THE GOLD STANDARD SINCE ALEC FORD

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ABSTRACT

     This paper surveys studies of the operation of the classical gold standard
published subsequent to the appearance of Alec Ford's The Gold Standard 1880-
1914: Britain and Argentina in 1962. Contributions tend to fall under two
headings: those which emphasize stock equilibrium in money markets (examples
of the so-called "monetary approach") and those which emphasize instead stock-
flow interactions in bond markets. The paper then addresses the perennial
question of how the gold standard worked. A central element of my explanation
for the stability of the gold standard at the center is the credibility of the
official commitment to gold. Knowing that policymakers would intervene in
defense of the gold standard, markets responded in the same direction in
anticipation of official action. Hence the need for actual intervention was
minimized. Credibility derived from the fact that the commitment to the gold
standard was international. Central banks like the Bank of England could rely
on foreign assistance in times of exceptional stress. Again, the need for
actual assistance was minimized because the commitment to offer it was fully
credible. Thus, international cooperation is a central element of my
explanation of how the classical gold standard worked.

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Alec Ford's The Gold Standard 1880-1914: Britain and Argentina is one of a handful of classics on the gold standard written in the 20th century. The book made three contributions. First, it elaborated a new model of the balance-of-payments adjustment mechanism. Analyzing the experience of Britain, Ford argued that the adjustment worked through different channels than the price-specie flow mechanism emphasized by Hume or the interest-rate-induced capital flows emphasized by Whale.1/ Ford's Keynesian model highlighted the tendency of gold outflows to raise interest rates, lower domestic demand, and restore external balance through the reduction of output, employment and import demand.2/ Relative price movements, or changes in interest rates induced by central banks playing by the rules of the game, might aid adjustment but their role was subsidiary.

The second contribution of the book was to contrast the very different nature of gold standard experience in general, and of the adjustment mechanism in particular, in less-developed primary-producing countries. Analyzing the experience of Argentina, Ford argued that the record of stability under the gold standard was less satisfactory at the periphery than the center. As at the center, at the periphery adjustment worked through changes in income and demand. An inflow of long-term capital, for example, tended to stimulate demand, increasing imports and thereby tending to restore balance to the external accounts. But at the periphery exceptionally large fluctuations in income were required. Given the underdeveloped state of domestic financial markets and even the absence of a central bank, there was little scope for interest rate changes to induce accommodating short-term capital flows. The commodity prices facing primary-producing countries were dictated by world commodity markets. Hence the burden of adjustment fell squarely on changes in demand, often brought about by fluctuations in employment.

Ford's third contribution was to indicate how countries of both types fit together in an equilibrium system. He showed how the operation of markets throughout the international economy facilitated adjustment to balance-of-payments disturbances. An increase in long-term foreign lending by London, for example, automatically induced an increase in the recipient country's demand for commodity imports from Britain. The fall in British output and employment that otherwise would be caused by the shift from domestic to foreign investment was attenuated by the export boom. But Ford also emphasized the extent to which the operation of these markets depended on "the social and political environments, as well as economic, of the countries concerned."3/ Specifically, the maintenance of international equilibrium depended on the fortuitously rapid growth of the world economy, which subdued domestic devaluation lobbies. It depended on the propensity of capital-importing nations to use foreign funds to finance investment rather than consumption. It depended on the fact that the leading capital-exporting nation was also an exporter of capital goods.

Ford's model, with its prominent Keynesian features, was a product of its time. The subsequent quarter of a century has seen a radical changes of fashion in macroeconomics, and a recasting of the literature on the gold standard. The rise of monetarism has produced monetarist models of the gold standard. The rise of efficient-markets models of the macroeconomy has led to efficient-markets models of the gold standard. The literature on rules versus discretion and on the credibility and time consistency of macroeconomic policy has led recent authors to view the gold standard in this light.

In this paper I assess the recent literature on the gold standard. I limit my attention to contributions which postdate Ford's 1962 book, concentrating on publications from the last decade. This review suggests that recent developments have been very much of the

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character "two steps forward, one step back." Most recent work on the gold standard has been driven by a theoretical agenda, not an historical one. Advances in theory have helped to illuminate dark corners of the gold standard adjustment mechanism. But they have led investigators to pay exaggerated attention to certain features of the system at the neglect of others. The literature on the gold standard may have moved forward, but not without suffering significant reversals.

In the second part of the paper I offer a synthesis of the literature on how the gold standard worked. The model turns out to be very much in the spirit of the work of Alec Ford.

I. The Literature Since Alec Ford[4]/

The Gold Standard, 1880-1914 postdated integration of the IS-LM model into the mainstream of theoretical macroeconomics but preceded the elaboration of its open-economy variant. This awaited the work of Fleming (1962) and Mundell (1963). These authors showed how, in an open economy with sticky prices, the response of employment and the balance of payments to monetary and fiscal impulses depended on the degree of international capital mobility. The Mundell-Fleming model formalized the elements of income and balance-of-payments determination suggested by Meade (1951) and discussed in a gold standard context by Ford. The adjustment mechanism -- the translation of flows into stocks along the traverse from temporary to steady-state equilibrium -- was not treated explicitly, but its nature was clear. If demand expansion raised absorption or reduced interest rates relative to combinations consistent with balance-of-payments equilibrium, income would have to fall or interest rates would have to rise, perhaps through contraction of the money supply, for the fixed exchange rate (or gold convertibility) to be maintained.

From there it was a small step to specify a two-country version of the model, as in Mundell (1968), and to analyze internal and external balance under different assumptions about capital mobility. The problem with these models was the assumption that capital flows responded to interest differentials. Flows were not tracked into stocks, which had uncomfortable implications. In two-country models, for instance, residents of both countries would have wished to accumulate assets of the country with the higher yield, which was patently impossible.5/

It is as a response to these contradictions that the monetary approach to the balance of payments (Frenkel, 1971; Mundell, 1971; Johnson, 1973) must be understood. The monetary approach was the simplest way of analyzing balance-of-payments adjustment with stock equilibrium in asset markets. As in the Mundell-Fleming model, each country possessed a money demand function (the stock equilibrium condition). But flows cumulated into changes in stocks. Money supply equaled the sum of domestic credit and foreign reserves.6/ Under fixed rates, the authorities stood ready to purchase domestic currency for reserves when money demand exceeded money supply at the fixed domestic currency price of foreign exchange, and to swap domestic currency for reserves when supply exceeded demand. If domestic credit was held constant, money supplies responded to demand exclusively through reserve flows -- that is, through the balance of payments. An excess of money demand over money supply caused reserves to be imported from abroad. An injection of domestic credit which raised money supply relative to demand caused a loss of reserves, leading ultimately to a convertibility crisis. It was straightforward to combine two such countries (Mundell, 1971) and to show how the level of commodity prices had to adjust to insure that global excess demands for money and reserves equaled zero.

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Application to the gold standard was direct (Mundell, 1971; McCloskey and Zecher, 1976). In the simplest formulation, the supply of domestic credit was fixed. Money supplies responded to changes in demand through international specie flows. It was a simple extension to add to this framework the rules of the gold standard game. If central banks adjusted domestic credit in the same direction as changes in their foreign reserves (in other words, played by the rules of the game), the need for actual gold movements would be minimized. Changes in the discount rate might be utilized to bring about the same result through changes in the money multiplier.

Consistent treatment of stock-flow relationships was a step forward. But much of this literature also took on board a whole array of monetarist assumptions and assumptions from efficient markets models with which monetarism is sometimes confused. The money market was assumed to clear instantaneously. Domestic and foreign interest-bearing assets were assumed to be perfect substitutes. Capital was assumed to be perfectly mobile internationally. Real variables were assumed to be determined independently of financial stocks and flows. Purchasing power parity was assumed to hold continuously.

These assumptions combined to yield a particular model of the adjustment mechanism, one very different from its predecessors. With purchasing power parity holding continuously, adjustment entailed no relative price movements like those predicted by Hume. With interest parity holding continuously, it entailed no relative interest rates movements like those predicted by Whale. With full employment maintained continuously, it entailed no relative income movements like those predicted by Ford. When money demand exceeded supply and the incipient excess demand put upward pressure on interest rates, capital simply flowed in, reserves accumulated, and

money supply expanded instantaneously to insure that interest rates remained pegged at world levels.

Changes in spending and other adjustments remained in the background. But if one paused to think about the issue, they were of the utmost importance. If little or no decline in spending occurred in the short run, the capital inflow took the form of increased claims by foreigners on domestic residents. Spending would have to be reduced subsequently to generate the current account surpluses necessary to service the debt. If spending fell in the short run, the accumulation of reserves could be financed with current account surpluses. In this case, no decline in spending would be needed in the future to service foreign debt.

What combination of these extremes operated to restore external balance depended on the consumption-smoothing motives of households and the investment decisions of firms. Early examples of the monetary approach, including those applied to the gold standard, did not address this question. Nor did they ask what change in relative prices was needed to render foreigners willing to absorb the exports consequent on changes in domestic absorption. They assumed away the question by imposing the assumption of absolute purchasing power parity (McCloskey and Zecher, 1984) and by ignoring nontraded goods (and their relative price) entirely. Finally, they failed to pursue the implications of imperfect substitutability between domestic and foreign interest-bearing assets.

Subsequent work, which relaxed many of these restrictive assumptions, demonstrated that the emphasis of the monetary approach on stock equilibrium was entirely compatible with the adjustment mechanisms emphasized by Hume, Whale and Ford.7/ If domestic and foreign goods were imperfect substitutes in consumption, adjustment which entailed a decline in domestic absorption required precisely the change in relative prices predicted

by Hume. Domestic prices would have to fall to render foreigners willing to absorb an increasing volume of imports. The stock-flow relationships central to the monetary approach survive this extension.8/ If wages or other costs of production were sticky in nominal terms, the fall in prices might move firms down their supply curves, reducing output and employment as predicted by Ford. If domestic and foreign financial assets were imperfect substitutes in portfolios, adjustment which entailed a capital account deficit required precisely the change in relative interest rates predicted by Whale. The yield on domestic bonds would have to rise to render foreigners willing to devote to them an increasing share of their portfolios.9/ There was nothing incompatible in the alternative formulations. They were all special cases of a more general model. Which mechanisms bore the burden of adjustment depended both on the structure of the economies involved and the nature of the disturbances in response to which adjustment was required.10/

Unfortunately, the compatibility of these formulations was not widely appreciated. The monetary approach was characterized as a radical departure and a fundamental challenge to existing models.

The monetary approach found widespread application. McCloskey and Zecher (1976) used it to analyze gold flows between the U.S. and Britain. Jonung (1984) analyzed Swedish experience under the gold standard using a framework featuring both the monetary model of adjustment and purchasing power parity. McKinnon (1988) used the model to assess the performance of the gold standard in other countries. The relative prices of domestic and foreign traded goods played little role in these authors' description of the adjustment mechanism. According to McKinnon (1988, p. 9), for example, "generalized commodity price arbitrage became sufficiently strong [under the gold standard] to prevent the prices (exclusive of tariffs) of any particular tradable good — say

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cotton shirts — from differing significantly more across countries than they did interregionally within a country."

McKinnon did not assume that purchasing power parity is an economic fact of life, however. Rather, he suggested that its presence was a function precisely of the fact that exchange rates had been fixed for substantial periods of time. Absent exchange risk, arbitragers had an incentive to develop the capacity to exploit and eliminate international commodity price differentials. This hypothesis suggests that the price-specie flow mechanism may have been more important during the early years of the gold standard as an international system.11/

Like Jonung for Sweden, Calomiris and Hubbard (1987) for the United States argued that a monetary model best explains balance-of-payments adjustment under the gold standard. They argued that shocks to money supply and money demand had little persistent impact on prices, output or the balance of payments. Rather, such disturbances appear to have been quickly offset (in the case of money supply shocks) or accommodated (in the case of money demand shocks) by the rapid response of international gold flows. But in contrast to their predecessors, Calomiris and Hubbard acknowledged the compatibility of the essential element of the monetary approach -- stock equilibrium in asset markets — with relative price movements inconsistent with strict purchasing power parity. In their analysis, a trade-balance shock might very well require a change in relative prices in order for balance-of-payments equilibrium to be restored. But in their model all of the price adjustment occurred immediately. Gold quickly flowed in or out to equilibrate asset markets. There was no need for the gradual or persistent adjustment characteristic of the price-specie flow model.

A logical problem raised by these conclusions is that it is not clear, in the absence of nominal inertia and in the presence of perfect international capital mobility, how to

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account for business cycles.12/ Calomiris and Hubbard's answer is credit rationing. In their model, deflationary disturbances erode the value of collateral, threatening the solvency of banks and producing a spread between interest rates in the customer markets frequented by borrowers dependent on bank credit and the internationally-arbitraged spot rates at which governments and other reputable agents can borrow and lend. A widening of these interest differentials signals credit rationing, which is the driving force behind business cycles in the Calomiris-Hubbard model.

The problem with attempting to apply this model to an actual historical episode is that interest differentials can arise also for a variety of other reasons. One, acknowledged by Calomiris and Hubbard themselves, is exchange risk. If, for example, there is a danger that a country will suspend gold convertibility and devalue, investors will demand a higher currency. Garber and Grilli (1986) among others explain the high level of interest rates in the United States in the 1890s, when the free silver movement raised the specter of monetary inflation and devaluation, on these grounds. Fratianni and Spinelli (1984) make a similar argument for Italy, a country threatened repeated with inconvertibility due to balance of payments problems.13/

More generally, investors will demand to be compensated with a premium in order to devote a growing share of their portfolios to the liabilities of a specific country, as in the model of the gold standard developed in Floyd (1984, chapter 4).
Balance-of-payments adjustment will be associated with changes in international interest differentials even if asset and commodity markets are perfectly integrated, interest rates rising in the deficit country and falling in the surplus country.14/ Observed interest differentials are likely to reflect some combination of credit rationing and these portfolio effects.

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Complementing the literature suggesting that the gold standard was conducive to the equalization of commodity prices across countries is a second literature emphasizing the tendency of the gold standard to stabilize the price level over time. Barro (1979) formalized the argument, due to Mill (1865) and Mundell (1971), that the gold standard stabilized price levels through the reaction of gold supplies. Given gold stocks and money supplies, economic growth tended to put downward pressure on price levels through the operation of the quantity equation. With national monetary authorities pegging the own-currency price of gold, the decline in commodity prices was equivalent to a rise in the relative price of gold. Insofar as commodity prices and costs of gold mining move together, the decline in prices should have induced a reallocation of resources toward the gold-mining industry and elicited increased production, augmenting the monetary gold stock and reversing the fall in the price level. These conclusions are modified when the characteristics of gold as a depletable resource are acknowledged, of course. Bordo and Ellson (1985) show that there is an inescapable tendency to long-run deflation when account is taken of the resource constraint.

Empirical support for the operation of this mechanism is less than compelling. Rockoff (1984) concluded from his study of mining and prospecting that gold supplies depended more on chance discoveries than on changes in the real price of gold. McKinnon (1988) went further, arguing that gold discoveries largely unrelated to price-level trends were the main source of instability in the operation of the classical gold standard. Other authors like Bordo (1981) look not at gold mining per se but at the price-level stability that it was supposed to produce. Bordo's conclusions are mixed: he finds for Britain that the standard deviation of prices was somewhat lower during the four decades of the classical gold standard than during the post-1913 period; for the United States, it was slightly higher. This skeptical position is buttressed by Cooper

(1982) and Callahan (1984), who find little evidence that prices were easier to predict in the gold standard years.

Another approach is to consider short- rather than long-run price-level movements, and to focus not on mining but on shifts of existing gold between monetary and nonmonetary uses. Barksy and Summers (1988) and Lee and Petruzzi (1986) observe that asset market equilibrium implies a relationship between rates of return on gold and other nonmonetary assets. If a productivity disturbance increases the real return on financial capital, investors will reduce the share of their portfolios devoted to alternative assets such as gold. Investors discouraged from holding gold by the incipient fall in its relative rate of return will sell it to the monetary authorities, who will use it to expand the money supply, raising the price level. Hence the positive correlation between the interest rate and the price level known as Gibson's Paradox.15/

The implication is that the price level may be unstable under a gold standard not just because of chance gold discoveries, as emphasized by McKinnon, and because of developments affecting the demand for money, but also because of shocks affecting portfolio behavior that induce shifts in the demand for nonmonetary gold, destabilizing the money supply. The quantitative importance of the mechanism remains to be adduced, however.

This literature also has implications for the debate over the validity of the Fisher effect in the gold standard years. If productivity disturbances were random and unpredictable, the same would have been true of the price-level changes they produced. Agents' best estimate of the inflation rate would have been zero. Hence actual (current and lagged) inflation would not have been incorporated into nominal interest rates, even had investors been prepared to respond to anticipated inflation in the manner predicted by Irving Fisher. This is the conclusion reached by Barsky (1987). But if the

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Mill-Barro gold mining mechanism also comes into play, there may be serial correlation in inflation rates over long intervals. The British data in fact display some evidence of negative serial correlation at longer lags. If so, price-level changes may have been predictable, but their effects still would not be captured by investigators who use only lagged inflation as a proxy for expected inflation.16/

The alternative to the monetary approach is represented by contributions emphasizing not stock equilibrium in money markets but stock-flow interactions in bond markets, itself a central element of Ford's analysis. Contributions that followed quickly on the heels of Ford's 1962 book include Lindert's (1969) study documenting reliance on foreign exchange reserves in the pre-1913 period; Bloomfield's (1968) study documenting the importance of long-term capital movements in provoking imbalances in the international accounts; and Bloomfield's (1963) study documenting the importance of short-term capital movements in accommodating those imbalances. The unifying theme running through this work was that international capital markets played a more important role in the operation of the gold standard than suggested in traditional accounts.

The introduction of capital movements into models of the gold standard drew attention to the role of central banks in managing the monetary mechanism. The locus classicus of this literature is the work by Nurkse (1944) and Bloomfield (1959) on the rules of the gold standard game. Using annual data for a cross section of countries in the 1920s and 1930s, Nurkse demonstrated that the domestic and foreign assets of central banks moved together, as required by the rules of the game, on only a minority of occasions. He concluded that the stability of the classical gold standard relative to its interwar successor was attributable to the greater propensity of central bankers to play by the rules of the game. Upon replicating Nurkse's analysis for the pre-1914 period,

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Bloomfield found no greater tendency to obey the rules, however. This finding was paradoxical, since it raised the question of how the classical gold standard had operated so successfully if central banks systematically sterilized reserve flows.

The paradox led subsequent investigators to study the behavior of individual central banks in an effort to better characterize their behavior. Goodhart (1972) estimated one of the first central bank reaction functions for the gold standard years, finding little evidence that the Bank of England played by the rules of the game. A resolution to the paradox was suggested by Pippinger (1984), who argued that existing studies failed to distinguish adequately between short- and long-run responses. Short-run sterilization may have been compatible with the stability of the gold standard so long as it was reversed subsequently. In the long run, central banks had to reduce monetary liabilities in response to a decline in gold reserves or risk the suspension of convertibility. Pippinger's specification distinguished the short- and long-run responses of the Bank of England, and led him to conclude that there was considerable sterilization in the short run but validation of reserve movements in the long run.17/

Discount policy depended not only on current gold flows, of course, but also on anticipated future gold flows. And anticipated future flows depended in part on changes in policy abroad. Eichengreen (1987) and Giovannini (1989) therefore analyzed the strategic interaction of central banks, using discount rates as a measure of policy stance, Eichengreen arguing in favor of more extensive strategic interaction than Giovannini. But both authors found evidence of asymmetries in the behavior of different central banks. Certain central banks, like the Bank of England, seem to have played a disproportionate role in the determination of discount rates worldwide. When the Bank of England raised her rate, the Bank of France and the Reichsbank were quick to follow.

While the Bank of England also responded to changes in monetary policy abroad, it did so to a considerably lesser extent.

The recognition that the gold standard was actively managed by national central banks interacting in an international setting can be developed in two directions. One is additional study of the political economy of economic policymaking, as in de Cecco (1974) and Gallarotti (1988). The other is to search for economic foundations of the asymmetries that characterized international monetary interactions. Lindert (1969), for example, argues that asymmetries stemmed from differences across countries in the depth of domestic financial markets and the value of foreign investments. Deep domestic markets and extensive foreign investments rendered some discount rates, notably that of the Bank of England, more powerful than others. Hence foreign central banks concerned with their reserve positions were forced to respond quickly to Bank rate changes in London, while the Bank of England could restore her reserve position to desired levels with only modest changes in interest rates, even after considerable delay.18/

Another possible source of asymmetry, popularized by Hawtrey, was London's prominence in primary commodity markets. Not only was Britain the leading importer of primary products, but London provided the bulk of the short-term credits that financed inventories of primary commodities. A higher Bank rate increased inventory-carrying costs, causing stocks of raw materials to be dumped on the market. Thus, a rise in Bank rate had an exceptional ability to strengthen the British balance of payments: in addition to its other effects, it induced the liquidation of commodity stocks, depressing their price, improving Britain's terms of trade, and reducing the cost of her imports. The time-series evidence does not lend overwhelming support to this interpretation (Moggridge, 1972), although a careful study remains to be done.

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These asymmetries may help to shed light on the very different experiences of countries at the center and the periphery of the gold standard system. All too few authors have followed Ford's lead in focusing on the special difficulties of less developed countries in maintaining gold convertibility. The gap is surprising, since a useful byproduct of the asset market approach to modeling the balance of payments has been models of balance of payments crises (Krugman, 1979). These are directly applicable to the problem of a run on the gold reserves of a central bank striving to maintain a gold standard parity. Analyses of stability and crisis under the gold standard remain rare. One of the few examples is Dornbusch and Frenkel (1984), who develop a model of central bank management of the gold standard and suggest that, if the central bank's reserve-deposit falls to low enough levels, actions which normally attract bullion from abroad instead may undermine confidence, with destabilizing effects.

Those few studies which have considered the question from the perspective of the periphery analyze the gold standard in conjunction with the periods of inconvertibility with which it alternated. Fishlow (1987) has considered the factors that tended to produce balance-of-payments difficulties for Latin American countries in the gold standard years.19/ His conclusions are consistent with Ford's interpretation of Argentine experience: that the countries of the periphery endured special difficulties due to the synchronization of capital- and commodity-market shocks. When countries like Britain suffered a decline in exports, the Bank of England could restore external balance by raising interest rates so as to discourage foreign investment. But the countries of Latin America, many of which lacked even a central bank, had no control over the direction of international capital flows. Moreover, disruptions to their export markets rendered them less desirable places to invest. Hence they simultaneously suffered declines in export revenues and in capital inflows. Fishlow concluded that the relative importance of the

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shocks varied across countries, however. Fluctuations in capital inflows mattered more for Argentina and Chile than for Brazil. Changes in real export receipts mattered more for Argentina and Brazil than for Chile. Thus, the "Ford hypothesis" that Latin American countries were buffeted simultaneously by capital- and commodity-market shocks seems to have been primarily a hypothesis applicable to Argentina, logically enough since that was the country studied by Ford.

Even after controlling for external disturbances, Fishlow found that the balance of payments of all three countries was significantly affected by changes in domestic money supply. In other words, the failure of these countries to adhere to the rules of the game, and not merely the severity of the external shocks they suffered, explains their repeated bouts of inconvertibility. The traditional interpretation of this failure is the political power of export and debtor interests: inflation and depreciation benefited politically influential landowners with mortgages and exporters competing in world markets. Fishlow suggests, however that this interpretation may impute too much foresight and influence to these special interests. Responsibility for the excesses of monetary policy resided, ironically, with the banking and financial communities. There was a growing feeling throughout Latin America in the late-19th century that banking and financial development had lagged behind the needs of the economy. Ample liquidity was seen as conducive to the expansion of the banking system and to the invigoration of financial markets. Unfortunately, more than liquidity was needed to promote the financial deepening. Rather than financial development, the result of rapid monetary expansion was inflation, inconvertibility and depreciation.

The view that domestic policy was responsible for external difficulties at the periphery was common among foreign investors. Creditors rightly focused on the incompatibility of domestic monetary policy with gold convertibility. In their view,

exchange rate instability resulted not from periodic shortfalls of export receipts but from domestic profligacy. It mattered little whether the exchange rate was marginally overvalued so long as the growth of global export markets was maintained. What mattered was to restrain the tendency toward excess on the part of Latin American governments. Hence the propensity of foreign lenders to require restoration of the gold standard as a prerequisite for renewed foreign lending (Fishlow, 1989). Going off the gold standard could be embarrassing and damaging to a government which had invested considerable importance in its restoration. Having associated their reputations with successful maintenance of the gold standard, governments had an incentive to exercise discipline in their conduct of monetary and fiscal policies. This incentive vested their promises to pursue policies consistent with exchange rate and price stability with new credibility.[20] Somewhat ironically, the role of the gold standard as a credibility-creating device was most prominent on the fringes of the gold standard system.

II. Notes on the Working of the Gold Standard Before 1914 [21]

This review of the literature provides another opportunity to pose the perennial question of how the gold standard worked. In this section I essay a provisional answer to that question. The methodology employs economic theory and historical data very much in the manner of Alec Ford.

In The Gold Standard, 1880-1914, Ford analyzed time series data for Britain and Argentina, without estimating a formal structural model of their balances of payments. Using time-series plots, he described first differences of exports, imports, foreign lending, net gold movements and the like. He then calculated correlation coefficients for pairs of these variables, and used them to inform his story of how the gold standard worked.

In this section, I proceed in similar fashion. Rather than specifying and estimating a structural model, I begin with significantly less structured data analysis, which considers correlations among the relevant variables in the time domain. The technique is a straightforward extension of Ford's methodology, namely vector autoregression. I regress each element of a vector of endogenous variables on lagged values of itself and lagged values of the other variables. The estimated coefficients can be used to summarize the correlations between a variable of interest and lagged values of the other variables. Impulse-response functions, in which the error term in one of these equations is perturbed and the dynamic response of the system is traced out, can be used to trace out the consequences of various disturbances.

Vector autoregression reveals little about economic or historical causality. It is unlikely to tell us much about the ultimate causes of balance-of-payments problems under the gold standard.22/ It simply summarizes the relevant correlations in a digestible form. Simulations using the estimated coefficients may help us to narrow the range of plausible models consistent with the facts, although there may be more than one model which satisfies this consistency criterion. Ultimately, other economic or historical evidence will be required to arrive at a satisfying interpretation.

Britain's experience is only one part of the larger gold standard story, as Ford's work makes clear. But an analysis of international adjustment by Britain, the center country of the international gold standard, is a logical starting point for any such study. Here I limit the statistical analysis to data for Britain.

The six variables upon which I concentrate are the volume of British exports, the volume of British imports, Britain's international terms of trade (export prices relative to import prices), the Bank of England's discount rate, gold reserves, and the volume of

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FIGURE 1.   BANK RATE AND GOLD RESERVE
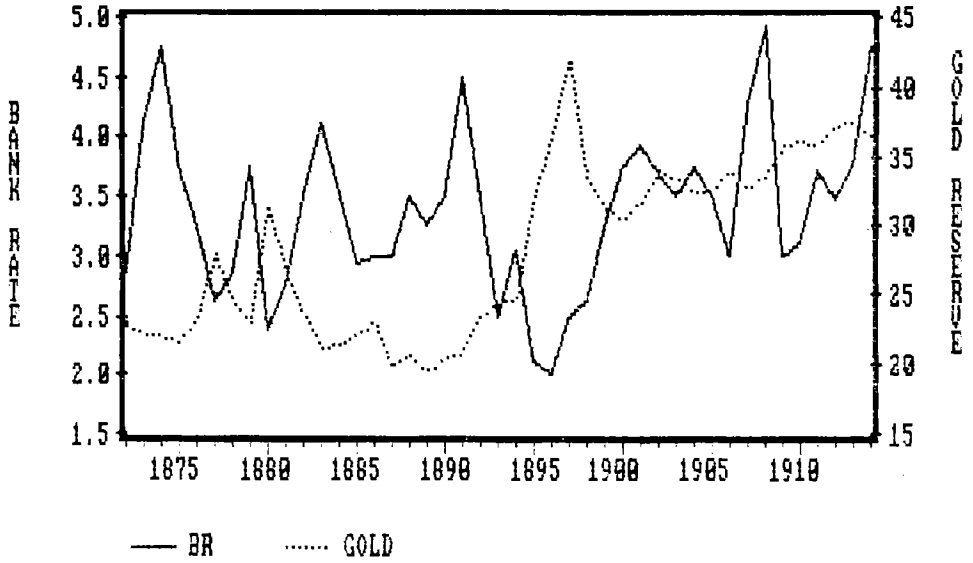
British foreign lending. This is the minimal list of variables necessary to capture the most important disturbances to the British balance of payments and the most important channels through which balance-of-payments equilibrium was restored. The foreign lending variable is new issues for overseas borrowers (calls) on the London capital market, from Simon (1968), transformed to constant prices using the GNP deflator. Gold reserves (gold in the Issue Department of the Bank of England) are drawn from Mitchell and Deane (1962). The Bank of England's discount rate is drawn from Palgrave (1903), as supplemented by the Economist Magazine. The remaining variables are drawn from Feinstein's (1972) national income accounts. All variables are for the period 1871-1913.

A. Statistical Analysis

Figures 1 through 5 juxtapose the gold flows against the other five variables. Figure 1 shows the well-known tendency of the Bank of England to adjust Bank rate in response to changes in its gold reserve. Generally, as the reserve rises Bank rate is reduced, although there are exceptions to the rule. Figure 2 juxtaposes the gold reserve and the real value of new issues on behalf of overseas borrowers. Here too there is some evidence of the expected inverse correlation. Generally speaking, as the volume of overseas lending rises, the gold reserve tends to fall.

Interpretation of the remaining three figures is less straightforward. Figures 3 and 4 display the change in the volume of British imports and exports along with the gold reserve. (Since import and export volumes trend strongly upward over the period, first differences are displayed in Figures 3 and 4.) Although there is some, rather weak evidence in Figure 3 of positive comovements between imports and gold reserves (as if the accumulation of reserves allowed an expansion of money supply which fueled the demand for foreign goods), a notable feature of Figure 3 is that the upward shift in the

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FIGURE 2.   NEW ISSUES AND GOLD RESERVE
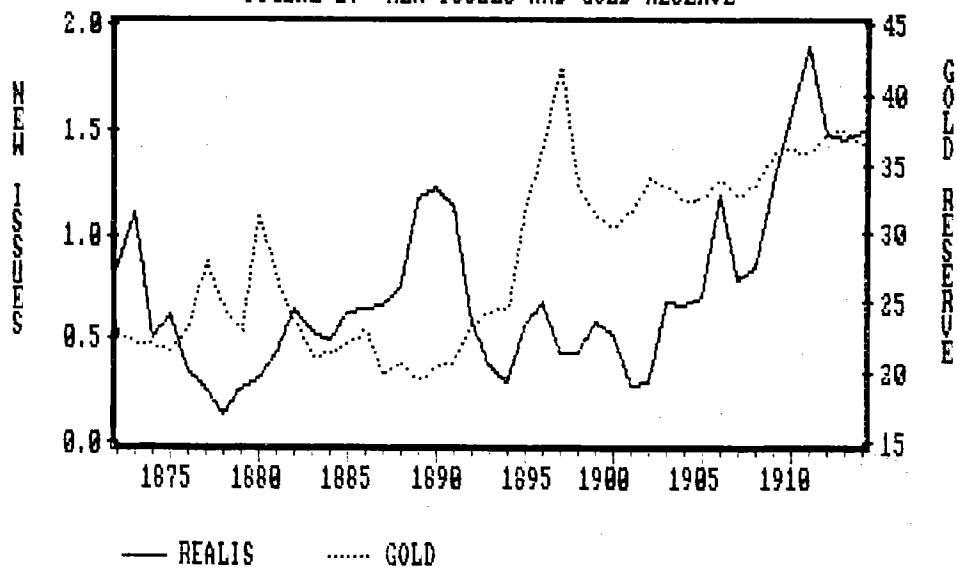
gold reserve in the 1890s was not accompanied by a comparable shift in the growth of imports. Figure 4 makes a similar impression: export volumes and gold reserves move together (with notable exceptions like the 1907 panic), but once again there is little noticeable upward shift in export growth in the 1890s.

Finally, Figure 5 juxtaposes the terms of trade against the Bank of England's gold reserves. There is some evidence of sympathetic movements in the two series, albeit with long and variable lags. In the 1870s and 1880s, movements in gold seem to lag behind the terms of trade, while in the 1890s and 1900s, the opposite if anything is true.

Table 1 shows correlation coefficients for the six variables, all expressed in level form. The strongest correlation is between exports and imports. The important question is whether fluctuations in one component of the trade balance responded to fluctuations in the other, or whether both responded contemporaneously to movements in other variables. Both exports and imports appear to have been tightly linked to the level of the gold reserve. There is evidence of a strong contemporaneous correlation between foreign lending and exports, as noted previously by Ford, raising anew the question of the direction of causality.

Table 2 reports the results of regressing each of these variables on three own lags and three lags of each of the other variables.[23] The sample is 1874-1913 to allow for lags. The figures reported are the confidence intervals implied by F-statistics testing the joint significance of lagged values of an explanatory variable. The null hypothesis is that lagged values of a variable are jointly unrelated to current values of the dependent variable. An entry of 0.05, for example, indicates that the null hypothesis of no association can be rejected at the 95 per cent confidence level.

The first column summarizes influences on the Bank of England's discount rate. By far the most important determinant of changes in Bank rate (other than its own lags) is
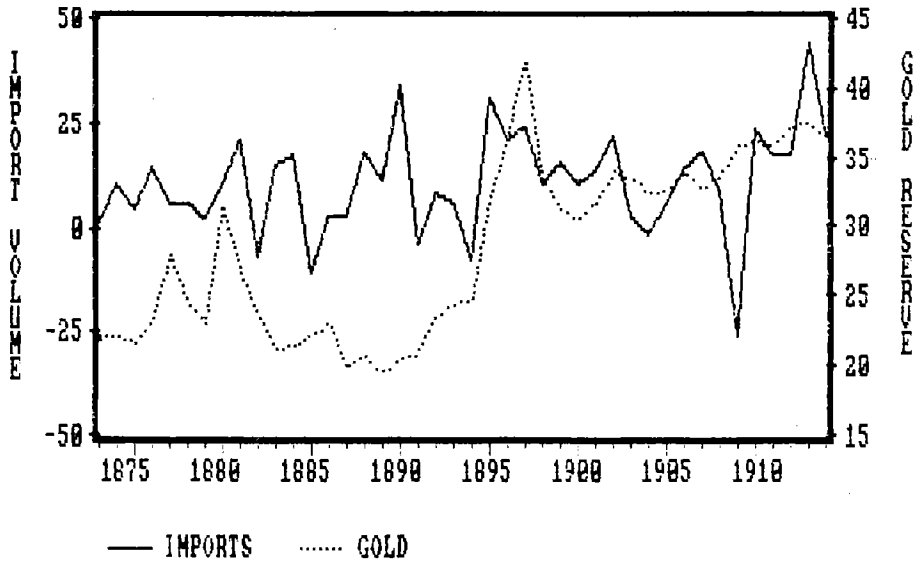
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FIGURE 3.   CHANGE IN IMPORT VOLUME AND GOLD RESERVE

IMPORTS   ⋯⋯ GOLD

Table 1
Correlation Coefficients

	New Issues	Exports	Imports	Terms of Trade	Gold Reserve
Bank Rate	0.291	0.295	0.224	0.315	-0.114
New Issues	-	0.701	0.535	0.084	0.293
Exports	-	-	0.961	0.332	0.723
Imports	-	-	-	0.462	0.801
Terms of Trade	-	-	-	-	0.432

Notes: Sample period for all variables is 1871-1914.

Source: See text.

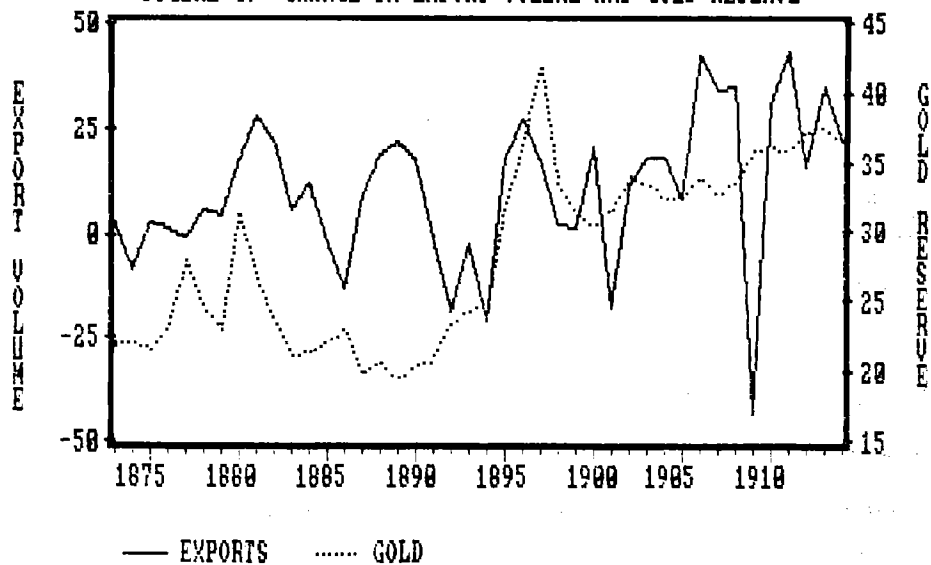FIGURE 4. CHANGE IN EXPORT VOLUME AND GOLD RESERVE

Table 2
Statistical Significance of Independent Variables
(Confidence Levels at which F-Statistics
Indicate Null Hypothesis Can be Rejected)

Dependent Variable

Independent Variable	Bank Rate	New Issues	Exports	Imports	Terms of Trade	Gold Reserve
Bank Rate	0.049	0.810	0.334	0.403	0.281	0.766
New Issues	0.051	0.019	0.143	0.242	0.714	0.518
Exports	0.448	0.114	0.006	0.913	0.584	0.482
Imports	0.049	0.043	0.098	0.044	0.272	0.456
Terms of Trade	0.078	0.554	0.340	0.241	0.015	0.021
Gold Reserve	0.002	0.616	0.712	0.781	0.161	0.008

Source: See text.

FIGURE 5.   TERMS OF TRADE AND GOLD RESERVE
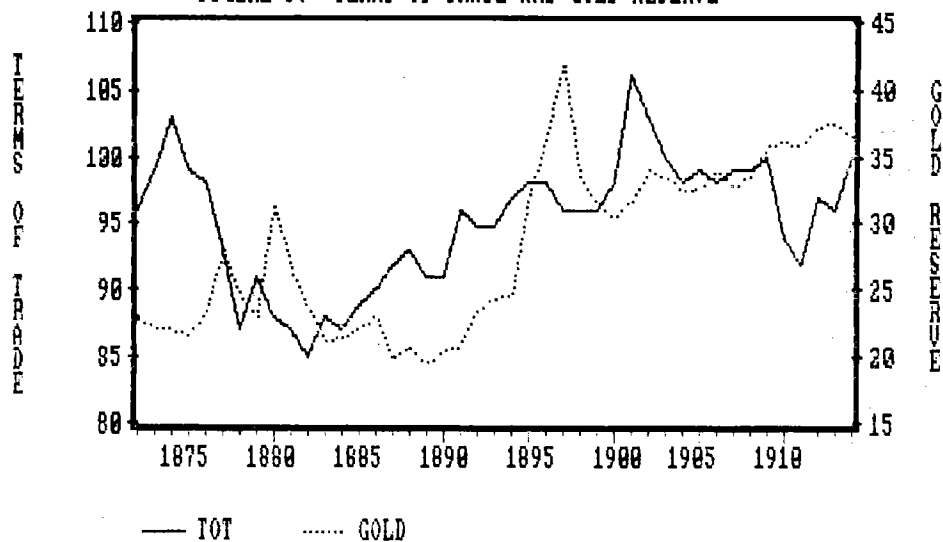
changes in gold in the Issue Department, plausibly enough given the Directors' concern with changes in gold reserves. There is some evidence that Bank rate was raised in response to increases in the volume of imports and foreign lending. The obvious interpretation is that these variables were viewed as leading indicators of balance of payments trends and hence of future gold flows.

The second column, which summarizes influences on the volume of overseas lending, paints a different picture. Changes in Bank rate, in gold flows, and in the terms of trade display little association with movements in new foreign issues. Only lagged changes in British imports (and, to a lesser extent, exports) have much tendency to "produce" a change in new foreign lending. It is difficult to determine, on the basis of these correlations, whether it is more appropriate to regard fluctuations in new foreign lending as induced by swings in other components of the balance of payments or as relatively autonomous, as suggested by Ford.24/

The strongest influence on British exports (other than their own lagged values) is British imports. The two variables covary positively. Apparently, business cycle movements which raised British imports subsequently induced a rise in British exports which served to moderate the deterioration in the balance of trade. One can imagine a two-country model in which the rise in British imports stimulated economic activity abroad through the export multiplier, raising foreign incomes and stimulating demands overseas for British exports. There is also evidence of a less definitive nature that a rise in British foreign lending was followed by a rise in commodity exports. Ford suggested that British funds lent to regions of recent European settlement were disproportionately devoted to investment projects, creating a demand for imported capital goods and stimulating British exports. There is some support in the table of what Ford called the

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"sensitivity" of British exports "directly and indirectly" to British overseas lending, but the evidence is far from overwhelming.25/

Imports appear to have been little affected by changes in Bank rate or other variables. If monetary policy was effective in influencing the evolution of the balance of payments, it appears to have operated mainly by influencing other components of the external accounts. Similarly, the terms of trade do not appear to have been directly responsive to the Bank of England's discount rate. There is little evidence in Table 2 of the "Triffin Effect" -- the tendency of a rise in Bank rate to induce liquidation of commodity stocks and strengthen Britain's terms of trade, although the impact of changes in Bank rate on the terms of trade is more pronounced than its impact on foreign lending, exports, imports or gold flows.26/ Indeed, the dominant impression that emerges from the first row of the table is that Bank rate had only a weak impact on the British balance of payments. This is consistent with Sayers' (1936) conclusion that, for much of the period, the Bank of England was still struggling, with mixed success, to render its discount rate effective, and with Ford's conclusion that the power and influence of Bank of England monetary policy has been exaggerated.

The final column of Table 2 shows that lagged values of most of the variables under consideration had only a weak direct impact on the Bank of England's gold reserve. (Those variables still could have affected the reserve indirectly, a possibility considered below.) However, lagged values of the terms of trade do exhibit an association with the Bank of England's reserve, which may give pause to those inclined to dismiss the relevance of the price-specie flow mechanism.

The above are partial equilibrium inferences. To focus attention on general equilibrium repercussions, Figures 6 through 11 show the response of the system to perturbations to the disturbance terms in three of these equations. (The equations are

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FIGURE 6. IMPULSE RESPONSE TO SHOCK TO FOREIGN LENDING

NEW ISSUES

TERMS OF TRADE

BR

GOLD

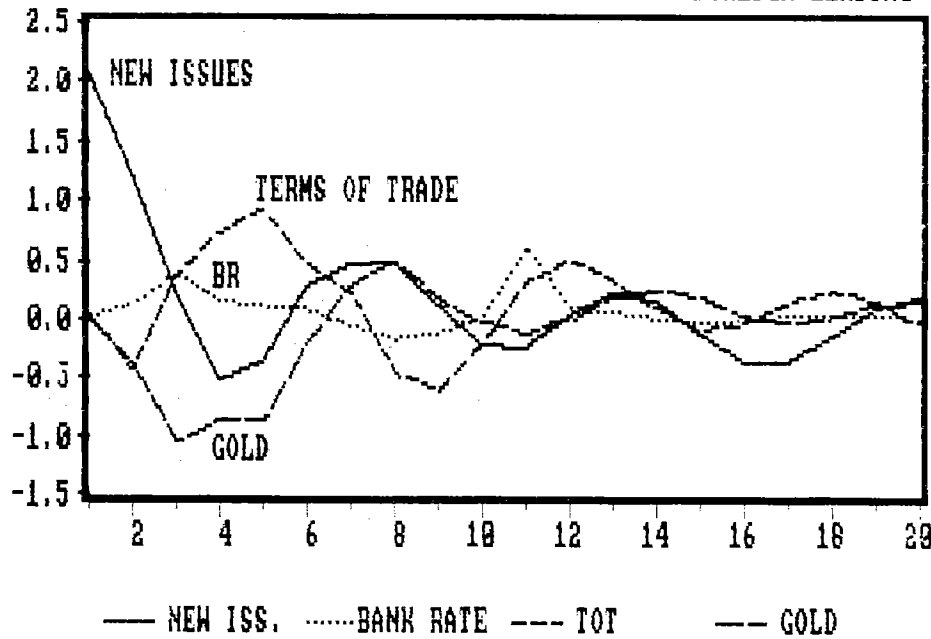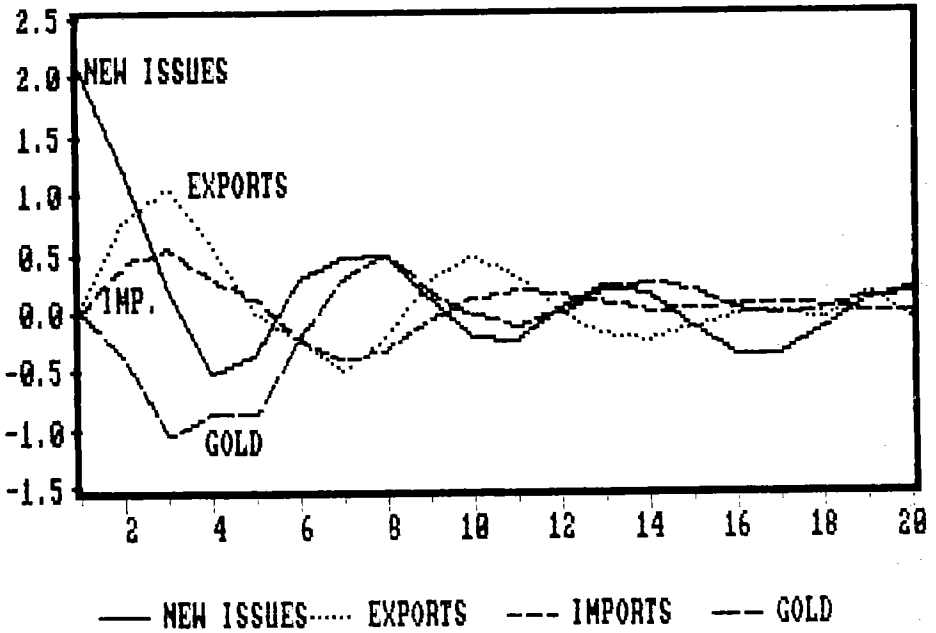—— NEW ISS. ·······BANK RATE ——— TOT   —— GOLD

FIGURE 7. IMPULSE RESPONSE TO SHOCK TO FOREIGN LENDING

first transformed to moving-average form, as is standard in the literature.) The resulting system is then perturbed, in turn, by a one standard deviation to the disturbances to the foreign issue, export, and gold equations.27/ I interpret the three disturbances as temporary shocks to the capital account, the current account, and to confidence.

Consider first the response, depicted in Figures 6 and 7, to a temporary increase in new foreign lending. The autonomous weakening of the balance of payments produces an immediate gold outflow. The Bank of England's discount rate is raised, presumably in an effort to damp the loss of reserves. The volume of new foreign issues falls back toward pre-disturbance levels, as if higher British interest rates increase the attractiveness of domestic investment. Indeed, the volume of new foreign issues declines temporarily below its steady state level, due one supposes to higher domestic interest rates.

The response of the current account of the balance of payments is less straightforward. Exports rise relative to imports with the initial weakening of the capital account (Figure 7). The rise in exports is associated initially with some deterioration in Britain's terms of trade, as if the relative price of British goods had to decline in order to stimulate their increased absorption overseas. But by the second year following the shock, the terms of trade have recovered fully. From years three through seven, they are above their steady state level, as if the surge in foreign lending, once it had time to work its way through the system, shifted rightward the foreign demand curve for British goods.

Figures 6 and 7 may say something about the geographical source of shocks to British foreign lending. If shifts from domestic to foreign investment had been produced by increases in the marginal efficiency of capital overseas, this should have provoked a rise in import demand overseas at the same time it attracted financial capital from Britain. The rise in foreign demand should then have strengthened Britain's terms of trade. If, in contrast, shifts from domestic to foreign investment had been produced
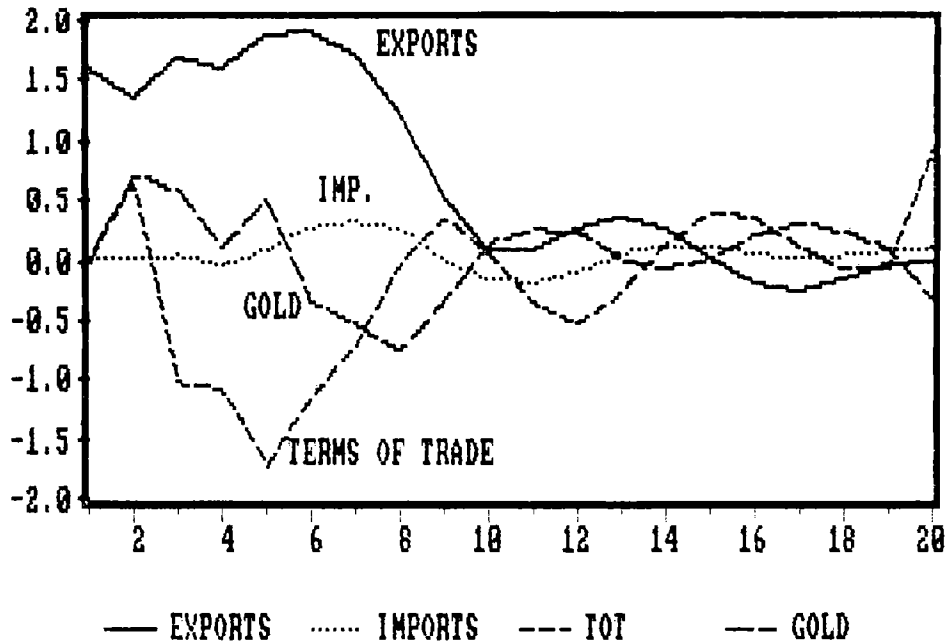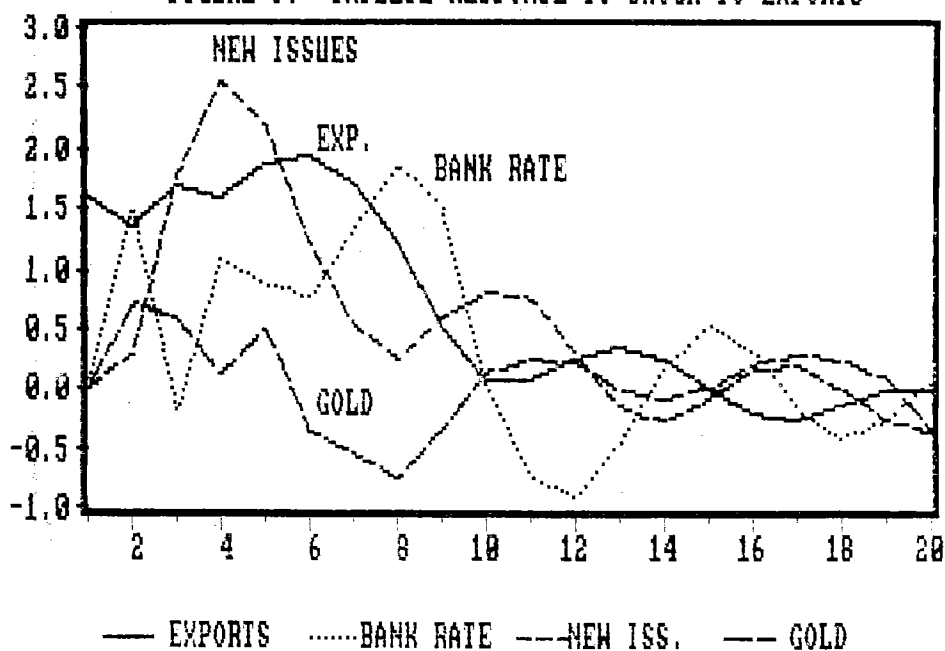
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FIGURE 8. IMPULSE RESPONSE TO SHOCK TO EXPORTS

FIGURE 9. IMPULSE RESPONSE TO SHOCK TO EXPORTS

—— EXPORTS ·······BANK RATE ———NEW ISS. —— GOLD

mainly by inward shifts in the marginal efficiency of capital schedule at home, this should have provoked a decline in domestic demand and a deterioration in Britain's terms of trade sufficient for an increased share of domestic output to be willingly absorbed abroad. There is support for this interpretation in the fact that Britain's terms of trade deteriorate on impact, although their subsequent tendency to strengthen is subversive of that conclusion.

A possible resolution of the paradox may be to argue that foreign shocks in fact drove the fluctuation of foreign lending over the cycle, but that foreign households and firms could not finance their increased notional demand for imports from Britain due to a binding balance-of-payments constraint. They had to wait for the response by British investors and the receipt of long-term capital inflows before increasing their purchases of British goods. Figures 6 and 7 support this interpretation. Thus, the domestic demand for British goods declined initially, as financial capital was shifted from home to overseas investment in response to the productivity shock abroad. Over time, overseas investors begin to devote their increased sterling balances to purchases of British goods, driving up British export prices. Thus, following their initial deterioration, Britain's terms of trade quickly strengthen. Exports rise steadily. It indeed appears that in the short run an increase in British foreign lending provoked or facilitated little rightward shift in the demand schedule for British exports, but that over time British lending began to translate into a rise in foreign expenditure, including expenditure on imports. Eventually, these effects damp out, as exports, foreign lending and the terms of trade return to their steady state levels. But over the intermediate run, from two to six years following the shock, the terms of trade strengthen relative to their steady state level.

Figures 8 and 9 show the response to a temporary increase in exports. The autonomous rise in export revenues strengthens the balance of payments and leads

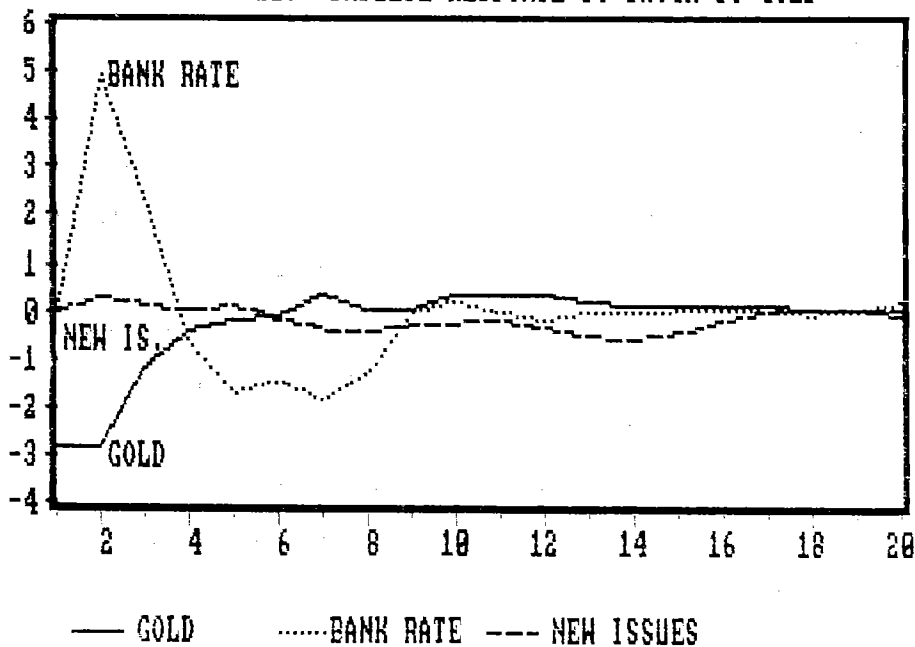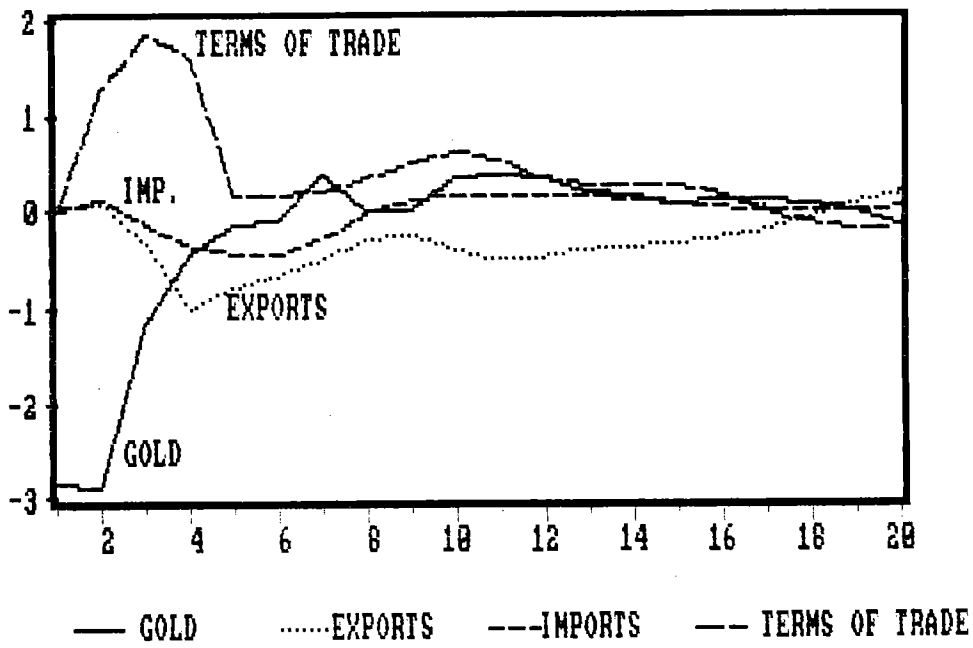FIGURE 18. IMPULSE RESPONSE TO SHOCK TO GOLD

— GOLD ⋯⋯BANK RATE --- NEW ISSUES

FIGURE 11.   IMPULSE RESPONSE TO SHOCK TO GOLD

—— GOLD   ·······EXPORTS   ---IMPORTS   — — TERMS OF TRADE

initially to an accumulation of gold reserves. But the gold inflow is quickly attenuated. Imports rise in response to the export boom. Long-term foreign lending also rises (Figure 9). Presumably, the rise in demand overseas for the products of British industry increased British incomes, provoking the rise in import demand.

That foreign lending rises rather than falling following the autonomous increase in exports is helpful for distinguishing between two competing interpretations of the export shocks experienced by the British economy. If exports had tended to fluctuate mainly in response to productivity shocks at home, the logical consequence of a positive shock to export capacity would have been to render domestic investment more attractive relative to foreign investment, and to produce a decline in new foreign issues. If in contrast exports tended to fluctuate primarily because of external shocks to incomes overseas, a positive shock to exports would have rendered foreign investment more attractive relative to domestic investment, and one would have expected foreign lending to rise. It is the second case that is observed. The notion that the fluctuation of British export markets was driven mainly by disturbances abroad is supported by the initial improvement in the terms of trade following the positive export shock. If fluctuations in capacity at home rather than in demand abroad had been the primary source of British export cycles, one would expect to see the relative price of British exports decline (the terms of trade deteriorate) following a positive export shock, whereas they improve initially. The explanation for the subsequent deterioration in the terms of trade is less evident.

Figures 10 and 11 show the response to a temporary, one standard deviation fall in gold reserves. By construction, the initial gold outflow is not associated with a rise in imports, a fall in exports, or an increase in long-term lending abroad. Thus, the disturbance can be interpreted as a purely financial shock -- say an autonomous short-term capital outflow. In response to the loss of reserves, the Bank of England

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raises its discount rate. Reserves recover quickly. It would appear that the principal

channel through which adjustment to short-term capital outflows took place was the

response of the Bank of England and its capacity to attract capital flows. Interestingly,

there is little evidence of an improvement in the trade balance following the loss of gold

reserves. To the contrary, the fall in export volume which takes place in response to the

loss of reserves and the rise in Bank rate swamps the fall in import volume. The

behavior of exports is attributable, presumably, to the decline in economic activity

induced by the financial market disturbance and the higher interest rates it provokes.

The decline in export volume is offset, however, by some improvement in the terms of

trade. The two effects roughly cancel, yielding little net change in the current account of

the balance of payments.

B. Interpretation

The metaphor for the balance-of-payments adjustment mechanism that the statistical

analysis suggests is a slim man in a winter storm. Like a slim man with little flesh on

his bones, the Bank of England had only a slim gold reserve surrounding a vulnerable

gold standard frame. To survive in a winter storm, a slim man must dress in layers of

clothing to insulate himself from the cold. The Bank of England similarly possessed

several layers of insulation to protect itself from the elements. I describe the nature of

this insulation by considering export, foreign lending and confidence shocks in turn.

The first layer of insulation from export fluctuations was provided by parallel

movements in imports. A foreign expansion which raised the volume of British exports

induced parallel movements in imports through two channels: first, the terms-of-trade

improvement provoked by the rise in the overseas demand for British exports reduced the

relative price of British imports; second, the rise in export demand stimulated domestic

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production in Britain, increasing the need for intermediate imports and, by raising real incomes, further augmenting the demand for imported consumer goods. Thus, even when trade flows were the source of the external imbalance, they also provided the first layer of insulation.

But induced changes in imports financed only a fraction of autonomous fluctuations in exports. The second layer of insulation was provided by changes in foreign deposits and security holdings. Countries which made up Britain's principal overseas markets tended to hold sterling balances in London. Instead of demanding that the Bank of England convert into gold any sterling balances they acquired from export sales, often they invested in securities in London. In effect, a British trade deficit automatically generated a short-term capital inflow which helped to relieve the pressure on the external accounts.

The third layer of insulation was provided by the banking system through the mechanism emphasized by Whale. Insofar as the autonomous rise in export demand stimulated industrial activity, it increased domestic demands for money and credit. Interest rates were driven up, and short-term capital was attracted from abroad. The increase in circulating media was provided by the banking system, partly in response to its receipt of short-term deposits from abroad.

The fourth and final layer of insulation was provided by the Bank of England. The Bank could raise its discount rate in response to gold losses to attract capital inflows. Characterizing the Bank's role in this way serves to remind that, while the balance-of-payments adjustment process was far from automatic, neither did hinge exclusively on discretionary management by the Bank of England.

The sources of insulation that came into play in response to swings in foreign lending were essentially the same, although their relative importance differed. When

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new issues for an overseas borrower were floated, the proceeds would be deposited to the borrower's London account. In the first instance, then, new foreign lending led to no change in Britain's balance of payments position. Only over time, as those deposits were drawn down, would the British balance of payments weaken and might the Bank of England begin to lose gold. In the short run, therefore, foreign deposits were Britain's first layer of insulation and the only insulation required.

As the borrower subsequently drew down its deposits to finance purchases of imports, British exports would begin to rise. The importance of this mechanism should not be exaggerated. Typically, a borrower like Canada or Australia would use only a portion of any increase in foreign funds to import commodities and equipment. Only a portion of any such purchases would come from Britain. It is possible, of course, that the demand for British exports was stimulated indirectly. If Canada purchased imports from the United States, the stimulus to U.S. incomes might lead to increased American imports of British goods. But this circular mechanism was subject to leakages which attenuated its operation and built lags into the response of British commodity exports to prior foreign lending.

There was, nonetheless, at least some response of commodity exports to prior foreign lending. At the same time, since investment had shifted from the domestic to the foreign market, economic activity at home would decelerate, generating a sympathetic fall in British imports. Thus, a strengthening of the trade balance was Britain's second layer of insulation.

The final layer of insulation was again provided by the Bank of England. The Bank could raise its discount rate and induce an inflow of short-term capital to partially offset the outflow of long-term funds.

The response to an autonomous outflow of gold not associated with a fall in exports or a rise in foreign lending -- in other words, a shock to confidence -- was very different. There was no reason for foreign deposits to rise or for the trade balance to strengthen. Thus, Britain's two outer layers of insulation were stripped away. The burden of adjustment was placed squared on the Bank of England.

It is not obvious how the Bank of England so successfully shouldered this burden. Part of the explanation is that the British authorities attached clear priority to defense of the gold standard. If the nation simultaneously experienced gold losses and a cyclical downturn, or gold losses and financial panic, there was no question that the authorities attached priority to defense of the monetary standard, even if this implied an intensification of domestic difficulties. They had demonstrated their commitment to the gold standard in 1847, in 1866, and on numerous other occasions. The impact of monetary policy on domestic activity, while vaguely understood, had not been clearly articulated, as it was by Keynes and others in the 1920s. Prior to the extension of the franchise and the rise of the Parliamentary Labour Party, there could be little effective pressure to adapt monetary policy toward employment targets.

To use modern terminology, the Bank of England had acquired a reputation for action that rendered its commitment to the gold standard fully credible. There was no need for domestic or foreign depositors to run on the Bank as a way of testing that commitment. To the contrary, in times of difficulty, short-term capital would tend to flow toward Britain in anticipation of official intervention. If sterling fell toward the gold export point, speculators purchased it in anticipation of official actions designed to strengthen the exchange rate. Intervention would be rendered largely redundant.

The Bank's gold reserve was small in comparison with Britain's external obligations. It is not obvious, therefore, how it succeeded in defending its reserve and maintaining

convertibility in instances like 1890 and 1907 when the shock to confidence and consequent gold flows were large relative to the Bank's reserve. Part of the explanation is that by 1890 the official commitment to the gold standard was not merely national but international. The Bank of England could rely on assistance from abroad, notably from the Bank of France. The resources available for sterling's defense were not limited to those of the Bank of England. In 1890, in response to the Baring Crisis, the Bank of England obtained, with the aid of Rothchilds, a loan of £2 million of gold from the Bank of France. It secured £1.5 million in gold from the Russian government.28/ The mere announcement that these funds had been made available proved sufficient to stem the drain from the Bank of England. There was no need for much of the French gold to be ferried across the English Channel. Anticipating that concerted international action to defend the sterling parity would be forthcoming, speculators reversed the direction of capital flows so as to render that action unnecessary.

The 1907 crisis provides an even more telling illustration of the point. Bank failures led to a shift out of deposits and into gold in the United States, and to a flow of specie from Britain to America. In response to the loss of gold reserves, the Bank of England first borrowed on the market. Next it raised Bank rate in an effort to attract gold from third countries, and restricted discounts to short-dated paper only. Finally it obtained support from abroad. But with memory of 1890 still fresh, it was not even necessary for foreign support to be actively solicited. The Bank of France purchased sterling bills, presumably on its own initiative. Apparently aware that the Bank of France was intervening on behalf of its British counterpart, speculators reversed course, repurchasing the sterling assets they had liquidated previously. Again, the response of the market minimized the need for official intervention. The credibility of the commitment to the

sterling parity, which extended beyond British shores, did much to relieve the pressure on the Bank of England.

III. Conclusion

In this paper I have provided a "Ford-like" model of how the gold standard worked. The model suggests that the gold standard's smooth operation -- smooth from the perspective of the center -- depended on a particular constellation of market forces. Many of those relationships are the very ones first emphasized by Ford more than a quarter of a century ago. My model differs by attaching somewhat less weight than did Ford to the linkage running from British capital exports to capital-good imports by the recipient countries and to exports of capital goods by Britain. It attaches more weight than did Ford to monetary management by the Bank of England. But in emphasizing the adjustment of real variables to monetary impulses as well as adjustments in the other direction, and in its retention of certain Keynesian features, the model is very much in the spirit of the one developed by Ford.

The final element of my explanation for the stability of the British gold standard is the credibility of the official commitment to gold. Policymakers in Britain were unwavering in their commitment to gold convertibility. To the extent to which there existed other goals of policy, these were accorded lower priority. Knowing that policymakers would intervene in defense of the gold standard, markets responded in the same direction in anticipation of official action. Hence the need for actual intervention was minimized. Credibility and stability were byproducts of a reputation for willingness to take the necessary action. But a central element of my argument is that credibility derived from the fact that the commitment to the gold standard was international. Central banks like the Bank of England could rely on foreign assistance in times of

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exceptional stress. Again, the need for actual assistance was minimized because the commitment to offer it was fully credible. The markets anticipated the actions of the central bankers, basing their anticipations on the policymakers' track records. Their anticipations and consequent actions rendered official intervention largely redundant.

In fact, this point was understood well before the recent literature on credibility and reputation. "[D]omestic confidence in convertibility was nourished on its past success," wrote Ford in 1962. "[F]or some countries the maintenance of specie payments was never endangered by domestic speculative runs on gold, while for others a less successful history meant that the additional threat of a domestic speculative drain was ever present..."29/

FOOTNOTES

1. See Hume (1752) and Whale (1937).

2. Precursors who also emphasized the output and employment effects of international reserve flows include Angell (1926), Ohlin (1929) and White (1933). Hints of the approach can be discerned even earlier, in the debate between Taussig (1917) and Wicksell (1918). None of these authors elaborated a fully-articulated Keynesian model, obviously. But Ford's model owed much to Meade's (1951) seminal work on income determination in the open economy.

3. Ford (1962), p. 189.

4. This is a highly selective survey. I beg the forgiveness of authors whose work I neglect.

5. The inconsistencies implicit in the interest differential formulation of capital flows are neatly discussed by Floyd (1984), chapter 4, appendix II.

6. For simplicity, I discuss money supply and demand in terms of the monetary base, for the time being ignoring the money multiplier and broader monetary aggregates.

7. The discussion here retraces ground covered in Eichengreen (1985). A catalog of the relevant models is provided by Dornbusch (1980).

8. See for example Dornbusch and Jaffee (1978) and even McCloskey and Zecher (1984), p. 122.

9. A general analysis of portfolio balance under the gold standard is provided by Floyd (1985).

10. It is perhaps useful to present some examples that illustrate the compatibility of the monetary and price specie flow models. Consider a country which is small in international capital markets and which cannot affect the world price of its imports. Capital is perfectly mobile and domestic and foreign interest-bearing assets (bonds for short) are perfect substitutes in portfolios. However, domestic- and foreign-produced goods are imperfect substitutes in consumption. To increase the volume of exports, domestic producers must reduce the (relative) price of what they sell.

What is the response of such an economy to an increase in money demand? If this increase in money demand arises out of a shift in portfolio preference -- a desire to shift out of a certain quantity of bonds in favor of money -- the adjustment mechanism highlighted by the monetary approach bears the entire burden of adjustment. Domestic residents sell bonds in an effort to obtain money, driving down bond prices and driving up bond yields. But the incipient rise in yields renders domestic bonds attractive to foreign investors. They bring gold to the domestic central bank, exchange it for currency, and use that currency to purchase domestic bonds until yields fall (bond prices rise) to world levels. This adjustment can occur quickly (instantaneously under perfect capital mobility) with no accompanying change in relative commodity prices.

But if, in contrast, the increase in money demand is not accompanied by a decline in the demand for bonds, domestic residents can obtain additional domestic currency (and its requisite gold backing) only by exchanging domestic commodities for foreign gold. They reduce their absorption relative to their production, and export the excess in return for gold. Given the desire to smooth consumption over time, the decline in domestic absorption and the consequent balance of trade surplus should, in each period, be small relative to the overall increase in money demand and persist for some time. To enable the increase in exports to be willingly absorbed abroad, their relative price must decline. Thus, adjustment occurs gradually and is accompanied by precisely the kind of relative price movements predicted by the price specie flow model.

11. Just as beauty is in the eye of the beholder, the implications to be drawn from the literature on the efficiency of commodity arbitrage under the gold standard (McCloskey and Zecher, 1976, 1984) depend very much on the tastes of the reader. The one commodity for which detailed studies of the efficiency of international markets have been conducted, namely gold, has led to conflicting conclusions. Clark (1984) argued that there were many violations of market efficiency in the period 1890-1908. Subsequent estimates by Officer (1986, 1989) challenge Clark's conclusions. Interestingly, both authors agree that there were fewer instances of market inefficiency in the second of these decades than in the first.

12. One possible answer is productivity shocks, as in the real business cycle literature. It is hard to imagine a period to which productivity shocks due to changing technology could be more relevant than the century prior to 1913. The problem with this approach is the absence of an obvious propagation mechanism. I discuss some implications of productivity shocks in a gold standard setting later in this section.

13. Fratianni and Spinelli also find little support in Italian experience for the purchasing power parity assumption. Given Italy's record of exchange rate changes, their finding is consistent with McKinnon's view that exchange rate stability fosters commodity market arbitrage.

14. Dick and Floyd (1987) demonstrate how this approach can be applied to Canadian experience under the classical gold standard.

15. An alternative view, that of Benjamin and Kochin (1984), rejects Gibson's Paradox as a spurious correlation. I am convinced by Barsky and Summers' rejection of their rejection.

16. Barsky and DeLong (1988) present some evidence that lagged changes in gold supplies were useful for predicting price-level changes during the gold standard years.

17. A different conclusion, that central banks systematically violated the rules of the game, is reached by Dutton (1984). Some authors (viz. Giovannini, 1987) challenge the validity of the entire reaction function literature. The question also has been considered using the case study approach sans econometrics; see McGouldrick (1984) and Rich (1984) on Germany and Canada, respectively.

18. de Cecco (1974) elaborated many of the same points when contrasting the operation of the London, Paris, Berlin and New York financial markets.

19. Much of Fishlow's analysis applies to the period when the gold convertibility was in suspension and currency was inconvertible. But many of the same points carry over to the years in which their gold standards prevailed.

20. For a sympathetic perspective, see Bordo and Kydland (1989).

21. The title of this section is lifted directly from Ford (1960).

22. I have utilized vector autoregression in another context, where I present my views of its applicability to questions of causality and justify my preferred interpretation of such results. See Eichengreen (1983).

23. A constant term and time trend also were included but are not reported in the table.

24. Ford (1962), p. 190.

25. Ford (1962), p. 190.

26. Note the emphasis of the word "directly" in the preceding sentence. Gold flows also appear to have had some impact on the subsequent evolution of the terms of trade. Hence it may be on premature to conclude in favor or against this hypothesis the basis of the coefficients on Bank Rate alone. It could be that Bank Rate affected the terms of trade indirectly (by attracting gold flows, which altered the terms of trade). This hypothesis is pursued in pp. 23-25 below.

27. Given the order in which the variables are entered, the Choleski Factorization chooses Bank rate as the "most exogenous" variable. That is, the error term in the moving average representation of its equation is uncorrelated by the other error terms. It is followed, in order, by new issues, exports, imports, the terms of trade, and the gold reserve (the "most endogenous" variable). I experimented with other orthoganalizations and found them to have little impact on the results. For the diagram, I have multiplied the results for Bank rate by ten and divided those for imports and exports by ten before displaying them in the figures. Otherwise, movements in variables other than imports and exports (especially Bank rate) would not be apparent to the naked eye.

28. Sayers (1936), p. 103.

29. Ford (1962), p. 189

REFERENCES

Angell, James W. (1926), The Theory of International Prices, Cambridge, Mass.: Harvard University Press.

Barsky, Robert B. (1987), "The Fisher Hypothesis and the Forecastability and Persistence of Inflation," Journal of Monetary Economics 19, pp. 3-24.

Barsky, Robert B. and J. Bradford DeLong (1988), "Forecasting Pre-World War I Inflation: The Fisher Effect Revisited," NBER Working Paper No. 2784 (December).

Barsky, Robert B. and Lawrence H. Summers (1988), "Gibson's Paradox and the Gold Standard," Journal of Political Economy 96, pp. 528-550.

Barro, Robert (1979), "Money and the Price Level Under the Gold Standard," Economic Journal 89, pp. 13-33.

Benjamin, Daniel and Levis Kochin (1984), "War, Prices and Interest Rates: A Martial Solution to Gibson's Paradox," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 587-604.

Bloomfield, Arthur I. (1959), Monetary Policy Under the International Gold Standard, New York: Federal Reserve Bank of New York.

Bloomfield, Arthur I. (1963), "Short-term Capital Movements Under the Pre-1914 Gold Standard," Princeton Studies in International Finance no. 11, Princeton: Princeton University Press.

Bloomfield, Arthur I. (1968), "Patterns of Fluctuation in International Investment Before 1914," Princeton Studies in International Finance no. 21, Princeton: Princeton University Press.

Bordo, Michael (1981), "The Classical Gold Standard: Some Lessons for Today," St. Louis Federal Reserve Bank Monthly Review 63, pp. 1-17.

Bordo, Michael and Richard Ellson (1985), "A Model of the Classical Gold Standard with Depletion," Journal of Monetary Economics 16, pp. 109-120.

Bordo, Michael and Finn Kydland (1989), "The Gold Standard as a Rule," unpublished manuscript.

Callahan, C. (1984), "Movements in Aggregate Price Uncertainty in the United States," unpublished, University of North Carolina.

Calomiris, Charles and R. Glenn Hubbard (1987), "International Adjustment Under the Classical Gold Standard: Evidence for the U.S. and Britain, 1879- 1914," unpublished, Northwestern University.

Clark, Truman A. (1984), "Violations of the Gold Points, 1890-1914," Journal of Political Economy 92, pp. 791-823.

Cooper, Richard (1982), "The Gold Standard: Historical Facts and Future Prospects," Brookings Papers on Economic Activity 1, pp. 1-45.

de Cecco, Marcello (1974), Money and Empire: The International Gold Standard, London: Frances Pinter (second edition, 1984).

Dick, Trevor and John Floyd (1988), Canada and the Gold Standard, 1880-1914, unpublished manuscript.

Dornbusch, Rudiger (1980), Open Economy Macroeconomics, New York: Basic Books.

Dornbusch, Rudiger and Jacob Frenkel (1984), "The Gold Standard and the Bank of England in the Crisis of 1847," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 233-264.

Dornbusch, Rudiger and Dwight Jaffee (1978), "Purchasing Power Parity and Exchange Rate Problems: Introduction," Journal of International Economics 8, pp. 157-161.

Eichengreen, Barry (1983), "The Causes of British Business Cycles, 1833-1913," Journal of European Economic History 12, pp. 145-161.

Eichengreen, Barry (1985), "Editor's Introduction," in The Gold Standard in Theory and History, London: Methuen, pp. 1-35.

Eichengreen, Barry (1987), "Conducting the International Orchestra: Bank of England Leadership Under the Classical Gold Standard," Journal of International Money and Finance 6, pp. 5-29.

Feinstein, Charles (1972), National Income, Expenditure and Output of the United Kingdom, 1855-1965, Cambridge: Cambridge University Press.

Fishlow, Albert (1987), "Market Forces or Group Interests: Inconvertible Currency in Pre-1914 Latin America," unpublished, University of California at Berkeley.

Fishlow, Albert (1989), "Conditionality and Willingness to Pay: Some Parallels from the 1890's," forthcoming in Barry Eichengreen and Peter Lindert (eds.), The International Debt Crisis in Historical Perspective, Cambridge, Mass.: MIT Press.

Fleming, J. Marcus (1962), "Domestic Financial Policies Under Fixed and Under Flexible Exchange Rates," IMF Staff Papers 9, pp. 369-380.

Floyd, John E. (1985), World Monetary Equilibrium: International Monetary Theory in an Historical-Institutional Context, Philadelphia: University of Pennsylvania Press.

Ford, A.G. (1960), "Notes on the Working of the Gold Standard Before 1914," Oxford Economic Papers 12, pp. 52-76.

Ford, A.G. (1962), The Gold Standard 1880-1914: Britain and Argentina, Oxford: Clarendon Pres.

Fratianni, Michele and Franco Spinelli (1984), "Italy in the Gold Standard Period, 1861-1914," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 405-451.

Frenkel, Jacob A. (1971), "A Theory of Money, Trade and the Balance of Payments in a Model of Accumulation," Journal of International Economics 1, pp. 158-187.

Gallarotti, Giulio M. (1989), "The Anatomy of Spontaneous Order: The Emergence of International Monetary Order Before World War I," Ph.D. dissertation, Columbia University.

Garber, Peter and Vittorio Grilli (1986), "The Belmont-Morgan Syndicate as an Optimal Investment Banking Contract," European Economic Review 30, pp. 649-677.

Giovannini, Alberto (1987), "'Rules of the Game' During the International Gold Standard: England and Germany," Journal of International Money and Finance 5, pp. 467-483.

Giovannini, Alberto (1988), "How Fixed Exchange Rate Regimes Work: Evidence from the Gold Standard, Bretton Woods and the EMS," in Marcus Miller, Barry Eichengreen and Richard Portes (eds.), Blueprints for Exchange Rate Management, New York: Academic Press, pp. 13-41.

Goodhart, Charles (1972), The Business of Banking, 1891-1914, London: Weidenfield and Nicolson.

Hume, David (1752), "On the Balance of Trade," in Essays, Moral, Political and Literary, vol. 1, 1898 edition, London: Longmans, Green.

Johnson, Harry G. (1973), "The Monetary Approach to Balance of Payments Theory," in M.N. Connolly and A.K. Swoboda (eds), International Trade and Money, London: Allen & Unwin, pp. 206-224.

Jonung, Lars (1984), "Swedish Experience Under the Classical Gold Standard, 1873-1914," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 399.

Krugman, Paul (1979), "A Model of Balance of Payments Crises," Journal of Money, Credit and Banking 11, pp. 311-325.

Lee, Chi-Wen and Christopher Petruzzi (1986), "The Gibson Paradox and the Monetary Standard," Review of Economics and Statistics 68, pp. 189-196.

Lindert, Peter H. (1969), "Key Currencies and Gold, 1900-1913," Princeton Studies in International Finance no. 24, Princeton: Princeton University Press.

McCloskey, Donald and J. Richard Zecher (1976), "How the Gold Standard Worked, 1880-1913," in Jacob A. Frenkel and Harry G. Johnson (eds.), The Monetary Approach to the Balance of Payments, London: Allen & Unwin, pp. 357- 385.

McCloskey, Donald and J. Richard Zecher (1984), "The Success of Purchasing Power Parity: Historical Evidence and its Implications for Macroeconomics," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 121-150.

McGouldrick, Paul (1984), "Operations of the German Central Bank and the Rules of the Game, 1879-1913," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 311-349.

McKinnon, Ronald I. (1988), "An International Gold Standard without Gold," unpublished, Stanford University.

Meade, J.E. (1951), The Theory of International Economic Policy, Oxford: Oxford University Press.

Mill, J.S. (1865), Principles of Political Economy, New York: A.M. Kelly (1961 reprint).

Mitchell, B.R. and P. Deane (1962), Abstract of British Historical Statistics, Cambridge: Cambridge University Press.

Moggridge, Donald (1972), British Monetary Policy, 1924-1931, Cambridge; Cambridge University Press.

Mundell, Robert (1963), "Capital Mobility and Stabilization Policy Under Fixed and Flexible Exchange Rates," Canadian Journal of Economics 29, pp. 475-485.

Mundell, Robert (1968), International Economics, New York: Macmillan.

Mundell, Robert (1971), Monetary Theory, Pacific Palisades: Goodyear.

Nurkse, Ragnar (1944), International Currency Experience, Geneva: League of Nations.

Officer, Lawrence (1986), "The Efficiency of the Dollar-Sterling Gold Standard, 1890-1908," Journal of Political Economy 94, pp. 1038-1073.

Officer, Lawrence (1989), "The Remarkable Efficiency of the Dollar-Sterling Gold Standard, 1890-1906," Journal of Economic History XLIX, pp. 1-42.

Ohlin, Bertil (1929), "The Reparation Problem: A Discission," Economic Journal 39, pp. 172-173.

Palgrave, R.H. (1903), Bank Rate and the Money Market, London: J. Murray.

Pippinger, John (1984), "Bank of England Operations, 1893-1913," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, Chicago: University of Chicago Press, pp. 203-232.

Rich, Georg (1984), "Canada without a Central Bank: Operation of the Price-Specie-Flow Mechanism, 1872-1913," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 547-601.

Rockoff, Hugh (1984), "Some Evidence on the Real Price of Gold, Its Costs of Production, and Commodity Prices," in Michael Bordo and Anna Schwartz (eds.), A Retrospective on the Classical Gold Standard, 1821-1931, Chicago: University of Chicago Press, pp. 613-644.

Sayers, Richard S. (1936), Bank of England Operations, 1890-1914, London: P. S. King and Son.

Simon, M. (1968), "The Pattern of New British Portfolio Investment, 1865- 1914," in A.R. Hall (ed.), The Export of Capital 1870-1914, London: Methuen, pp. 15-44.

Taussig, Frank (1917), "International Trade Under Depreciated Paper," Quarterly Journal of Economics XXXI, pp. 330-403.

Whale, P. B. (1937), "The Working of the Prewar Gold Standard," Economica 11, pp. 18-32.

White, H.D. (1933), The French International Accounts, 1880-1913, Cambridge, Mass.: Harvard University Press.

Wicksell, Knut (1918), "International Freights and Prices," Quarterly Journal of Economics XXXII, pp. 401-410.