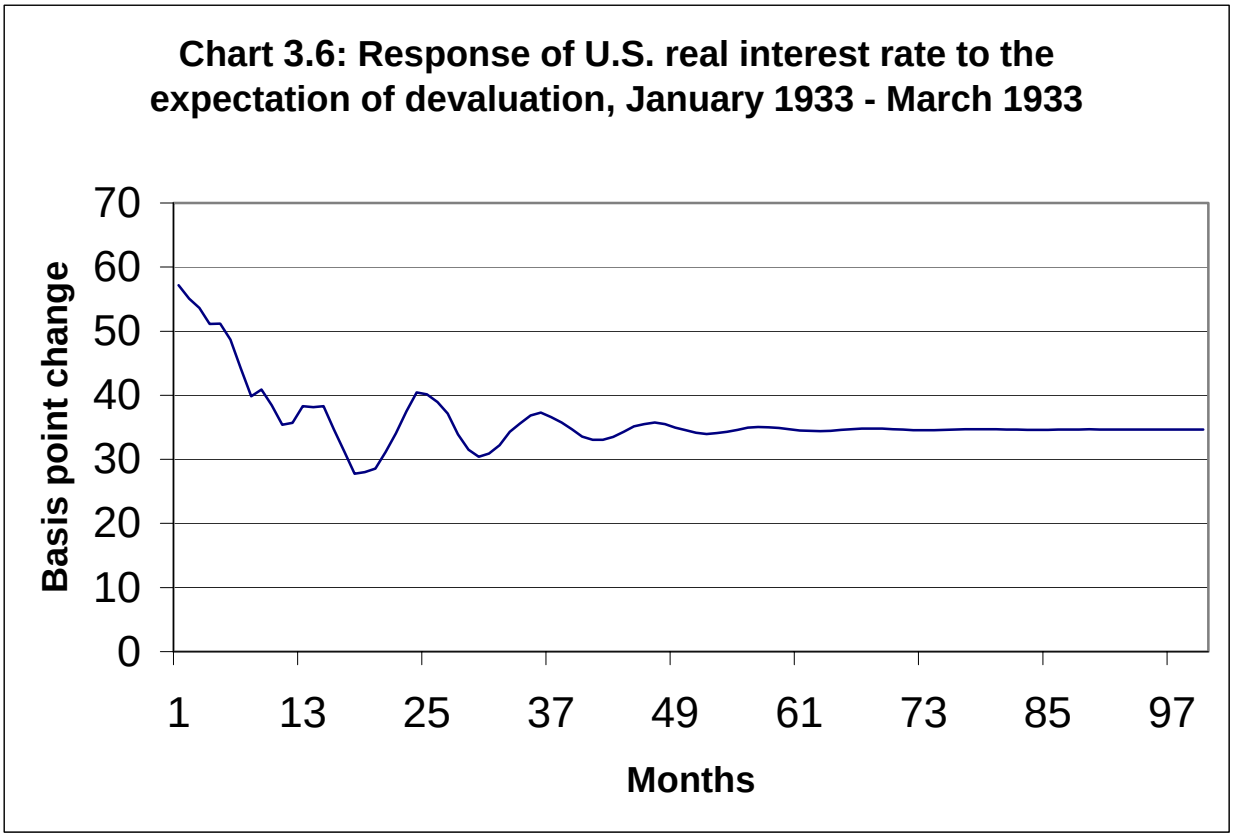


Chart 3.5 shows that real output rose approximately 0.89 percent in response to the expectation of devaluation. Combined with the effects on output from the float of the dollar and the official

change in the dollar price of gold, output increased by 1.42 percent for the entire episode. This result suggests that if merchants anticipated devaluation and withheld exports and increased imports, as is suggested by Palyi (1972), the negative effect of their actions would be more than offset by an increase in consumption and an increase in investment. Further, it doesn't appear that labor withheld any of its services, as Obstfeld (1997, pp. 69 – 70) suggests may have happened, which would not be surprising considering the high unemployment rate during the period.

Chart 3.6 shows that U.S. real interest rate increased approximately 34.6 basis points in anticipation of devaluation.



If one combines this result with the 9.7 basis point rise in response to the dollar's float and the 2.3 basis point rise in response to the change in the dollar price of gold, one finds that overall the U.S. real interest rate increased by 46.6 basis points which is approximately the increase Bordo and Rockoff (1996, p. 413) and Obstfeld and Taylor (2003, pp. 253, 260) find in their studies. This effect is consistent also with Temin and Wigmore's optimistic investor theory, Calvo's consumption smoothing theory, and the theories presented by Klein (1978), Nagy (1979), Bordo and Rockoff (1996), Obstfeld and Taylor (2003), and Bordo and Kydland's (1996) which claim that violating the gold standard would cause markets to require increased returns to compensate for price level uncertainty.

3.7.3 How did devaluation of the dollar affect *British* output and real interest rates?

The second part of Eichengreen and Sachs' theory is the "beggar – thy – neighbor" consequence of devaluation. Eichengreen and Sachs (1985, p. 238) could not present "a blanket endorsement of competitive devaluations of the 1930s" because they lower output in other countries. My results do not provide supporting evidence for their contention. The baseline model estimates that the float of the United States' dollar lowered British employment by 0.15 percent and that the official change in the dollar price of gold lowered British employment by 0.02 percent. However, the expectation of devaluation *raised* British employment by 1.09 percent. Therefore, the cumulative effect of the United States' decision to devalue, measured from the expectation through the official devaluation, raised British employment by 0.92 percent. These three effects are presented in Charts 3.7 through 3.9.

Chart 3.7: Response of British employment to the float of the dollar, April 1933 - January 1934

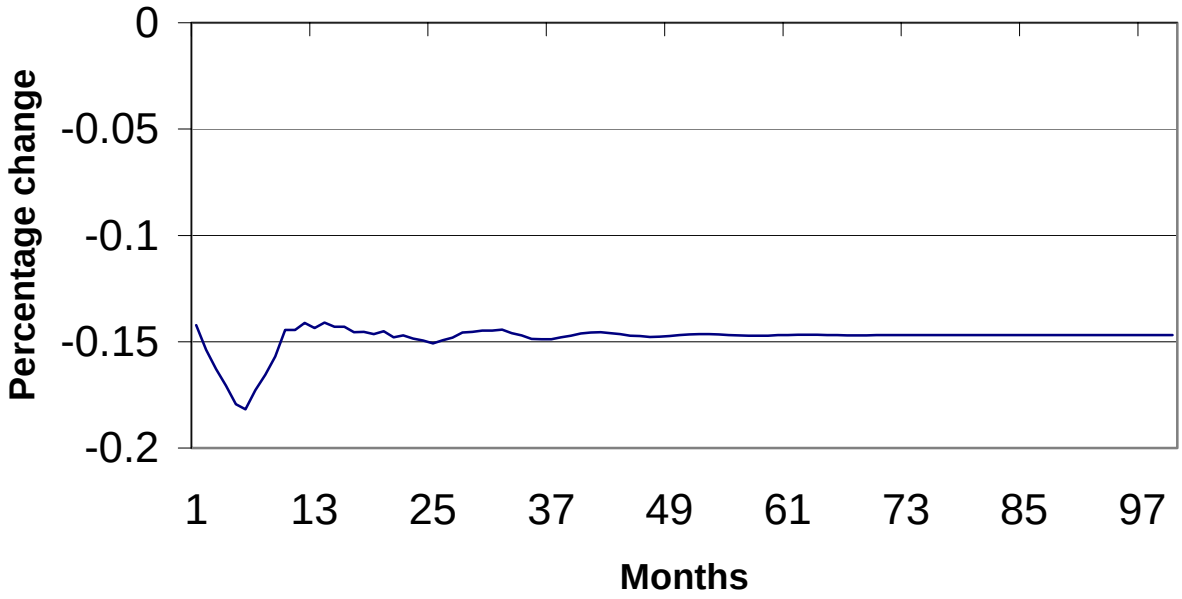
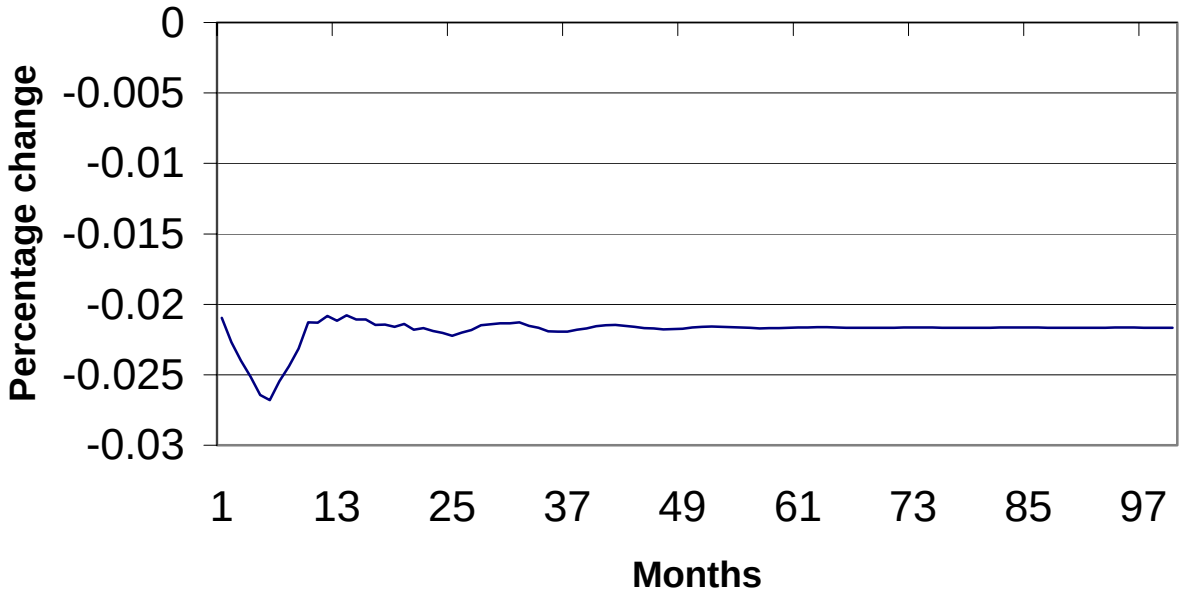
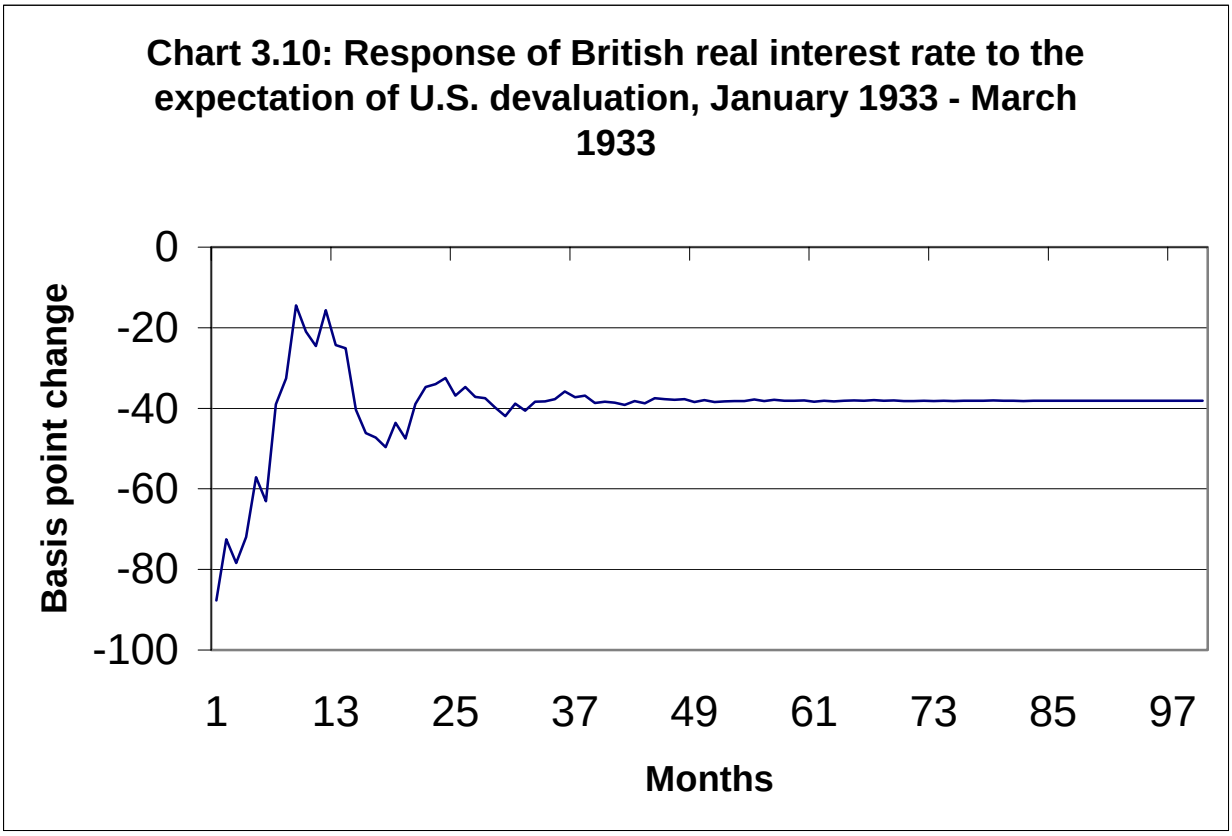


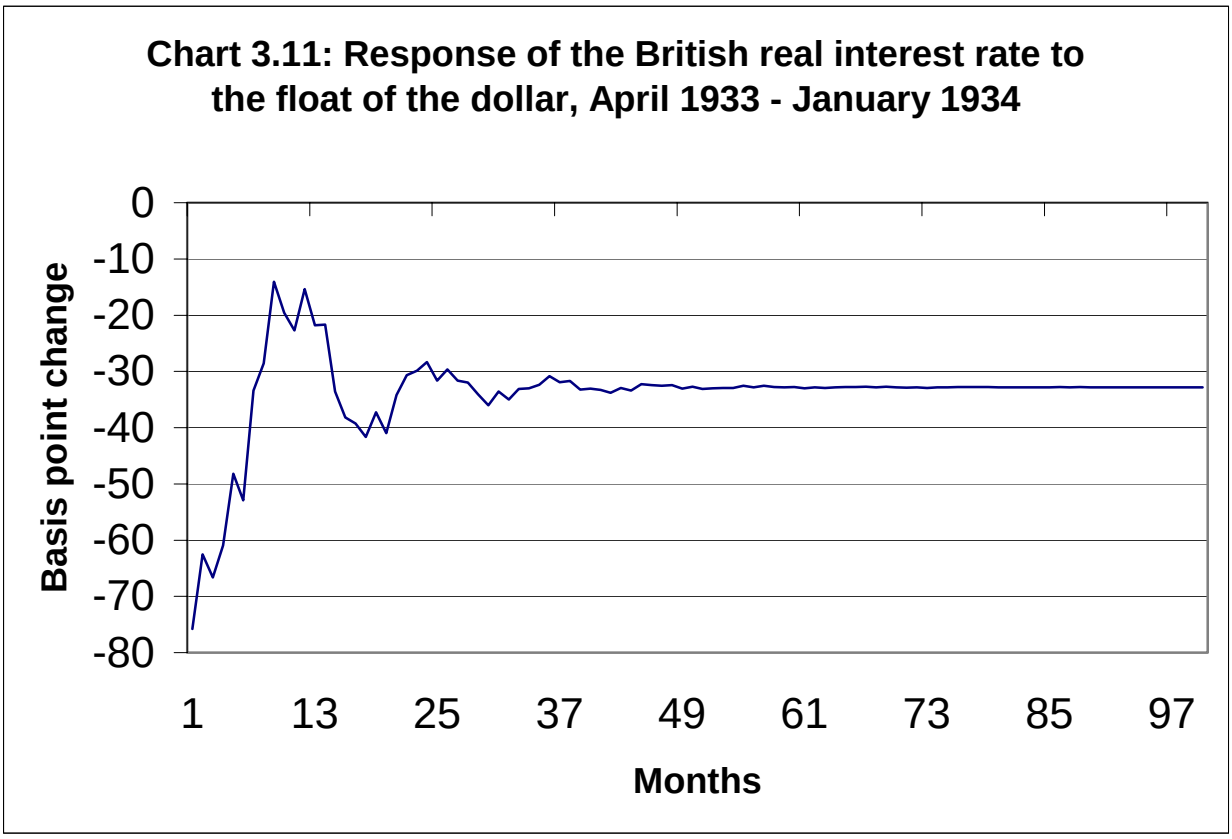
Chart 3.8: Response of British employment to the change in the dollar price of gold, February 1934



The explanation for the cumulative net increase in British employment may lie with capital flight from the United States. The expectation of devaluation caused the British real interest rate to *decline* by 35.6 basis points, as shown in Chart 3.10, while the expectation *increased* British output by 1.09 percent. The combination of these two changes indicates that the British are benefiting from more than just the U.S. public's attempt to beat the price increase associated with devaluation. It appears as if the British markets are also benefiting from increased financial resources.

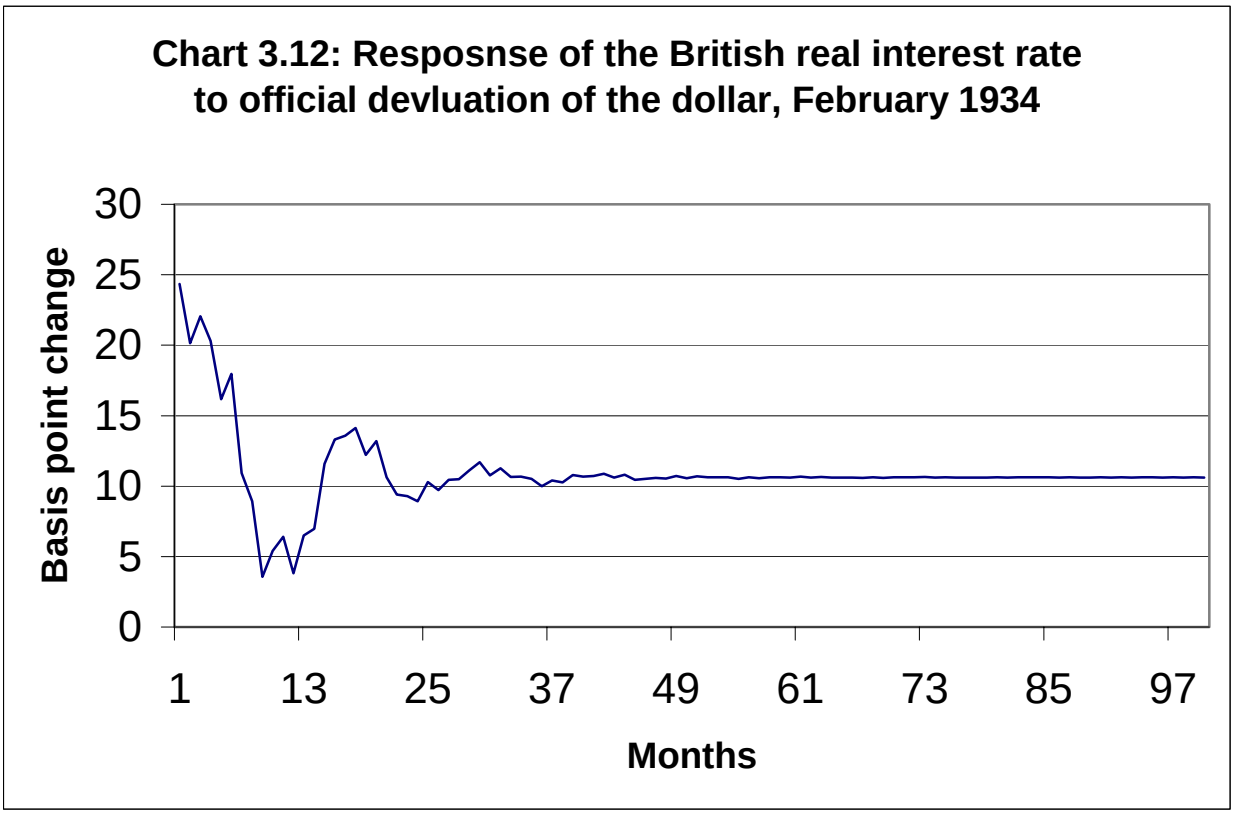


Further evidence of capital flight is found during the float of the dollar. While employment in Britain decreased during this period, the British real interest rate *declined* 32.8 basis points in response to the float of the dollar, as is shown in Chart 3.11.



Declining employment and falling real interest rates in response to the dollar's float, Charts 3.7 and 3.11, suggest that capital was fleeing the dollar rather than being attracted by an expanding British economy. These two results are consistent with Palyi's (1972) claim that merchants of a devaluing country would increase imports and withhold exports prior to devaluation. The results are also consistent with Calvo's (1986) utility maximizing consumption theory.

Lastly, as is shown in Chart 3.12, the official change in the dollar price of gold caused British real interest rates to rise by approximately 10.6 basis points.

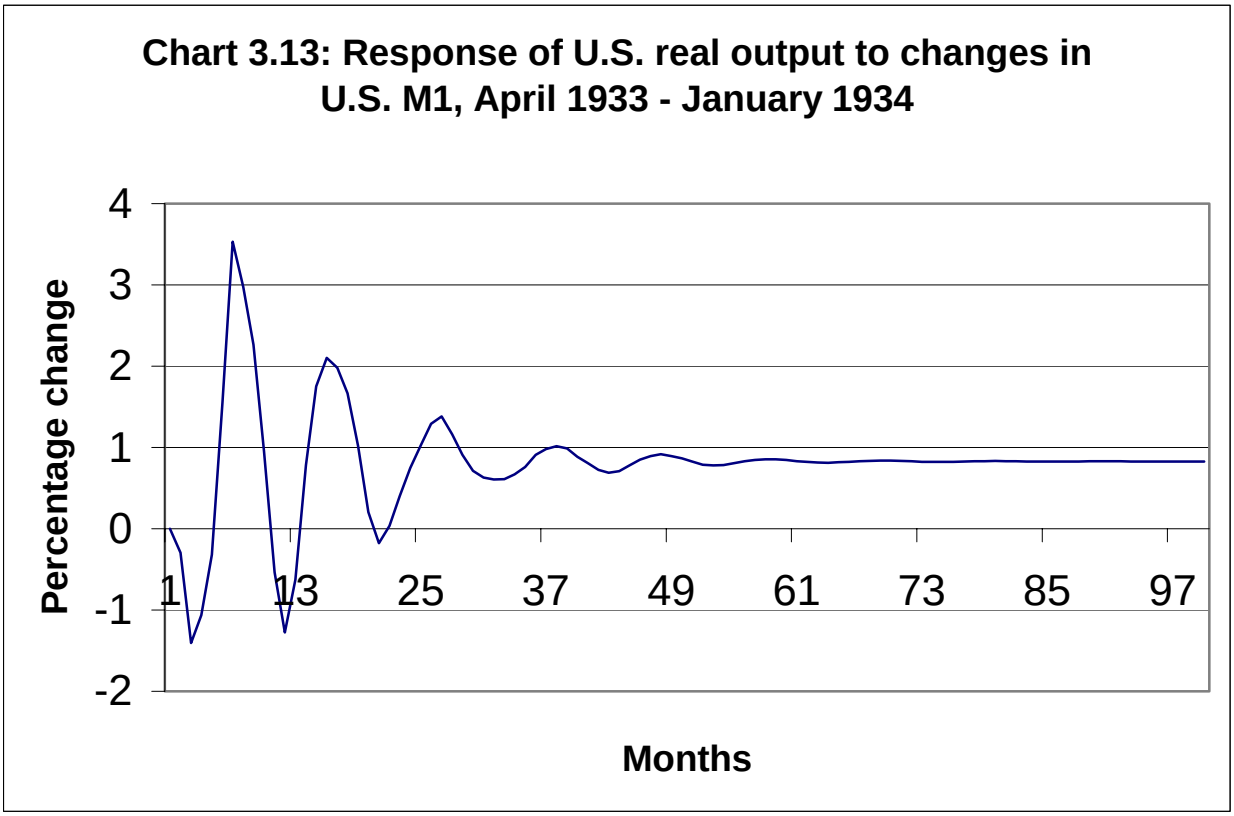


This suggests that capital could have returned to the United States and could have kept the U.S. real interest rate from increasing more than 2.3 basis points in response to the change in the dollar price of gold.

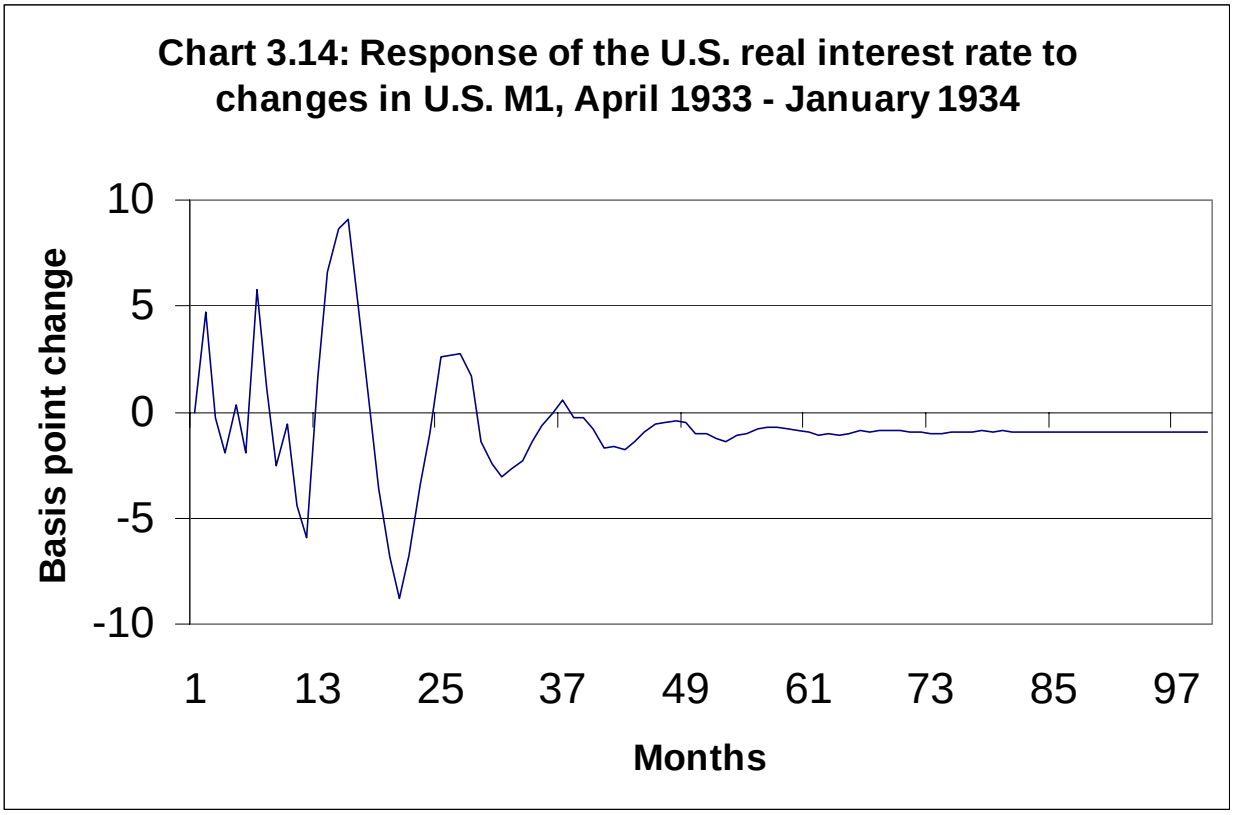
In sum, the cumulative effect of the United States' decision to devalue, as is measured from the expectation of devaluation through the official change in the dollar price of gold, caused British real interest rates to decline by 57.8 basis points. This result, coupled with the 0.92 percent increase in employment, provides evidence against the long-standing "beggar-thy-neighbor" characterization of devaluation.

3.7.4 How important were the consequences of devaluation compared to those of devaluation – independent changes in the U.S. money stock and to changes in the federal deficit?

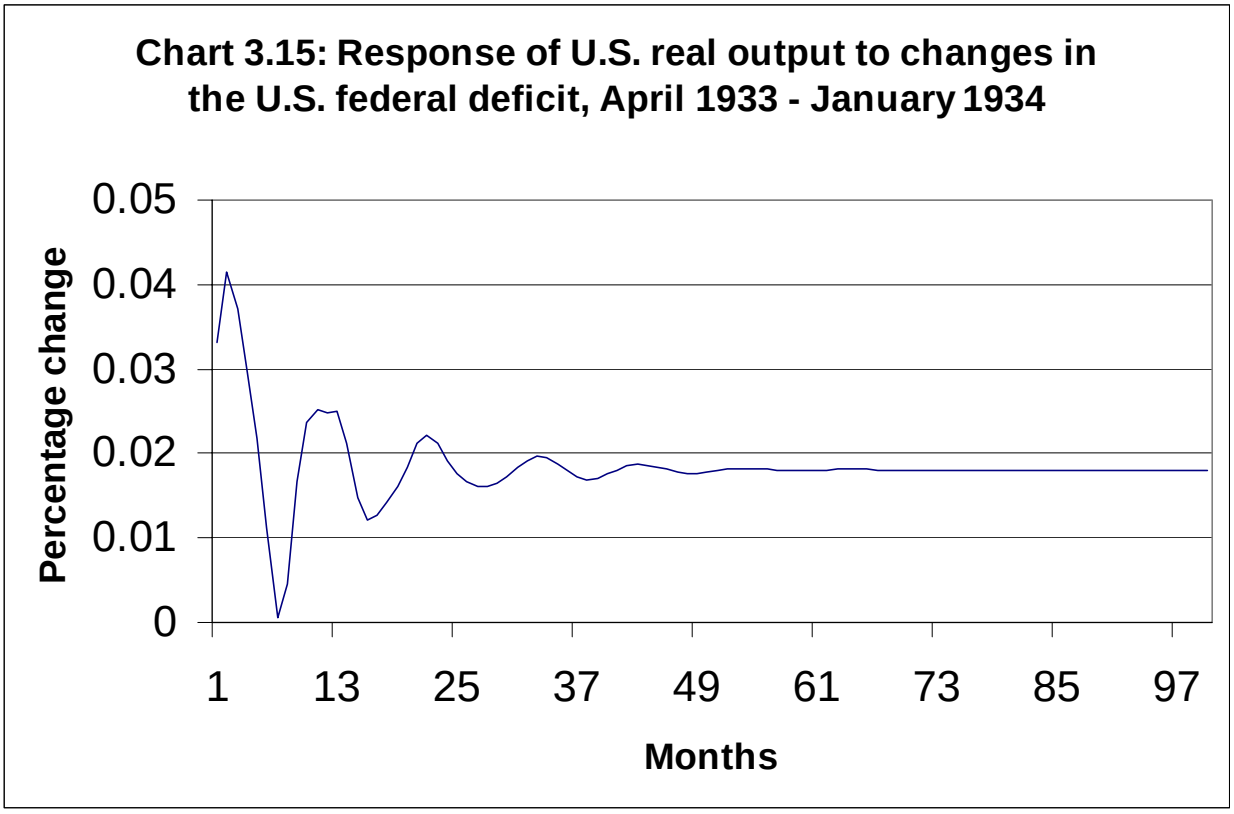
From April 1933 through January 1934 the United States' M1 money supply increased by $681 million, which is an increase of 3.6 percent. To calculate the effect of this change in M1 on real output, I multiplied the impulse response function of real output to a unit change in the money supply by the cumulative change in M1 for this period. I estimate that the increase in the money supply caused real output in the United States to increase by approximately 0.83 percent, as is illustrated in Chart 3.13.



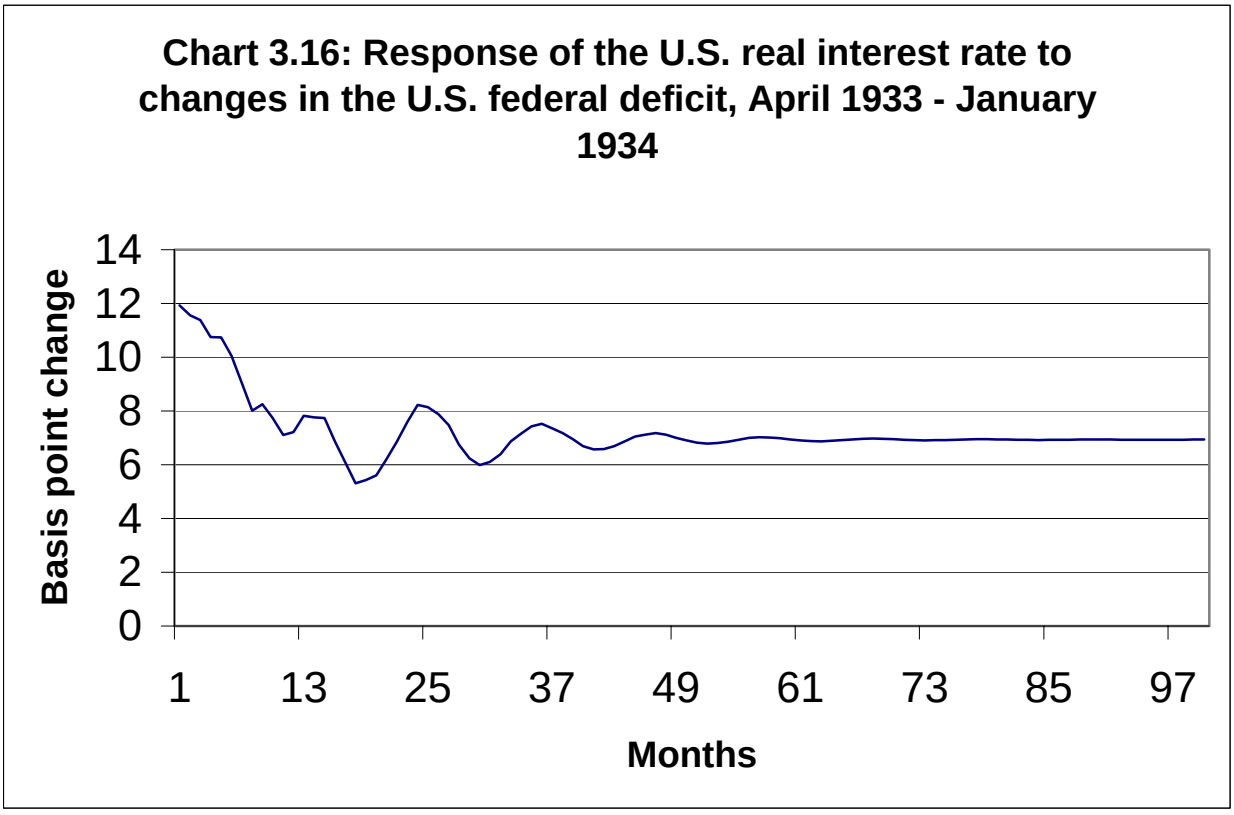
To calculate the effect of the same increase in M1 on the United States' real interest rate, I multiplied the per-unit response of the real interest rate to a unit change in the money supply by the cumulative change in the M1 money supply. I estimate that the increase in the money supply caused the real interest rate to decrease by 0.9 basis points, as is illustrated in Chart 3.14.



The United States' federal government ran a budget deficit of $2671 million during the period from April 1933 through January 1934. Following the method used to estimate the response of real output to changes in the money supply, I estimate the effect of the federal deficit on real output to be a mere 0.018 percent increase, as is illustrated in Chart 3.15.



Similarly, following the method for estimating the effect the changes in the money supply had on the real interest rate, I estimate that the federal deficit caused the real interest rate to increase only 7.93 basis points, as is illustrated in Chart 3.16.



Note that the federal deficit was approximately four times the size of the decrease in the M1 money supply, but the positive effects of the deficit on output were much smaller than the positive effects of the increase in money supply. The implication is that monetary expansion would have done much more for the economy than a fiscal expansion.

3.8 Discussion of the robustness of the estimates

To test the robustness of the results of the estimated base model, I estimate 21 additional models that vary in lag length, in the presence of the exogenous 12^{th} lag, in the interest rate sequence, and in whether I include a time trend variable. Of the 22 models I estimated, 12 used devaluation expectations that begin in January 1933 and end in March 1933 (*CF*1), and 10 used expectations that begin in November 1932 and end in March 1933 (*CF*2). 12 of these models

used interest rate series A, which includes the baseline model, and 10 of the models used interest rate series B. 12 of the estimated models had an exogenous 12^{th} lag, and 10 did not. 15 of the estimated models included a time trend variable, and 7 did not. All models had residuals that whitened and led me to reject the null hypothesis of serial correlation according to Box – Ljung modified Q-statistics. For most estimated relationships, the variations produced a general consensus consistent with the baseline model. A summary of the models tested and the long-run results for all 22 models is presented in Appendix II.

I consider the response of a variable to a shock robust if 19 or more of the 22 estimated models produce estimates with the same sign. I consider the response moderately robust if the response has the same sign for 15 to 18 of the 22 models, and ambiguous if only 11 to 14 of the models produce results with the same sign. This categorization is summarized in Table 3.1.

There are five robust relationships that have either all positive or all negative estimated effects. In all 22 models, the anticipation of devaluation in the U.S. had a positive effect on British employment and a positive effect on U.S. real interest rates. In all 22 models, the official change in the dollar price of gold had a negative effect on U.S. real output and a positive effect on British real interest rates. Lastly, in all 22 models an increase in the federal deficit had a positive effect on U.S. real interest rates. Among the results that had differing signs in their estimates, I found that the British real interest rate declined in response to the anticipation of U.S. devaluation in 21 of 22 models. I also found that the same 21 models showed that the British real interest rate declined in response to the float of the dollar.

Table 3.1: Summary of model estimates

Dependent Variable	Responding to change in	Robustness Characterization	Sign of majority responses	Largest positive response	Smallest (most negative) response
Real U.S. output	Anticipation of devaluation	Moderately Robust	Positive	1.104 Percent	-3.828 Percent
British employment	Anticipation of devaluation	Robust	Positive	1.626 Percent	None
Real U.S. interest rate	Anticipation of devaluation	Robust	Positive	88.344 Basis points	None
British real interest rate	Anticipation of devaluation	Robust	Negative	3.569 Basis points	-52.228 Basis points
Real U.S. output	Float of the dollar	Robust	Positive	3.738 Percent	-0.673 Percent
British employment	Float of the dollar	Ambiguous	Negative	1.179 Percent	-0.586 Percent
Real U.S. interest rate	Float of the dollar	Moderately Robust	Positive	31.133 Basis points	-29.164 Basis points
British real interest rate	Float of the dollar	Robust	Negative	-79.135 Basis points	11.654 Basis points
Real U.S. output	Official change in the dollar price of gold	Robust	Negative	None	-3.477 Percent
British employment	Official change in the dollar price of gold	Ambiguous	Positive	0.331 Percent	-0.122 Percent
Real U.S. interest rate	Official change in the dollar price of gold	Moderately Robust	Positive	9.759 Basis points	-15.798 Basis points
British real interest rate	Official change in the dollar price of gold	Robust	Positive	16.446 Basis points	None
Real U.S. output	Change in U.S. M1	Moderately Robust	Positive	4.432 Percent	-1.541 Percent
British employment	Change in U.S. M1	Ambiguous	Negative	0.934 Percent	-0.516 Percent
Real U.S. interest rate	Change in U.S. M1	Moderately Robust	Positive	33.027 Basis points	-5.793 Basis points
British real interest rate	Change in U.S. M1	Ambiguous	Negative	29.448 Basis points	-11.026 Basis points
Real U.S. output	Change in the U.S. federal deficit	Robust	Positive	0.759 Percent	-0.067 Percent
British employment	Change in the U.S. federal deficit	Robust	Positive	0.171 Percent	-0.026 Percent
Real U.S. interest rate	Change in the U.S. federal deficit	Robust	Positive	18.972 Basis points	None
British real interest rate	Change in the U.S. federal deficit	Ambiguous	Negative	5.068 Basis points	-6.528 Basis points

Among the moderately robust estimates, both the response of U.S. real output to the anticipation of devaluation and the response of the U.S. real interest rate to the float of the dollar showed a positive response in 15 of 22 models. The response of the U.S. real interest rate to the official change in the price of gold, and the response of U.S. real output and real interest rates to changes in M1 showed positive responses in 16 of the 22 estimated models.

Of the moderately robust responses, only the estimated response of the U.S. real interest rate to the dollar's float showed any sort of pattern among the estimates. In estimating this relationship, the combination of interest rate series B[3] and *CF*2[4] all show a negative response of the real interest rate to the float of the dollar. Other combinations of interest rate series A and *CF*2, interest rate series B and *CF*1, and interest rate series A and *CF*1, show a positive relationship in 15 of 16 estimated. I interpret the correlation of the negative estimated effects with the combination of interest rate series B and *CF*2 as the result of some anomaly in their combination, rather than as a reflection of the true economic relationship.

The estimated models that produced ambiguous results all involved British data: British employment responses to the float of the U.S. dollar, to the official change in the dollar price of gold, and to changes in the U.S. M1 money supply; and British real interest rate response to changes in U.S. M1 and to the U.S. federal deficit.

Finally, I tested the consequence of changing the manner in which I spliced together the two interest rate sequences, M13029a and M13029b, into interest rate sequences A and B to see whether it introduced any disturbance in the VARs. I re-estimated all 26 models with pulse dummy variables that are set to correspond with the point at which I combined the two interest

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[3] Interest rate A uses the last observations of NBER series M13029a and drops the first 47 observations of series M13029b, and interest rate series B drops the last 47 observations of series M13029a, replacing them with the first 47 observations of series M13029b.

[4] *CF*2 is the dummy variable for devaluation expectations that begins in November 1932 as opposed to *CF*1 that begins in January 1933.

rates' sequences. Including the pulse dummy variable did not substantially alter the impulse response functions of the base model or any of the other models. None of the responses change from positive to negative, or vice versa, and none of the magnitudes of the effects changed substantially. Therefore, these results were not reported.

3.9 Was the right policy chosen?

Table 3.2 summarizes the main findings of this chapter.

Table 3.2
Summary of responses to the expectation of devaluation, the float of the dollar, the change in the dollar price of gold, monetary shocks, and fiscal shocks

Shock	Effect on	Positive or negative
Devaluation expectation	U.S. output	+
	U.K. output	+
	U.S. real interest rate	+
	U.K. real interest rate	-
Float of the U.S. dollar	U.S. output	+
	U.K. output	Ambiguous
	U.S. real interest rate	+
	U.K. real interest rate	-
Change in dollar price of gold	U.S. output	-
	U.K. output	Ambiguous
	U.S. real interest rate	+
	U.K. real interest rate	+
Change in M1	U.S. output	+
	U.K. output	Ambiguous
	U.S. real interest rate	+
	U.K. real interest rate	Ambiguous
Change in U.S. federal deficit	U.S. output	+
	U.K. output	+
	U.S. real interest rate	+
	U.K. real interest rate	Ambiguous

In reviewing the effects on U.S. real output, the anticipation of devaluation raises real output less than one percent. It appears that the positive effects of the float of the dollar are largely offset by the negative effects of the official change in the price of gold. Assuming this is correct, the net effect of devaluation and its anticipation on real output is less than a one percent increase. Alternatively, most estimates show that a 3.6 percent increase in M1 raises output between 0.8 and 4.4 percent. Most estimates show output increased approximately 0.5 percent in response to the $2671 million cumulative federal deficit.

Against these gains are the changes in the United States real interest rate. With one exception, the expectation of devaluation increased the U.S. real interest rate by at least 17 basis points, and 15 of 22 models show an increase of more that 40 basis points. Excluding the results of the models that combined interest rate B and *CF*2, most of the remaining models show that the float of the dollar raised real interest rates by more than 10 basis points. Lastly, of those models showing a positive response of the real interest rate to the federal deficit, most show that the federal deficit raised real interest rates by more than 5 basis points. Collectively, devaluation and its anticipation raised the U.S. real interest rate by more that 55 basis points. Alternatively, the potentially bigger increase in real output brought on by the increase in the M1 money supply is estimated to have raised real interest rates by no more than 33 basis points, with most estimates showing a less than 10 basis point increase. Similarly, the federal deficit during the period is estimated to have increased the U.S. real interest rate by no more than 18 basis points with most of the estimates showing a less than 10 basis point increase.

The expectation of devaluation raised British output between 0.22 and 1.63 percent and lowered British real interest rates between 5 and 52 basis points, with most estimates showing a decrease of no less than 20 basis points. The float of the dollar has an ambiguous effect on

British employment, even though most estimates show a negative effect on employment, but the float substantially reduced British real interest rates, with most estimates showing a decline of more than 30 basis points. The change in the dollar price of gold also had an ambiguous effect on British output, but, unlike the float of the dollar, the change in dollar price of gold caused British real interest rates to increase between 3 and 17 basis points, with most estimates showing an increase of more than 8 basis points. Overall, devaluation raised British real output and lowered its real interest rate. In this case, devaluation was a "better-thy-neighbor" and not a "beggar-thy-neighbor" policy.

Changes in the U.S. money supply did not have definite effects on either British output or British real interest rates. The U.S. federal deficit had a positive, but very small, effect on British employment, with almost all estimates showing an increase of less than 0.1 percent. The federal deficit had an ambiguous effect on British real interest rates.

Overall, the results suggest that the three policies produced different mixes of benefits and harm to the U.S. and Britain. The most selfish policy for the U.S. would have been to use monetary policy exclusively. For comparable increases in the real interest rates, monetary policy would have produced much larger increases in output making it the most effective policy if one considers only the U.S. economy. A less selfish policy would have been to increase the federal deficit. In suggesting this policy option I do not consider the long-term ability of the U.S. federal government to pay for further increases in the federal deficit. However increasing the federal deficit would have been less costly, in terms of the real interest rate, than devaluation, and it would have provided a small increase in British output that was absent from monetary policy. Lastly, the collective policy of devaluation, from expectation through official change in the dollar price of gold, was very costly in terms of the real interest rate, but it provided substantial

benefits to the British economy. Therefore, the "right" policy in this case is really a matter of whether one considers only the U.S. economy or whether one considers both the U.S. and Britain.

3.10 Conclusion

This dissertation improves on the existing research on the effect of devaluation on output and interest rates by using higher frequency data, accounting for inflation expectations, allowing for the effect of devaluation to vary by size of the economy, accounting for devaluation expectations, and incorporating the federal deficit. This dissertation presents evidence that supports the claims put forth by Eichengreen and Sachs (1985) and Bernanke (1995) that devaluation leads to an increase in output. The findings of the dissertation, however, show that devaluation did not have the "beggar-thy-neighbor" effects that Eichengreen and Sachs suggest accompanied unilateral devaluation.

The dissertation provides evidence supporting the optimistic investor theory promoted by Temin and Wigmore (1990). I find that the expectation of devaluation led to an increase in both output and the real interest rate. If there is any evidence against the optimistic investor theory it is in the effect the official change in the dollar price of gold had on output. The optimistic investor theory, on its own, is unable to explain why official recognition of the devaluation that occurred with the float of the dollar would cause a decrease in output.

This dissertation, unlike prior research on the Depression, incorporates elements of the stabilization literature that places an emphasis on the role of government debt. The dissertation finds support for the type of consumption smoothing theorized by Calvo (1986, pgs 1323-1325).

The dissertation also provides evidence for Bordo and Kydland's (1996, pg. 87) claim that the commitment to the gold standard facilitated lending by protecting the public from random shocks to the money supply and capital losses. Each phase of devaluation causes an increase in the U.S. real interest rate. Further, the overall decrease in the British real interest rate suggests that the British economy was the beneficiary of capital flight from the U.S. Such capital flight, if it occurred, suggests that with the advent of devaluation expectation, and the float of the dollar, British financial assets became under-priced relative to U.S. financial assets on a risk-return basis. The change in the dollar price of gold led to a small increase in the British real interest rate. This increase in the British real interest rate may indicate a reversal of the flow of capital as the U.S., in setting the new dollar price of gold, removed some price level uncertainty.

Finally, the dissertation raises questions about Klein's (1975a, 1975b, and 1978) theory that, if borrowers and lenders have the same price level expectations, monetary and price level shocks should be neutral on the term structure of interest rates. His theory holds that uncertainty, measured as the variance of the price level, would be the source of any change in the real interest rate. Although I did not investigate the effect of devaluation and the expectation of devaluation on the term structure, I have a proxy for uncertainty in the model in the form of devaluation expectations. Applying Klein's logic to my work, it makes sense that the expectation of devaluation should have an effect on interest rates, but that devaluation, measured as the float of the dollar and the official change in the dollar price of gold, should not. However, the dissertation finds that devaluation had a positive effect on the real interest rate, which undermines Klein's central premise. Because real interest rates changed in response to the price level shock of devaluation, my results suggest that the term structure may hold important

information regarding expectations about the current business environment and the expectation of future inflation.

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APPENDIX I

DATA SOURCES

United States:

National Bureau of Economic Research data	Series Number
Index of the General Price Level	m04051
U.S. Yields on Short-term United States Securities, Three-Six Month Treasury Notes and Certificates, Three-Month Treasury	m13029a, b
Bonds Outstanding, Par Value, All Industries	m10083
Index of industrial production	m01175
Federal Deficit and / or surplus	m15025b, c

Other sources

M1 money supply	Friedman and Schwartz (1963)
Nominal Exchange Rates	Wall Street Journal, beginning of the Month, 1925-1936

United Kingdom:

National Bureau of Economic Research data	Series Number
Great Britain Wholesale Price Index	m04053
U.K. employed in Producers' durable goods trade	m08135
U.K. employed in consumers' durable goods trade	m08136
U.K. employed in consumers' non-durable goods trade	m08137

Other Sources

U.K. M1	Capie and Webber (1985), Table II(2), Column II plus Table II(1), Column IV
U.K. three-month bank bill rate	Capie and Webber (1985), Table III(10), Column V.

APPENDIX II

SUMMARY OF EMPIRICAL RESULTS

Table A1
Summary of tested models

Interest rate series	Number of Lags	Which version of devaluation expectations	Include an exogenous 12^{th} lag?	Include a time trend variable
A	5	*CF*1	No	Yes
A	9	*CF*1	No	Yes
A	4	*CF*1	Yes	No
A	5	*CF*1	Yes	No
A	7	*CF*1	Yes	No
A	2	*CF*1	Yes	Yes
A	6	*CF*1	Yes	Yes
A	9	*CF*1	Yes	Yes
B	7	*CF*1	No	No
B	7	*CF*1	No	Yes
B	9	*CF*1	No	Yes
B	6	*CF*1	Yes	Yes
A	9	*CF*2	No	Yes
A	6	*CF*2	Yes	No
A	2	*CF*2	Yes	Yes
A	6	*CF*2	Yes	Yes
B	6	*CF*2	No	No
B	7	*CF*2	No	No
B	7	*CF*2	No	Yes
B	9	*CF*2	No	Yes
B	3	*CF*2	Yes	Yes
B	6	*CF*2	Yes	Yes

Table A2
Percentage change in U.S. real output in response to the anticipation of
U.S. devaluation, January 1933 through March 1933 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-0.2639
9	Yes	No	-3.1048
4	No	Yes	-1.5886
5	No	Yes	0.1559
7	No	Yes	1.104
2	Yes	Yes	0.342
6	Yes	Yes	0.892
9	Yes	Yes	0.336

Table A3
Percentage change in U.S. real output in response to the anticipation of
U.S. devaluation, November 1932 through March 1933 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	0.4027
6	No	Yes	0.0079
2	Yes	Yes	-3.828
6	Yes	Yes	0.2605

Table A4
Percentage change in U.S. real output in response to the anticipation of
U.S. devaluation, January 1933 through March 1933 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	0.427
7	Yes	No	0.351
9	Yes	No	-2.828
6	Yes	Yes	0.837

Table A5
Percentage change in U.S. real output in response to the anticipation of
U.S. devaluation, November 1932 through March 1933 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	-0.224
7	No	No	0.978
7	Yes	No	0.955
9	Yes	No	0.556
3	Yes	Yes	-2.679
6	Yes	Yes	0.163

Table A6
Percentage change in British employment in response to the expectation of U.S. devaluation, January 1933 through March 1933 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	0.622
9	Yes	No	1.211
4	No	Yes	0.593
5	No	Yes	0.593
7	No	Yes	0.496
2	Yes	Yes	0.683
6	Yes	Yes	1.094
9	Yes	Yes	0.647

Table A7
Percentage change in British employment in response to the expectation of U.S. devaluation, November 1932 through March 1933 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	0.8844
6	No	Yes	0.771
2	Yes	Yes	0.6535
6	Yes	Yes	0.8490

Table A8
Percentage change in British employment in response to the expectation of U.S. devaluation, January 1933 through March 1933 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	0.447
7	Yes	No	0.520
9	Yes	No	1.626
6	Yes	Yes	0.878

Table A9
Percentage change in British employment in response to the expectation of U.S. devaluation, November 1932 through March 1933 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	0.529
7	No	No	0.221
7	Yes	No	0.282
9	Yes	No	0.729
3	Yes	Yes	0.523
6	Yes	Yes	0.643

Table A10
Response of the U.S. real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate A and *CF*1,
January 1933 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	81.036
9	Yes	No	78.339
4	No	Yes	56.376
5	No	Yes	55.911
7	No	Yes	40.720
2	Yes	Yes	35.744
6	Yes	Yes	34.646
9	Yes	Yes	30.620

Table A11
Response of the U.S. real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate A and *CF*2,
November 1932 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	62.387
6	No	Yes	17.854
2	Yes	Yes	3.569
6	Yes	Yes	18.096

Table A12
Response of the U.S. real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate B and *CF*1,
January 1933 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	67.314
7	Yes	No	66.240
9	Yes	No	78.238
6	Yes	Yes	48.982

Table A13
Response of the U.S. real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate B and *CF*2,
November 1932 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	52.228
7	No	No	45.476
7	Yes	No	45.518
9	Yes	No	88.344
3	Yes	Yes	44.575
6	Yes	Yes	28.671

Table A14
Response of the British real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate A and *CF*1,
January 1933 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-35.322
9	Yes	No	-36.6585
4	No	Yes	-49.478
5	No	Yes	-50.506
7	No	Yes	-38.617
2	Yes	Yes	-33.161
6	Yes	Yes	-38.130
9	Yes	Yes	-13.628

Table A15
Response of the British real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate A and *CF*2,
November 1932 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	-13.83
6	No	Yes	-15.345
2	Yes	Yes	3.569
6	Yes	Yes	-11.748

Table A16
Response of the British real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate B and *CF*1,
January 1933 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	-28.540
7	Yes	No	-22.890
9	Yes	No	-52.228
6	Yes	Yes	-34.006

Table A17
Response of the British real interest rate, in basis points, to
U.S. devaluation expectations, using interest rate B and *CF*2,
November 1932 through March 1933

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	-10.456
7	No	No	-12.202
7	Yes	No	-7.772
9	Yes	No	-23.758
3	Yes	Yes	-5.287
6	Yes	Yes	-7.905

Table A18
U.S. real output response to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	2.336
9	Yes	No	3.738
4	No	Yes	-0.471
5	No	Yes	-0.673
7	No	Yes	1.756
2	Yes	Yes	1.950
6	Yes	Yes	1.787
9	Yes	Yes	1.918

Table A19
U.S. real output response to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	3.661
6	No	Yes	1.418
2	Yes	Yes	0.209
6	Yes	Yes	1.758

Table A20
U.S. real output response to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	2.482
7	Yes	No	2.200
9	Yes	No	3.573
6	Yes	Yes	1.365

Table A21
U.S. real output response to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	2.202
7	No	No	2.422
7	Yes	No	2.335
9	Yes	No	3.496
3	Yes	Yes	2.053
6	Yes	Yes	1.291

Table A22
British employment response to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	-0.030
9	Yes	No	0.715
4	No	Yes	-0.050
5	No	Yes	-0.442
7	No	Yes	-0.360
2	Yes	Yes	0.564
6	Yes	Yes	-0.146
9	Yes	Yes	0.534

Table A23
British employment response to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	0.394
6	No	Yes	-0.586
2	Yes	Yes	0.777
6	Yes	Yes	-0.309

Table A24
British employment response to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	-0.521
7	Yes	No	-0.224
9	Yes	No	1.179
6	Yes	Yes	-0.090

Table A25
British employment response to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	-0.403
7	No	No	-0.571
7	Yes	No	-0.300
9	Yes	No	0.372
3	Yes	Yes	0.215
6	Yes	Yes	-0.222

Table A26
U.S. real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	20.237
9	Yes	No	31.133
4	No	Yes	15.789
5	No	Yes	13.557
7	No	Yes	10.639
2	Yes	Yes	14.851
6	Yes	Yes	9.677
9	Yes	Yes	12.632

Table A27
U.S. real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	23.246
6	No	Yes	1.2505
2	Yes	Yes	16.065
6	Yes	Yes	3.668

Table A28
U.S. real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	1.213
7	Yes	No	5.390
9	Yes	No	6.640
6	Yes	Yes	-0.906

Table A29
U.S. real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	-29.164
7	No	No	-12.363
7	Yes	No	-9.033
9	Yes	No	-9.123
3	Yes	Yes	-0.114
6	Yes	Yes	-11.132

Table A30
British real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	-46.556
9	Yes	No	-51.226
4	No	Yes	-20.880
5	No	Yes	-36.594
7	No	Yes	-35.084
2	Yes	Yes	-26.430
6	Yes	Yes	-32.817
9	Yes	Yes	-9.898

Table A31
British real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	-47.998
6	No	Yes	-32.437
2	Yes	Yes	11.654
6	Yes	Yes	-25.805

Table A32
British real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	-55.489
7	Yes	No	-44.447
9	Yes	No	-77.223
6	Yes	Yes	-34.163

Table A33
British real interest rate response, in basis points, to the dollar's float
March 1933 – January 1934 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	-61.814
7	No	No	-54.224
7	Yes	No	-42.123
9	Yes	No	-79.135
3	Yes	Yes	-11.493
6	Yes	Yes	-27.121

Table A34
Percentage change in U.S. real output in response to official change
In the dollar price of gold, February 1934 (using interest rate A and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-1.672
9	Yes	No	-1.569
4	No	Yes	-3.477
5	No	Yes	-2.293
7	No	Yes	-1.502
2	Yes	Yes	-0.725
6	Yes	Yes	-1.272
9	Yes	Yes	-0.713

Table A35
Percentage change in U.S. real output in response to official change
In the dollar price of gold, February 1934 (using interest rate A and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	-1.121
6	No	Yes	-1.757
2	Yes	Yes	-3.100
6	Yes	Yes	-1.470

Table A36
Percentage change in U.S. real output in response to official change
In the dollar price of gold, February 1934 (using interest rate B and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	-2.434
7	Yes	No	-2.224
9	Yes	No	-2.249
6	Yes	Yes	-1.406

Table A37
Percentage change in U.S. real output in response to official change
In the dollar price of gold, February 1934 (using interest rate B and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	-1.906
7	No	No	-2.332
7	Yes	No	-2.180
9	Yes	No	-1.427
3	Yes	Yes	-2.849
6	Yes	Yes	-1.645

Table A38
Percentage change in British employment in response to official change
In the dollar price of gold, February 1934 (using interest rate A and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-0.136
9	Yes	No	0.113
4	No	Yes	0.000
5	No	Yes	-0.084
7	No	Yes	-0.070
2	Yes	Yes	0.068
6	Yes	Yes	-0.021
9	Yes	Yes	0.065

Table A39
Percentage change in British employment in response to official change
In the dollar price of gold, February 1934 (using interest rate A and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	0.036
6	No	Yes	-0.122
2	Yes	Yes	0.177
6	Yes	Yes	-0.027

Table A40
Percentage change in British employment in response to official change
In the dollar price of gold, February 1934 (using interest rate B and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	-0.043
7	Yes	No	0.039
9	Yes	No	0.331
6	Yes	Yes	0.036

Table A41
Percentage change in British employment in response to official change
In the dollar price of gold, February 1934 (using interest rate B and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	0.009
7	No	No	-0.056
7	Yes	No	0.020
9	Yes	No	0.087
3	Yes	Yes	0.200
6	Yes	Yes	0.034

Table A42
U.S. real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	0.05779
9	Yes	No	-0.086
4	No	Yes	0.241
5	No	Yes	-2.083
7	No	Yes	0.684
2	Yes	Yes	0. 4841
6	Yes	Yes	2.317
9	Yes	Yes	0.475

Table A43
U.S. real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	-15.7987
6	No	Yes	-3.379
2	Yes	Yes	1.7497
6	Yes	Yes	0.88951

Table A44
U.S. real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	8.911
7	Yes	No	9.759
9	Yes	No	2.953
6	Yes	Yes	3.621

Table A45
U.S. real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	7.772
7	No	No	8.378
7	Yes	No	8.592
9	Yes	No	-7.216
3	Yes	Yes	1.671
6	Yes	Yes	2.179

Table A46
British real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate A and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	9.229
9	Yes	No	5.578
4	No	Yes	5.618
5	No	Yes	8.713
7	No	Yes	8.204
2	Yes	Yes	15.248
6	Yes	Yes	10.617
9	Yes	Yes	6.569

Table A47
British real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate A and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	10.769
6	No	Yes	10.2515
2	Yes	Yes	3.2834
6	Yes	Yes	12.8217

Table A48
British real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate B and *CF*1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	8.796
7	Yes	No	8.944
9	Yes	No	8.455
6	Yes	Yes	9.243

Table A49
British real interest rate response (in basis point) to the official change
In the dollar price of gold, February 1934 (using interest rate B and *CF*2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	13.918
7	No	No	11.267
7	Yes	No	11.873
9	Yes	No	16.446
3	Yes	Yes	2.138
6	Yes	Yes	11.507

Table A50
Percentage change in U.S. real output in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-0.152
9	Yes	No	1.3097
4	No	Yes	-0.345
5	No	Yes	-0.555
7	No	Yes	1.961
2	Yes	Yes	0.876
6	Yes	Yes	0.828
9	Yes	Yes	0.865

Table A51
Percentage change in U.S. real output in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	1.285
6	No	Yes	2.048
2	Yes	Yes	-1.541
6	Yes	Yes	0.979

Table A52
Percentage change in U.S. real output in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	4.367
7	Yes	No	2.495
9	Yes	No	-0.267
6	Yes	Yes	1.026

Table A53
Percentage change in U.S. real output in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	3.936
7	No	No	4.432
7	Yes	No	2.222
9	Yes	No	0.257
3	Yes	Yes	-0.034
6	Yes	Yes	1.096

Table A54
Percentage change in British employment in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	-0.183
9	Yes	No	-0.288
4	No	Yes	0.034
5	No	Yes	-0.100
7	No	Yes	0.080
2	Yes	Yes	-0.231
6	Yes	Yes	-0.128
9	Yes	Yes	-0.332

Table A55
Percentage change in British employment in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change In employment
9	Yes	No	-0.307
6	No	Yes	0.165
2	Yes	Yes	-0.2112
6	Yes	Yes	-0.0877

Table A56
Percentage change in British employment in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	0.558
7	Yes	No	0.028
9	Yes	No	-0.516
6	Yes	Yes	-0.035

Table A57
Percentage change in British employment in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	0.934
7	No	No	0.619
7	Yes	No	0.088
9	Yes	No	-0.115
3	Yes	Yes	-0.325
6	Yes	Yes	-0.027

Table A58
Basis point change in U.S. real interest rate in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-5.793
9	Yes	No	17.4342
4	No	Yes	6.983
5	No	Yes	0.8678
7	No	Yes	0.690
2	Yes	Yes	7.050
6	Yes	Yes	-0.933
9	Yes	Yes	10.813

Table A59
Basis point change in U.S. real interest rate in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	17.919
6	No	Yes	10.8934
2	Yes	Yes	-1.71705
6	Yes	Yes	0.9511

Table A60
Basis point change in U.S. real interest rate in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	28.369
7	Yes	No	8.392
9	Yes	No	15.858
6	Yes	Yes	-2.100

Table A61
Basis point change in U.S. real interest rate in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	33.027
7	No	No	30.954
7	Yes	No	9.255
9	Yes	No	25.927
3	Yes	Yes	5.393
6	Yes	Yes	-1.463

Table A62
Basis point change in British real interest rate in response to changes in U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	7.332
9	Yes	No	8.209
4	No	Yes	4.675
5	No	Yes	-1.461
7	No	Yes	9.248
2	Yes	Yes	-1.287
6	Yes	Yes	-1.694
9	Yes	Yes	-6.656

Table A63
Basis point change in British real interest rate in response to changes in U.S. M1 money supply, March 1933 through January 1934
Using interest rate A and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	6.609
6	No	Yes	10.856
2	Yes	Yes	-11.026
6	Yes	Yes	-0.453

Table A64
Basis point change in British real interest rate in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 1

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	16.116
7	Yes	No	2.297
9	Yes	No	24.381
6	Yes	Yes	-5.571

Table A65
Basis point change in British real interest rate in response to changes in
U.S. M1 money supply, March 1933 through January 1934
Using interest rate B and *CF* 2

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	29.448
7	No	No	17.349
7	Yes	No	4.242
9	Yes	No	25.936
3	Yes	Yes	-7.590
6	Yes	Yes	-4.372

Table A66
Percentage change in U.S. real output in response to the federal deficit
April 1933 through January 1933 (using interest rate A and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	0.197
9	Yes	No	0.679
4	No	Yes	0.086
5	No	Yes	-0.067
7	No	Yes	0.197
2	Yes	Yes	0.208
6	Yes	Yes	0.018
9	Yes	Yes	0.207

Table A67
Percentage change in U.S. real output in response to the federal deficit
April 1933 through January 1933 (using interest rate A and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	0.518
6	No	Yes	0.042
2	Yes	Yes	0.168
6	Yes	Yes	0.025

Table A68
Percentage change in U.S. real output in response to the federal deficit
April 1933 through January 1933 (using interest rate B and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	0.577
7	Yes	No	0.524
9	Yes	No	0.759
6	Yes	Yes	0.069

Table A69
Percentage change in U.S. real output in response to the federal deficit
April 1933 through January 1933 (using interest rate B and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	0.343
7	No	No	0.560
7	Yes	No	0.527
9	Yes	No	0.533
3	Yes	Yes	-0.010
6	Yes	Yes	0.088

Table A70
Percentage change in British employment in response to the federal deficit
April 1933 through January 1933 (using interest rate A and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
5	Yes	No	-0.0268
9	Yes	No	-0.00243
4	No	Yes	0.12163
5	No	Yes	0.171
7	No	Yes	0.079
2	Yes	Yes	0.051
6	Yes	Yes	0.084
9	Yes	Yes	0.047

Table A71
Percentage change in British employment in response to the federal deficit
April 1933 through January 1933 (using interest rate A and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
9	Yes	No	-0.011
6	No	Yes	0.09478
2	Yes	Yes	0.0806
6	Yes	Yes	0.0803

Table A72
Percentage change in British employment in response to the federal deficit
April 1933 through January 1933 (using interest rate B and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
7	No	No	0.060
7	Yes	No	0.048
9	Yes	No	0.061
6	Yes	Yes	0.075

Table A73
Percentage change in British employment in response to the federal deficit
April 1933 through January 1933 (using interest rate B and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Percentage change in output
6	No	No	0.028
7	No	No	0.057
7	Yes	No	0.044
9	Yes	No	0.011
3	Yes	Yes	0.160
6	Yes	Yes	0.074

Table A74
Basis point change in U.S. real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate A and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	10.4795
9	Yes	No	16.8976
4	No	Yes	8.1219
5	No	Yes	7.9396
7	No	Yes	6.1814
2	Yes	Yes	3.393
6	Yes	Yes	6.933
9	Yes	Yes	4.500

Table A75
Basis point change in U.S. real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate A and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	18.972
6	No	Yes	10.1695
2	Yes	Yes	7.0144
6	Yes	Yes	7.6373

Table A76
Basis point change in U.S. real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate B and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	6.441
7	Yes	No	6.046
9	Yes	No	12.035
6	Yes	Yes	6.023

Table A77

Basis point change in U.S. real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate B and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	13.290
7	No	No	7.761
7	Yes	No	7.543
9	Yes	No	17.826
3	Yes	Yes	8.908
6	Yes	Yes	7.019

Table A78
Basis point change in British real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate A and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
5	Yes	No	-5.7042
9	Yes	No	-3.2697
4	No	Yes	-3.121
5	No	Yes	-2.9591
7	No	Yes	1.399
2	Yes	Yes	-3.134
6	Yes	Yes	-1.325
9	Yes	Yes	0.483

Table A79
Basis point change in British real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate A and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
9	Yes	No	5.068
6	No	Yes	-1.886
2	Yes	Yes	-6.5283
6	Yes	Yes	-1.2261

Table A80
Basis point change in British real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate B and *CF* 1)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
7	No	No	2.070
7	Yes	No	1.511
9	Yes	No	-4.620
6	Yes	Yes	-1.105

Table A81
Basis point change in British real interest rate in response to the U.S. federal deficit
March 1933 – January 1933 (using interest rate B and *CF* 2)

Number of lags	Include a time trend?	Include exogenous 12^{th} Lag?	Basis point change
6	No	No	-0.596
7	No	No	2.018
7	Yes	No	1.441
9	Yes	No	-5.801
3	Yes	Yes	0.352
6	Yes	Yes	-1.158