The French Gold Sink and the Great Deflation of 1929–32

Douglas A. Irwin

ABSTRACT

The gold standard was a key factor behind the Great Depression, but why did it produce such an intense worldwide deflation and associated economic contraction? While the tightening of U.S. monetary policy in 1928 is often blamed for having initiated the downturn, France increased its share of world gold reserves from 7 percent to 27 percent between 1927 and 1932, and failed to monetize most of this accumulation. This created an artificial shortage of gold reserves and put other countries under significant deflationary pressure. A simple calculation indicates that the United States and France shared the blame (in a 60/40 split) for the withdrawal of gold from the rest of the world and the onset of worldwide deflation in 1929. Counterfactual simulations indicate that world prices would have been stable during this period, instead of declining calamitously, if the historical relationship between gold reserves and world prices had continued. The deflation could have been avoided if central banks had simply maintained their 1928 cover ratios.

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The author thanks Michael Bordo, Barry Eichengreen, James Feyrer, Marc Flandreau, David Friedman, Clark Johnson, Nancy Marion, Allan Meltzer, Michael Mussa, Martha Olney, Randall Parker, Hugh Rockoff, Christina Romer, Marjorie Rose, Scott Sumner, and Peter Temin for helpful comments and conversations.

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1. INTRODUCTION

A large body of economic research has linked the gold standard to the length and severity of the Great Depression of the 1930s.[1] The gold standard's fixed-exchange rate regime transmitted financial disturbances across countries and prevented the use of monetary policy to address the economic crisis. Two compelling observations support this conclusion: countries not on the gold standard managed to avoid the Depression almost entirely, while countries on the gold standard did not begin to recover until they left it.[2]

While the link between the gold standard and the Great Depression is widely accepted, it begs the question of how the international monetary system produced such a monumental economic catastrophe. Structural flaws in the post–World War I gold standard and the fragility of international financial stability are often blamed for the problems of the period. However, it is not clear why such factors should have necessarily led to the massive price deflation experienced between 1929 and 1932 and the enormous economic difficulties associated with the decline in prices. In particular, there was no apparent shortage of gold in the 1920s and 1930s—worldwide gold reserves continued to expand—so it is not obvious why the system self-destructed and produced such a cataclysm.

Economic historians have traditionally singled out the United States for instigating the deflationary shock that led to the

[1] See Choudhri and Kochin (1980), Eichengreen and Sachs (1985), Hamilton (1988), Temin (1989), Bernanke and James (1991), Eichengreen (1992), and Bernanke (1995), among many other works.

[2] In terms of countries that were not on the gold standard, Spain and China stand out as examples of countries that largely avoided the economic collapse (Spain had a fiat currency and China was on a silver standard). Because countries on the gold standard chose to leave it at different times—the United Kingdom in 1931, the United States in 1933, and France in 1936—there is sufficient variation in country experiences to identify the recovery relationship.

worldwide Depression.[3] The standard explanation for the onset of the Depression is the tightening of U.S. monetary policy in early 1928, which led to gold inflows from the rest of the world that were sterilized by the Federal Reserve so that they did not affect the monetary base (Friedman and Schwartz 1963, Hamilton 1987). This forced other countries to tighten their monetary policies as well, without the benefit of a monetary expansion in the United States. From this initial deflationary impulse came banking panics and currency crises that merely reinforced the downward spiral of prices.

However, what is frequently overlooked—or mentioned only in passing—is the fact that France was doing almost exactly the same thing: accumulating gold reserves while failing to monetize them. Although its role is sometimes acknowledged, France's impact on the international monetary system is often believed to have been much smaller than that of the United States. In his famous League of Nations monograph, *The International Currency Experience*, Ragnar Nurkse (1944, 38–39) observed that "the French gold imports certainly aggravated the pressure of deflation in the rest of the world," but suggested that France's imports "contributed, though probably to a minor degree, to the forces making for depression in the rest of the world at the turning point of the business cycle in 1929–30." Similarly, Peter Temin (1989, 22) concludes that "American gold holdings were larger than those of the French, and the American influence on events was larger."

Yet France was accumulating gold reserves at a much more rapid rate than the United States. France's share of world gold reserves soared from 7 percent to 27 percent between 1926 and 1932. By contrast, although the U.S. share of world gold reserves rose slightly during a crucial period from 1928 to 1930, it generally fell in the late 1920s. The sheer size of the French gold accumulation in the late 1920s and early 1930s has led some economists to give its policies a closer look. Eichengreen (1990, 269–70) found that France's gold reserves were orders of magnitude larger than one would have predicted based on the country's economic attributes and concluded that "the exceptional demands for gold by the Federal Reserve and

[3] Milton Friedman and Anna Schwartz (1963, 360) argue that "the United States was in the van of the movement and not a follower." Similarly, Barry Eichengreen (1992, 222) states that "events in America were directly responsible for the slowdown in other parts of the world."

Banque de France placed downward pressure on global money supplies.... U.S. and French gold policies must therefore share the blame for exacerbating the monetary aspects of the Great Depression." Even Milton Friedman later said that, had he been fully aware of France's policy, he would have revised his view on the origins of the Great Depression.[4]

Scholars of French monetary history have even concluded that France deserves more blame than the United States for increasing the world's monetary stringency in the late 1920s and early 1930s. In *Gold, France, and the Great Depression,* Clark Johnson (1997, 147) contends that "while the United States did little to hinder the decline in world prices, especially after 1928, French policy can be charged with directly causing it." "That French gold policy aggravated the international monetary contraction from 1928 to 1932 is beyond dispute," Kenneth Mouré (2002, 180) argues. "The magnitude and timing of French gold absorption from mid-1928 to 1930 imposed a greater constraint on systemic monetary expansion than the gold accumulation in the United States during the same period."

Unfortunately, there is little quantitative evidence on the relative strength of the deflationary forces emanating from the United States and France as a result of their withdrawal of gold from the rest of the world. This paper seeks to address this question and begins by laying out some of the problems of the interwar gold standard and why it was vulnerable to a deflationary shock. The paper then turns to the factors behind the French gold accumulation and why it was not monetized. Finally, two counterfactual questions are raised: First, how much gold would have been freed up if the United States and France had kept only enough to cover their actual liabilities at their 1928 cover ratios?

[4] After re-reading the memoirs of Emile Moreau, the governor of the Bank of France, Friedman (1991, xii–xiii) said that he "would have assessed responsibility for the international character of the Great Depression somewhat differently" than he did originally in his *Monetary History* with Anna Schwartz, by laying some of the blame on France as well. Both the Federal Reserve and the Bank of France "were determined to prevent inflation and accordingly both sterilized the gold inflows, preventing them from providing the required increase in the quantity of money. . . . France's contribution to this process was, I now realize, much greater than we treated it as being in our [*Monetary*] *History*." In a 1998 interview, Friedman said, "[I]f I were rewriting [the *Monetary History*] now, I would paint a slightly different picture, one which made the great contraction and worldwide depression a consequence of the joint actions of both France and the U.S." (Parker 2002, 47)

Second, to what extent can those inactive, excess gold reserves account for the worldwide price deflation of 1929–32?

According to the calculations described below, the United States and France held excess gold, compared to 1928, equivalent to 5 percent of the world's gold reserves in 1929, 9 percent in 1930, and nearly 13 percent in 1931, when the gold standard began to fall apart. The United States and France contributed in almost equal proportions—about 60 percent to 40 percent—to the effective reduction in the world gold stock during those years. To assess the impact on world prices, the relationship between the world's wholesale prices and monetary gold stock is estimated for the period of the classical gold standard between 1870 and 1914. An out-of-sample forecast of the price level based on the actual changes in gold reserves suggests that, had the historical relationship between gold and prices continued, prices would have been roughly constant between 1929 and 1931 instead of declining 34 percent. The fact that the two countries kept such a large proportion of the world's gold stock effectively withdrawn from world circulation from 1929 to 1932 explains about 40 percent of the worldwide deflation at that time and may be indirectly responsible for some of the remainder.

These results support the view that France played a significant role in bringing about the great price deflation in the early 1930s. Contemporary observers at the time and scholars of the Great Depression today have been aware of France's gold position, but it remains a relatively neglected factor whose importance has not been fully appreciated. The findings presented here suggest that France deserves almost equal billing with the United States for having forced other countries to pursue a tighter monetary policy and thus initiating the worldwide deflationary spiral.

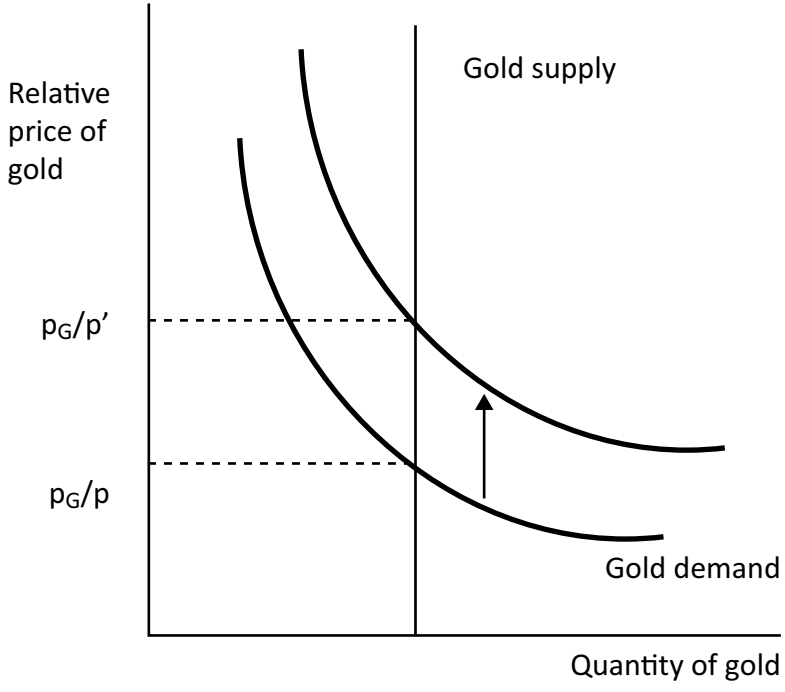
2. THE GOLD STANDARD AND FEARS OF DEFLATION

During World War I, most major countries abandoned the gold standard in order to use fiat currency to fund the war effort. As a result, those nations experienced high rates of inflation. The desire to bring inflation under control and restore monetary stability led most countries to plan on returning to the gold standard at some point after the war. Unfortunately, many of the international monetary difficulties of the late 1920s can be traced to decisions regarding the resumption of the gold standard in the mid-1920s.

Under the gold standard, the price level for goods and services was determined by the supply and demand for gold. The change in the price level was determined by the difference between the growth in the supply and the demand for gold: prices would rise if the world gold supply increased more rapidly than the demand for gold, whereas prices would fall if the demand for gold grew faster than the supply of gold.

Figure 1 illustrates these features by depicting the supply and demand for gold. The intersection of the world's gold supply and gold demand determines the relative price of gold in terms of other goods. In the short run, the world's supply of gold was fixed,

Figure 1
World Supply and Demand for Gold



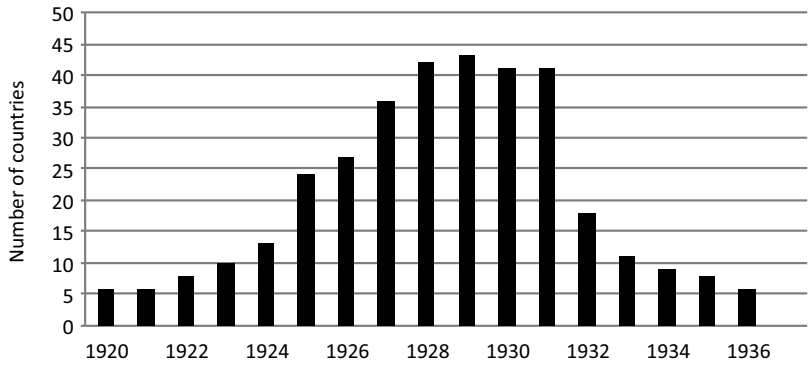
as indicated by the vertical supply line. Any increase in the demand for gold, such as the shift in Figure 1, would increase the relative price of gold. However, because the nominal price of gold was fixed in terms of national currencies, the adjustment would not take place through an increase in the price of gold but through a reduction in the price of other goods (deflation), as illustrated by the shift from p_G/p to p_G/p'.

Although ending inflation was a key motivation for returning to the gold standard, some leading economists of the day expressed the fear that a return to the gold standard could cause deflation. They feared that the slowing growth of gold production would make the supply of gold insufficient to keep up with the demand, which would increase if many countries sought to return to the gold standard and acquire gold reserves at the same time. Therefore, at the 1922 Genoa Conference on the international monetary system, Britain's Ralph Hawtrey and Sweden's Gustav Cassel encouraged countries to economize on their use of gold. Resolution No. 9 of the conference recommended that central banks "centralise and coordinate the demand for gold, and so 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." This could be accomplished by having low cover ratios, that is, requiring that central banks hold relatively small amounts of gold to back their liabilities, or by having some central banks hold foreign exchange as part of their reserve base.[5]

However, the Genoa resolutions were simply recommendations and were never formally adopted as policy. There was no international agreement on the "rules" of the gold standard game, particularly the fundamental point that countries with increasing gold reserves should inflate their money supplies. In addition, while some smaller countries agreed to hold foreign exchange reserves in currencies that were convertible into gold, the largest economies, such as the United

[5] They also anticipated higher demand for gold after the war because central banks had to support a larger base of liabilities due to the inflation that occurred during the war when the gold standard was suspended. The wartime inflation meant that nominal liabilities could not be covered by the existing monetary base of gold, so countries would either have to reset their exchange rate parities or accumulate more gold reserves.

Figure 2
Number of Countries on the Gold Standard



Source: Eichengreen (1992, 188–92).

States, Britain, and France, only held gold as reserves. Indeed, France rejected the gold exchange standard as inflationary and was firmly committed to a pure gold standard.[6]

Many countries began rejoining the gold standard following Britain's decision to do so in 1925. As Figure 2 shows, the number of countries on the gold standard increased significantly between 1924 and 1928.

As countries rejoined the gold standard, they established reserve requirements—or cover ratios—governing how much gold their central banks had to hold against their liabilities of currency in circulation and demand deposits. Such formal requirements were a departure from the classical gold standard. Furthermore, the cover ratios were asymmetric: while they specified a minimum level of

[6] As Mouré (2002, 188–89) notes: "The attitude of the Bank of France exemplified the asymmetry and the deflationary bias of the gold standard. The bank rejected the gold exchange standard as a dilution of the gold standard that promoted an over-expansion of credit. . .. The Bank of France set itself resolutely against measures to increase domestic monetary circulation and prices."

Table 1
Legal Reserve Requirements

	Coverage Required for	Gold Backing (percent)	Gold and Foreign Exchange (percent)
Belgium	Notes and demand liabilities	30	40*
France	Notes and demand liabilities	35	—
Germany	Notes	30	40
Switzerland	Notes	40	—
United Kingdom	Notes in excess of £280 m	100	—
United States	Deposits	35	—
	Notes	40	

* Belgium shifted from the gold exchange standard to the gold standard in August 1930.
Source: *Federal Reserve Bulletin*, August 1930, p. 502.

gold reserves below which central banks could not go, they did not set a maximum level beyond which banks could not go. (See Table 1.)

With the international monetary system lacking an agreed upon framework, the resurrected gold standard stood on a precarious foundation. Throughout the 1920s, Cassel repeatedly warned of an impending shortage of gold and the possibility of worldwide price deflation (Irwin 2011). In lectures delivered at Columbia University in May 1928, Cassel (1928, 44) argued that "the great problem before us is how to meet the growing scarcity of gold which threatens the world both from increased demand and from diminished supply." While little could be done about the projected slowing of growth in the supply of gold, Cassel proposed to remedy the imbalance by restricting the monetary demand for gold: "[O]nly if we succeed in doing this can we hope to prevent a permanent fall of the general price level and a prolonged and worldwide depression which would inevitably be connected with such a fall in prices."

Cassel (1928, 98–99) believed that without international cooperation to stabilize the value of gold, the result would

> obviously be a general and ruthless competition for gold, a consequent continual rise in the value of gold, and a corresponding world-wide economic depression for an unlimited future. A very disagreeable consequence of such a movement in the value of gold would be a general aggravation of all debts contracted in a gold standard, doubtless in many cases followed by an incapacity to pay debts or a refusal to do so. We must remember that the great part of the world that would have to suffer from such a development has a very powerful weapon of defense. This weapon is simply the abolition of gold as a monetary standard.

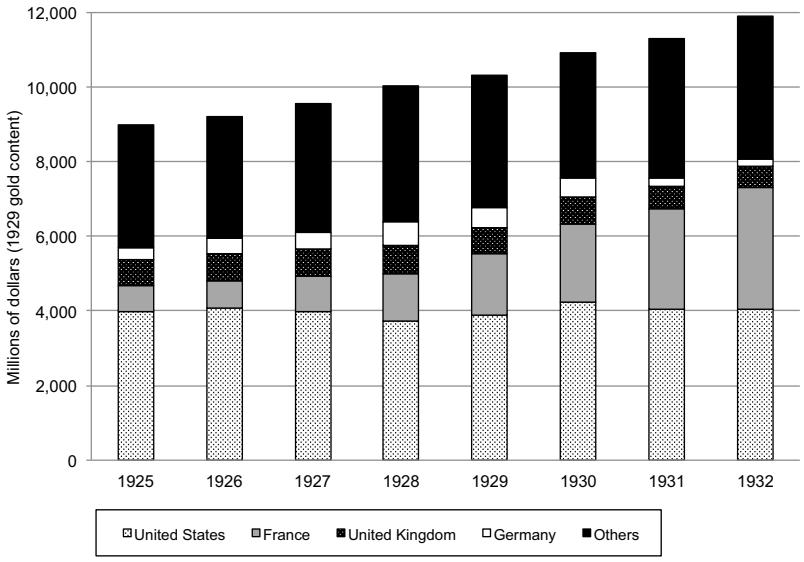
As is evident from the rapid decline in countries on the gold standard starting in late 1931, Cassel was prescient in predicting that countries would abandon the gold standard if the stress of deflation was too severe.

As it happened, Cassel's fears about an insufficient supply of gold were misplaced: forecasts of slowing gold production were off the mark and the supply of monetary gold continued to expand through the early 1930s. As Figure 3 shows, the supply of gold reserves continued to grow through the late 1920s and into the 1930s. In fact, world gold reserves increased 19 percent between 1928 and 1933. But his fears about the increasing monetary demand for gold were entirely realized.

2.1 The Distribution of Gold Reserves

While there was no major problem with the supply of gold, there was a problem with the demand for gold when many countries returned to the gold standard at the same time. In particular, the distribution of gold reserves changed dramatically as the Bank of France began to accumulate gold at a rapid rate. Between 1923 and 1926, France's share of world gold reserves was stable and virtually the same as Britain's. However, after the de facto stabilization of the franc in 1926 (de jure in 1928), France's share took off, growing from 7 percent of world reserves in 1926 to 27 percent in 1932. By 1932, France held nearly as much gold as the United States, though its economy was only about a fourth of the size of the United States. Together, the United States and

Figure 3
World Gold Reserves, 1925–32



Source: Hardy (1936, 92).

France held more than 60 percent of the world's monetary gold stock in 1932.[7]

What was driving changes in the international distribution of gold reserves? To some extent, changes were driven by the exchange rate at which countries rejoined the gold standard. Some countries restored their prewar parity, while others took inflation into account and refixed at a depreciated exchange rate. The reconstructed gold standard started off on the wrong foot in 1925 when Britain rejoined it at an exchange rate that overvalued the pound (Moggridge 1969). This not only harmed the competitive position of export industries but also meant that the British balance of payments remained in a fragile state. The balance of

[7] Eichengreen (1990, 264) finds that U.S. monetary gold stocks were two to three times, and French gold stocks were three to five times, what would be predicted on the basis of estimated central bank reserve demand from a cross section of countries.

payments weakness required the Bank of England to maintain a tight monetary policy to support the pound, keeping interest rates high and thereby diminishing domestic investment. This kept economic growth in check and made it difficult for Britain to reduce its already high level of unemployment. As a result, Britain suffered through a low-grade deflation from 1925 until the country left gold in 1931.

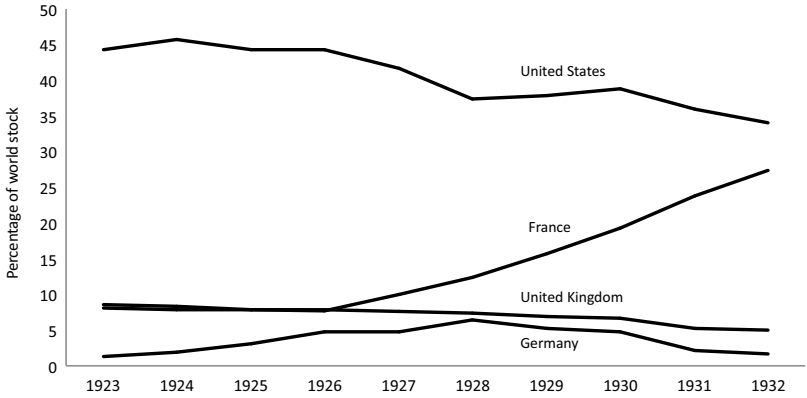
Meanwhile, after enduring a traumatic bout of inflation in 1924–26, France stabilized the franc at an undervalued rate. There is some debate about whether the undervaluation was deliberate or not.[8] French policymakers certainly debated which exchange rate the country should choose. Once the franc had been stabilized, foreign exchange markets put upward pressure on the franc as confidence in its value was restored. Finance Minister Raymond Poincaré wanted to allow the franc to appreciate before formally establishing the peg to gold, while Bank of France Governor Emile Moreau wanted to resist the exchange market pressure and keep the franc at the lower rate. France formalized its adoption of the gold standard with the Monetary Law of June 1928, which officially restored convertibility of the franc in terms of gold at the rate set in December 1926.

The evolution of gold reserves in Figure 4 reveals much about the monetary policies and exchange rate choices in the major countries. The United States lost reserves (relative to other countries) between 1926 and 1928 in part because of large capital exports to Europe. This foreign lending was largely directed to Germany, which used the loans to repay reparations to Britain and France, which in turn repaid its war loans from the United States. These capital flows also allowed Germany to rebuild its gold reserves, which steadily increased between 1923 and 1928. France began accumulating gold reserves once the franc was stabilized at an undervalued rate in late 1926, while Britain with its overvalued pound had to make do with an ever smaller share of the world's gold stock.

However, when the Federal Reserve began to tighten policy in early 1928, U.S. foreign lending dried up, the net export of gold reversed itself, and the U.S. share of reserves stabilized in 1929 and 1930. As American lending came to a halt, Germany's gold reserve position began to deteriorate. The United States began losing reserves to other countries again in 1931 and 1932, after Britain left the gold standard in September 1931.

[8] See Sicsic (1992) and Mouré (1996) for differing views.

Figure 4
Share of World Gold Reserves



Source: Hardy (1936, 93).

Thus, France's stabilization in 1926 and America's tightening of monetary policy in 1928 allowed the two countries to accumulate and retain a large share of the world's gold reserves. This reduced the absolute amount of gold reserves available for the rest of the world, as Table 2 shows. In 1928, the flow of gold to France and from the United States almost exactly offset each other, allowing the gold reserves of the rest of the world to grow by 4 percent. In December 1928, world gold reserves were 5 percent larger than they had been in December 1927; France gained 3 percentage points of that increase, the United States lost 2 percentage points, allowing the rest of the world to gain 4 percentage points.

The situation changed in 1929 when, instead of offsetting one another, the United States joined France in attracting gold away from the rest of the world. As a result, the rest of the world lost 3 percent of the world stock. The same thing happened in 1930 as well. In 1931, the world gold stock rose 3 percent, but France accumulated 8 percentage points, taking 2 percent of the world gold stock away from the United States and 3 percent from the rest of the world.

Table 2
Gold Reserves: Percentage Change from Previous Year

	Total World Gold Reserves	Absorption by (percentage of total world reserves)		
		United States	France	Rest of World
December 1928	+5	−2	+3	+4
December 1929	+3	+2	+4	−3
December 1930	+6	+3	+5	−2
December 1931	+3	−2	+8	−3
December 1932	+5	+0	+3	+3
Cumulative percentage change from December 1927				
December 1931	+18	+1	+21	−4
December 1932	+24	+1	+24	0

Source: Board of Governors of the Federal Reserve System (1943, 544−45).
Note: Final three columns may not sum to first column because of rounding.

The cumulative effect was astounding. In December 1932, world gold reserves were 24 percent larger than they had been in December 1927. However, France absorbed almost every ounce of the additional gold, leaving the rest of the world with no net increase. Watching this trend unfold, John Maynard Keynes (1932, 83) could not resist this biting remark: "And, when the last gold bar in the world has been safely lodged in the Bank of France, that will be the appropriate moment for the German Government to announce that one of their chemists has just perfected the technique for making the stuff at 6d. an ounce." The United States seems to have been less of a problem because it was not systematically accumulating gold throughout the period, although it did so during the crucial years of 1929 and 1930.

The deflationary pressure that this redistribution of gold put on other countries is remarkable. In 1929, 1930, and 1931, the rest of the world lost the equivalent of about 8 percent of the world's gold stock, an enormous proportion—15 percent—of the rest of the world's December 1928 reserve holdings. Gardner (1932, 63) summed up the situation this way: "The picture of the five years ending 1930 may perhaps be drawn in one sentence thus: A world, returning to the gold standard and unable to tap the surplus gold of the United

States, lost the bulk of its new supplies to France, notwithstanding the fact that these new supplies were exceptionally large because of the flow from special and non-recurrent sources."

2.2 Monetary Neutralization

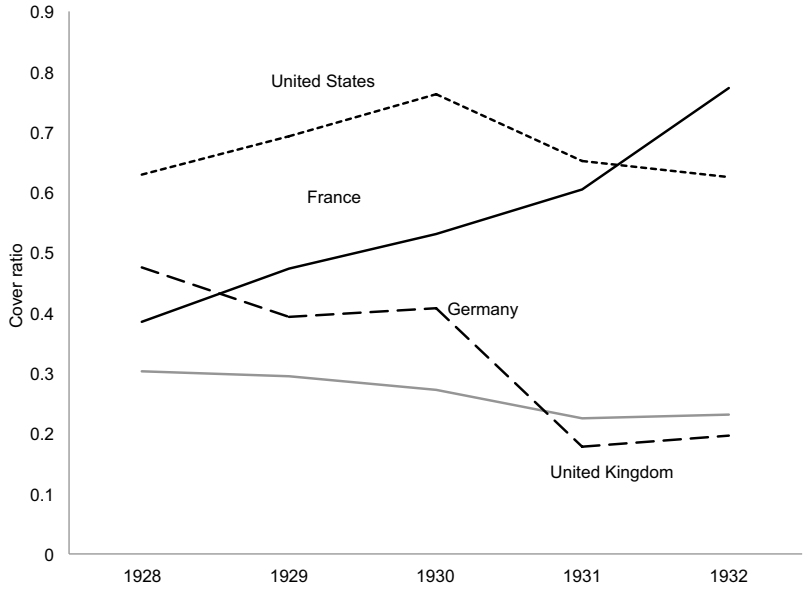
This massive redistribution of gold reserves might not have been a problem for the world economy if the United States and France had been monetizing the gold inflows. That would have been playing by the rules of the game of the classical gold standard: countries receiving gold inflows would have had a monetary expansion that would have balanced the monetary contraction in countries losing gold.

But as already noted, there were no agreed-upon rules of the game in the interwar gold standard. Both France and the United States were effectively neutralizing—or not monetizing—the inflows to ensure that they did not have an expansionary effect. The United States was explicitly sterilizing the gold inflows by conducting open market operations (purchases of Treasury securities) to offset their monetary impact.[9] France was not explicitly sterilizing the gold inflows, but the inflows failed to have much expansionary effect on the country's monetary stance for reasons that will be discussed below. As a result, this asymmetry—countries receiving gold failed to expand, while countries losing gold had to contract—gave the international monetary system a severe deflationary bias.

The neutralization of gold inflows is implicit in the cover ratios presented in Figure 5. The cover ratio is the ratio of central bank gold reserves to its domestic liabilities (notes in circulation and demand deposits). If countries followed the rules of the game and monetized gold inflows and outflows alike, the country's cover ratio would have been roughly constant. Once again, France stands out in comparison to the other countries. As mandated by the Monetary Law of 1928, the Bank of France was required to back a minimum of 35 percent

[9] "The international effects were severe and the transmission rapid, not only because the gold-exchange standard had rendered the international financial system more vulnerable to disturbances, but also because the United States did not follow gold-standard rules," Friedman and Schwartz (1963, 361) note. "We did not permit the inflow of gold to expand the U.S. money stock. We not only sterilized it, we went much further. Our money stock moved perversely, going down as the gold stock went up. . . . The result was that other countries not only had to bear the whole burden of adjustment but also were faced with continued additional disturbances in the same direction, to which they had to adjust."

Figure 5
Cover Ratios of Major Central Banks, 1928–32



Source: Calculated from the Board of Governors of the Federal Reserve System (1943).
Note: Data are for December of each year.

of its liabilities with gold, although the bank wanted a minimum of 40 percent in practice (Mouré 1991, 47–48). This is about where the cover ratio was in December 1928. Of course, the lower bound was a floor, but there was no ceiling or maximum cover ratio beyond which the bank was forbidden to go. By 1930, France's cover ratio rose to more than 50 percent. In January 1931, the cover ratio reached 55 percent, at which point the Bank of France considered but rejected a proposal to suspend its gold purchases (Mouré 2002, 188). By 1932, the cover ratio had risen to nearly 80 percent. France was well on its way to having 100 percent base money, in which all of the central bank liabilities were backed one-for-one with gold in its vault.

The path of the U.S. cover ratio is also consistent with the previous discussion of monetary policy. The U.S. cover ratio rose in 1929 and

1930 as the United States accumulated gold after the Federal Reserve raised interest rates in 1928. However, when the United States lost gold in 1931 and 1932, the cover ratio fell. Thus, the Federal Reserve's policy was symmetric: it did not inflate when gold was coming in and it did not deflate when gold was going out. Once again, by this measure, U.S. policy was somewhat tighter in 1929 and 1930, but somewhat looser in 1931 and 1932, with regard to the rest of the world, whereas France's policy was consistently tight throughout this period.

Meanwhile, Germany's cover ratio fell sharply in 1929 but stabilized in 1930. Britain's cover ratio was the lowest of the three and declined slightly as the Bank of England struggled to keep hold of its existing gold reserves.

2.3 Explaining French Policy

What was driving French gold and monetary policy during this period? Was the Bank of France simply passive with respect to the gold inflows, or was it actively encouraging it? And what accounts for the failure to monetize the rapidly accumulating gold reserves?

The answer depends in part on the particular time period considered. When the franc was finally stabilized in December 1926, it was—or soon became—undervalued in comparison to other major currencies. The Bank of France had to engage in large-scale foreign exchange intervention to prevent the appreciation of the franc. France's foreign exchange holdings rose from $50 million in November 1926 to $777 million by the end of May 1927 (Clarke 1967, 111).

However, this intervention, involving the sale of millions of francs to purchase pounds and dollars, did not have an inflationary effect in France. The stabilization of government finances enabled it to reap budget surpluses or led to capital inflows driven by the purchase of government securities, which were used to repay advances from the Bank of France. These budget surpluses, deposited at the Bank of France, removed the francs from circulation and were a deflationary offset to the sale of francs on foreign exchange markets.[10] As Nurkse

[10] "In effect, much of the cash that was pumped into the market by the Bank of France's purchases of foreign exchange was mopped up by Treasury funding issues, the proceeds of which were employed to reduce the government's short-term debt to the central bank. The authorities thus shifted government debt from the central bank to the market and achieved the same results that would have been attained through central bank open market sales." Clark (1967, 111).

(1944, 77) pointed out, from the end of 1926 until mid-1928, two-thirds of the gold inflow was "neutralized" by the reduction in the bank's holding of government debt. (He used the term "neutralization" rather than "sterilization" because he regarded it as automatic and not a deliberate policy.)[11]

However, the Bank of France became concerned about its rapidly growing foreign exchange reserves and began selling pounds and dollars for gold from the Bank of England and the Federal Reserve. This was the beginning of France's gold accumulation. The gold drain alarmed officials at the Bank of England, and in June 1927 the Bank of France reached an accommodation with Britain to stop its gold purchases and to keep its sterling reserves at the existing level.[12] The Bank of France then dealt with the situation by buying forward contracts on foreign exchange (selling pounds and dollars for francs now with the promise to repurchase the pounds and dollars a year later). These swaps temporarily kept the francs out of circulation and bought the bank a year of time.

Around the time these forward contracts came due, the Monetary Law of 1928 took effect. The law tied the hands of the Bank of France in several important ways. The bank was required to maintain gold reserves of at least 35 percent of sight liabilities (notes and demand deposits). In addition, the bank no longer had the legal authority to purchase foreign exchange and henceforth could only acquire gold. Finally, the bank was prohibited from engaging in open market operations, so it could never again monetize government deficits.

As a result, the Bank of France could no longer acquire foreign exchange instead of gold. Gold continued to flow into the country

[11] As Nurkse (1944, 77) notes:

> The reduction in the government's debt to the Bank was at bottom equivalent to an open-market operation, since it meant a shift in the holding of pre-existing government debt from the Bank to the market. Unlike an ordinary open-market operation, however, it did not come about at the Bank's initiative; and above all, being a "sale" instead of a purchase, it took place in the opposite direction to that which the "rules of the game" would have required. The "rules of the game" . . . would have required an inflation of domestic credit to reinforce the effects of the gold inflow; but the country had just emerged from a period of inflation and was not in the mood for more.

[12] Accominotti (2009) examines the Bank of France's management of its foreign exchange portfolio.

for several reasons. France was an undermonetized economy with a shortage of currency. Banks accommodated the demand for currency by withdrawing funds from overseas accounts, selling their pound and dollar assets for gold, which they would then turn over to the Bank of France for currency (Balogh 1930; Hawtrey 1932). Financial institutions were reluctant to discount bills at the Bank of France, which competed with them for commercial business. As the 1930 annual report of the Bank of France noted, "when on various occasions they [banks] were confronted with large demands for francs in their own market during 1930, they naturally preferred to repatriate part of those unproductive [foreign] balances rather than have recourse to the rediscount facilities obtainable at the Bank of France" (*Federal Reserve Bulletin*, March 1931, 146).[13] In addition, the bank could not conduct open market operations to inject additional currency into the financial system. Furthermore, particularly as economic troubles appeared in central Europe in mid-1931, there was capital flight to France as the franc was considered a safe asset.

A closer look at the balance sheet of the Bank of France indicates that it was not sterilizing the gold inflows in the classic sense of reducing domestic assets to offset the increase in foreign assets.[14] As Table 3 indicates, the bank continued to accumulate domestic assets even as its foreign asset holdings grew. The bank's total assets grew 29 percent between 1928 and 1932, although this understates the growth because the bank did not treat foreign exchange as part of its monetary base; total assets of gold and domestic assets grew 102 percent.

Despite this growth in the monetary base, the money supply was essentially unchanged over this period. The implicit money

[13] As the deputy controller of finance for the British Treasury, Sir Frederick Leith-Ross, put it, "the gold is not imported into France for commercial purposes; it is imported in order to be handed over to the Bank of France against francs. The movement of gold appears therefore to be due to a constantly recurring need for additional franc resources and if the movement is to be prevented, it will be necessary to ascertain what causes this shortage of francs." Royal Institute for International Affairs (1932, 53–54).

[14] Balogh (1930, 442) said that "those who make the charge of willful hoarding mistake conscious tactics for the shortcomings of the French banking system." Clarke (1967, 167) argued that the failure to monetize the gold inflows stemmed "from French institutional arrangements and financial policies—from the Bank of France's lack of authority to conduct open market operations, from the commercial banks' reluctance to discount at the central bank, and from the piling up at the central bank of surplus Treasury and other official receipts from the public."

Table 3
Bank of France's Balance Sheet, 1928–32
Millions of francs, end of December of each year

Year	Foreign Assets: Gold	Foreign Assets: Foreign Exchange	Domestic Assets	Total Liabilities (monetary base)	Money Supply (M2)	Money Multiplier
1928	32.0	32.7	19.9	84.6	161.7	1.91
1929	41.7	25.9	22.4	90.0	161.5	1.80
1930	53.6	26.2	23.2	103.0	170.2	1.65
1931	68.8	21.1	25.8	115.8	164.7	1.42
Percent Change (1928–31)	+115	−35	+30	+37	+2	—

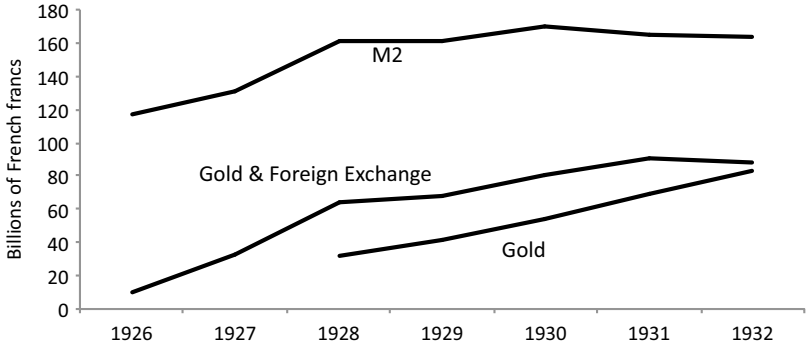
Sources: Board of Governors of the Federal Reserve System (1943, 641–42); M2 from Patat and Lutfalla (1990, Table A2).

multiplier dropped and offset the increase in high powered money. Figure 6 depicts France's reserves of gold, gold and foreign exchange, and money supply (M2). Simply put, the growth in the bank's gold reserves was not getting translated into the nation's money and credit.

And fiscal policy continued to exert a contractionary impact. Budget surpluses were deposited at the Bank of France and built up as idle balances because of the fear of monetization and inflation, as occurred before the 1926 stabilization. Hawtrey (1932, 24) noted that the repatriation of foreign capital "was mainly the result of big government loans. The government borrowed paper francs from the public and cancelled them by repaying advances to the Bank of France. The public, being short of paper francs, economized on imports and thereby acquired sufficient foreign exchange to extract a fresh supply of currency from the bank."

To some extent, the falling money multiplier was beyond the direct control of the Bank of France. Eichengreen (1986) examines the variety of institutional and legal constraints on the ability of the Bank of France to translate its expanding gold reserves into the money supply. Those policies were designed to tie the hands of the bank and prevent a reoccurrence of the inflation that the country had experienced earlier in the 1920s. Under the Monetary Law of 1928, the bank

Figure 6
France's Monetary Indicators, 1926–32



Sources: Patat and Lutfalla (1990, Table A2); Mouré (1991, 55–56).

was restricted in its ability to undertake open market operations to ease the monetary situation and slow the gold inflows. The French banking system was also notoriously inefficient at transforming reserves into francs. Given these restrictions on the Bank of France and the institutional environment, Eichengreen (1986) concludes that few policies (except open market operations, had they been permitted) could have stopped the French gold accumulation.[15]

Bernanke and Mihov (2000, 139–40, 148–50) make a qualified defense of the Bank of France. They observe that "the falling money multiplier combined with the Bank of France's movement from foreign exchange reserves to gold accounts for essentially the entire nullification of the effect of the gold inflows on the domestic money supply." Furthermore, the ratio of the monetary base to international reserves was basically unchanged, according to the data they

[15] Eichengreen (1986) argues that "France's painful experience with inflation in the early 1920s was directly responsible for the adoption of the stringent regulations which prevented the central bank from intervening to prevent the accumulation of gold." He suggests that "viewing French attitudes in their historical context sheds more light on the actions of policymakers than do allegations of obstinacy or of failure to understand the workings of the international monetary system."

present. Therefore, they conclude that "the actions of the Bank of France are difficult to fault. . . . [T]he Bank of France conducted policy almost entirely according to the gold standard's 'rules of the game.'" Unfortunately, Bernanke and Mihov find that the base-reserve ratio (the inverse of the cover ratio) was stable because they include foreign exchange reserves as part of France's reserves (see their footnote 6 on page 143). Yet France never adhered to the gold exchange standard, and indeed explicitly rejected it, and its cover ratio was far from constant during this period, as Figure 5 indicates. Therefore, the conclusion that France adhered to the rules of the game is inaccurate.[16]

Taken together, Figures 3, 4, and 5 illustrate why France was viewed as a "gold sink" by contemporary observers. This makes a plausible case that France's gold and monetary policies from 1928 to 1932 may have been as problematic for the world as American gold and monetary policies. Before turning to empirical evidence, the international reaction to France's gold accumulation is worth briefly considering.

2.4 The International Reaction

The growing French accumulation of gold soon became a source of international concern. In January 1929, John Maynard Keynes acknowledged that he had been wrong not to take more seriously Cassel's warnings about the gold standard's problems. Keynes (1929) argued that "a difficult, and even a dangerous, situation is developing" because

> there may not be enough gold in the world to allow all the central banks to feel comfortable at the same time. In this event they will compete to get what gold there is—which means that each will force his neighbor to tighten credit in self-protection, and that a protracted deflation will

[16] Bernanke and Mihov (2000, 148–50) temper their claim with this statement: "This is not to claim that French monetary policies were not bad, even disastrous, for the world as a whole: in particular, the large gold inflows induced by the conversion of foreign exchange and the switch by French citizens from deposits to currency put major pressure on other gold standard countries to tighten their monetary policies. However, the damage done by French policies lay to a much greater degree in the government's choice of monetary regime—its commitment to the gold standard, with minimal use of foreign exchange reserves—than in the Bank of France's implementation of that regime."

> restrict the world's economic activity, until, at long last, the working classes of every country have been driven down against their impassioned resistance to a lower money wage.

The recent behavior of the Bank of France "cannot help but cause an artificial shortage of gold," he noted. "The question of the sufficiency of the world's gold supplies in the abundance or scarcity of credit in the world's business lies, therefore, for the near future in the hands of the Bank of France."

By mid-1929, wholesale prices around the world began to fall and the deflationary spiral had begun. In March 1930 testimony before the Macmillan Committee, Keynes argued that the situation was reversible: "If . . . the United States and France were to declare that they would do everything reasonably in their power not to take more gold for a year or two, and, if practicable to lose ten percent of their present holdings, one would say that, in addition to other expedients, would make the position almost safe. I am absolutely confident that we could bring back the level of prices to what it was a couple of years ago." However, the problem was that "it is very doubtful how far the Bank of France is aware either of the existence of the problem or of the nature of the solution" (Keynes 1981, 154).

The Bank of France consistently denied that its policies were responsible for the inflow of gold. The 1929 annual report of the bank noted that "we never took the initiative in acquiring gold by means of foreign bills. We were obliged, in fulfillment of our obligation to regulate the currency, to accept all gold of foreign origin which was offered to us over the counter for francs, but we did not at any time intervene in the exchange market to accelerate the pace of these gold imports" (*Federal Reserve Bulletin*, March 1930, 113). Instead, the gold inflows were said to reflect confidence in French economic policies.[17]

[17] Sicsic (1993) notes that the capital inflows arose from the repatriation of capital by French residents after the stabilization became credible. Yet as Mouré (2002, 187) points out, this still created problems for the international financial system because even if all the gold coming back was repatriated capital, it had left the country without producing any decline in French gold reserves while it returned to France by delivering gold from the rest of the world.

French policymakers also denied accusations that they were sterilizing gold inflows.[18] Finance Minister Paul Reynaud (1933, 258) pointed out that new francs had been issued in almost equal value to the amount of gold accumulated between 1928 and 1932 "as is required by the gold standard system." (Reynaud failed to note that a decline in commercial banks' deposits had largely offset the increase in note issue.) He and other bank officials, such as Charles Rist (1932), argued that the Monetary Law of 1928 tied the hands of the bank in terms of its ability to pursue a more expansionary monetary policy.

Yet even if they could have pursued a more expansionary policy, French policymakers were not inclined to do anything much differently. Despite the expanding reserve base, the Bank of France did not want to pursue an "inflationary" monetary policy, so it took measures to limit the impact of gold on monetary circulation. French officials were satisfied with the situation and did not see why any changes should be made. They were particularly pleased with the rising cover ratio because it provided a cushion against capital flight. "It would have been extremely imprudent of the Bank to put all its gold to work, even had that been possible," Reynaud (1933, 258–60) argued. "The Bank of France has the duty to be forearmed against the possibility of a sudden withdrawal of foreign funds. . . . It is the duty of the Bank of France to guard against this danger by maintaining, not a sterile gold reserve, but a margin of available credit, so that it may intervene at an opportune moment and so far as possible modify the effect produced by the withdrawal of foreign capital."

As one might expect, French policy led to conflict with British officials, who were well aware that France's policy was making its own adjustment difficult in view of the overvalued pound. In January–February 1931, British officials consulted with their French counterparts to see if France would address its monetary situation. French officials insisted that the gold inflow demonstrated market confidence in its good policies, that they had done nothing deliberate to increase the gold inflow, and that there was nothing that they could do to stop it (Mouré 2002, 183–86). They put the burden on Britain to

[18] Reynaud (1933, 260) also tried to cast French policy in a favorable light in comparison to the Federal Reserve: "Unlike the United States, the Bank of France has never tried to neutralize the influx of gold into France. It felt that such a policy, by maintaining artificial credit conditions, would actually have stimulated the import of gold and aggravated the monetary difficulties of other countries."

raise interest rates further if they wished to attract gold. The French explanation failed to satisfy the British Treasury. As Ralph Hawtrey put it, "We complain of the drain of gold because it tends to cause a monetary contraction here and in the rest of the world, and Monsieur Escallier's reply is that we can prevent the drain of gold if we choose to effect a monetary contraction!" (Mouré 1991, 63)

British officials at the League of Nations also tried to raise the issue of the so-called maldistribution of gold and succeeded in establishing a Gold Delegation to investigate the problem. But the topic proved so controversial that the League was unable to address it head-on (Clavin and Wessels 2004). The Gold Delegation issued an interim report in September 1930 and concluded that "the problem of the distribution of gold is thus one of great importance. . . . [I]f the distribution of gold is the result of excessive or abnormal competition by a few countries, or if it has the effect of sterilizing important amounts of monetary stocks, serious consequences will arise affecting the general level of prices" (League of Nations 1930a, 17). The delegation proposed to alleviate the problem of excess demand for monetary gold through an international agreement for a coordinated reduction in cover ratios.[19]

Yet no serious efforts were made in 1930 or 1931 to address the gold situation. In September 1931, after Britain faced mounting losses in gold reserves as a result of the European financial crisis in mid-1931, Keynes argued that the United States and France were "primarily responsible for the disastrous fall in the level of world prices."

> The whole world is heartily sick of the selfishness and folly with which the international gold standard is being worked. Instead of being a means of facilitating international trade, the gold standard has become a curse laid upon the economic life of the world. It is not necessary to go into academic questions as to how far the fall in the world level of prices has been brought about by a worldwide shortage of gold. It is only necessary to look at the present distribution of the world's gold stocks. (Keynes 1981, 600)

[19] As a dissenting member of the Gold Delegation, Cassel (1932) bluntly stated what the more diplomatic League of Nations report could not say, that it was "especially remarkable that the Bank of France has consistently and unnecessarily acquired enormous amounts of gold without troubling in the least about the consequences that such a procedure is bound to have on the rest of the world."

Keynes called for an international gold conference to address the issue:

> This gold conference has to be put forward to America and France as an act of common sense and prudence, as a means of saving the economic world from the disaster which will surely overtake it if the slump is to be prolonged by a universal deflation policy.... We must make it plain to our friends on the gold standard that, if they refuse to play the game according to the rules, this is not to be made a compelling reason for reducing the standard of life in this country for a generation. If, as a result of the conference's failure, we were to leave the gold standard system, this would be preferable to the deflation policy with which the Coalition Government intends to launch this country in the race for economic suicide. (Keynes 1981, 602–3)

In fact, time had run out, and Britain left the gold standard just days after Keynes published this piece.

3. QUANTIFYING THE EXCESSIVE GOLD HOLDINGS BY FRANCE AND THE UNITED STATES

As noted earlier, there has been surprisingly little work done on the amount of gold withdrawn from world circulation by the United States and France and its effect on world prices.[20] To assess the contribution of American and French monetary policies to the worldwide deflation of the early 1930s, two counterfactual questions will be posed. First, how much excess gold was being held by the two countries? Second, to what extent can that excess gold accumulation explain the worldwide price deflation of the early 1930s?

The impact of the American and French monetary policies starting in 1928 can be assessed by calculating how much gold was sitting "inactive" in the vaults of the Federal Reserve and the Bank of France—that is, how much gold would have been freed up if the United States and France had kept only enough to cover their actual liabilities at their

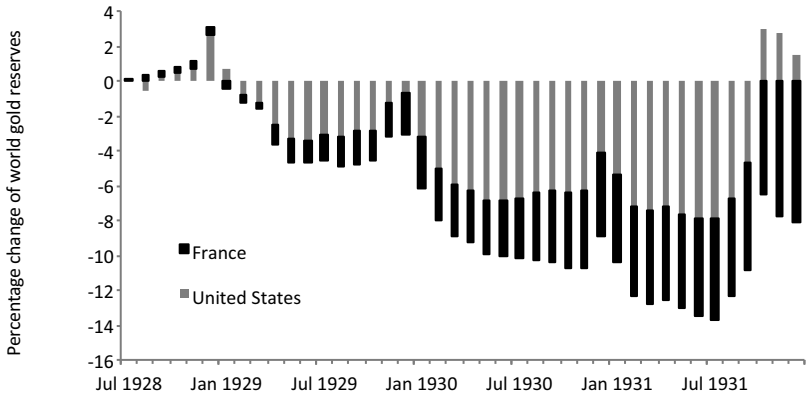
[20] Eichengreen (1990) found that if the U.S. and French shares of gold reserves had been at levels predicted by their economic characteristics, the gold reserves of other countries could have *doubled*. And "assuming that central banks were concerned to retain some proportion between their reserves and domestic liabilities," Eichengreen (1990, 264) concluded, "this redistribution of reserves would have provided considerable scope for an expansion of money supplies."

1928 cover ratio. Given that the world economy seemed to be doing reasonably well in 1928, the year in which the Federal Reserve began to tighten monetary policy and the Bank of France officially began operating under the new Monetary Law, that year will be taken as a benchmark. Specifically, we can start in June 1928 when the Bank of France first published its balance sheet under the new monetary regime.

The key assumption is that the two countries maintain their cover ratio—the ratio of gold reserves to domestic liabilities (notes in circulation and demand deposits)—at their June 1928 levels in subsequent years. (France's cover ratio was 40.45 percent on June 25, 1928.) Letting G stand for the gold reserves and L for domestic liabilities, the reserve ratio r for the 1928 benchmark can be calculated as $r_{28} = G_{28} \div L_{28}$, as depicted in Figure 5. The amount of excess gold held in 1929 can be calculated as $G_{29} - r_{28} \times L_{29}$, where $r_{28} \times L_{29}$ is the amount of gold required in 1929 to maintain the same 1928 cover ratio for the actual amount of outstanding liabilities in 1929. This can be calculated for subsequent months and years in the same way.

Figure 7 presents the monthly excess gold holdings of the United States and France as a share of the world's gold stock from June 1928.

Figure 7
Effective Reduction in World's Monetary Gold Stock, 1929–31



Source: Author's calculations. See text.

These countries did not have a contractionary impact on other countries for the remainder of that year. The United States exported large amounts of gold in June and July 1928, and although it imported small amounts of gold over the remainder of the year, its cover ratio fell. France also saw its cover ratio decline during the second half of 1928; by November, it had fallen below 38 percent. As a result, the Bank of France began to convert dollars and pounds into gold, and its cover ratio began to rise, ending the year at 38.46 percent (Mouré 1991, 47–48).

The situation changed dramatically in early 1929. By May 1929, the United States and France were holding 5 percent of the world's gold stock in excess of that needed to maintain their 1928 cover ratio. This means that about 5 percent of the world's gold stock was effectively withdrawn from world circulation and demonetized. (That gold became inactivate in 1929 in the sense that it was more than what would have been required to maintain the 1928 cover ratio, given the actual outstanding liabilities in 1929.) Although the United States eased its policy by the end of the year, the two countries took an average of 3.5 percent of the world's gold stock out of the international financial system over the course of 1929—the United States about 2.1 percentage points and France about 1.4 percentage points (about a 60/40 percent breakdown).

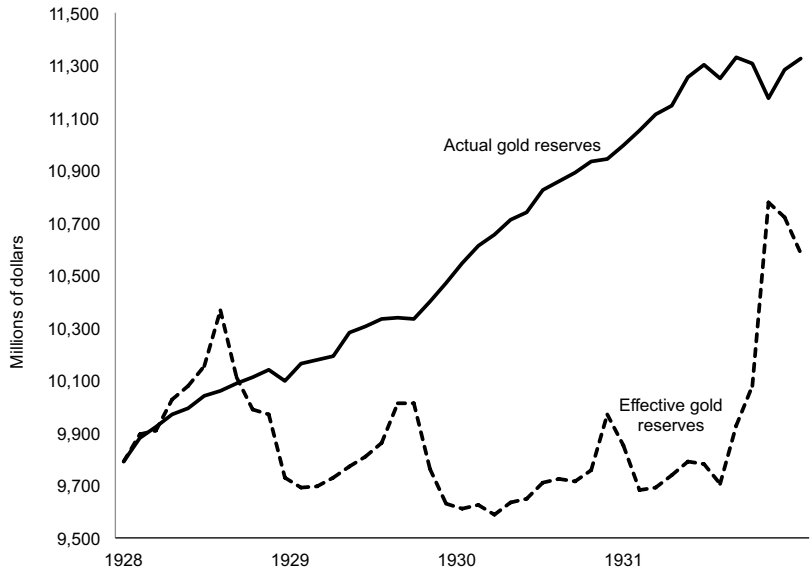
By early 1930, the United States and France had taken 9.5 percent of the world's gold reserves out of the system, the United States accounting for 6 percentage points and France 3.5 percentage points (again about a 60/40 breakdown, which was maintained throughout this period). By the end of the year, France's cover ratio had risen to well over 50 percent. In January 1931, the Bank of France considered suspending gold purchases if the cover ratio were to hit 55 percent, which it soon did, but this idea was rejected on the grounds that such a move would require legislation and would risk an appreciation of the franc (Mouré 2002, 188).

When the European financial crisis struck in mid-1931, even more gold flowed to the United States and France. By August 1931, the United States and France held 12.6 percent of the world's gold stock in excess reserves (7.2 percentage points for the United States, 5.4 percent for France). However, the situation once again changed dramatically in late 1931 when Britain left the gold standard and gold rapidly fled the United States in fear that the dollar would be

devalued. The U.S. cover ratio fell sharply while France's cover ratio reached 60 percent by the end of the year. By this point, the international gold standard had largely disintegrated.

In sum, the United States and France exerted roughly comparable pressure on foreign gold reserves in 1929, 1930, and through most of 1931, with the United States accounting for about 60 percent of the excess gold holdings to France's 40 percent. Figure 8 shows the path of the world's actual gold reserves, which were climbing steadily during this period, and the path of its "effective" gold reserves, which deducts the nonmonetized excess reserves of the United States and France. This latter path shows the sharp tightening of policy in early 1929 and again in early 1930. Rather than growing steadily, the effective amount of gold circulating in the world was flat in 1929, 1930, and 1931.

Figure 8
Actual and Effective World Gold Reserves, 1928–31



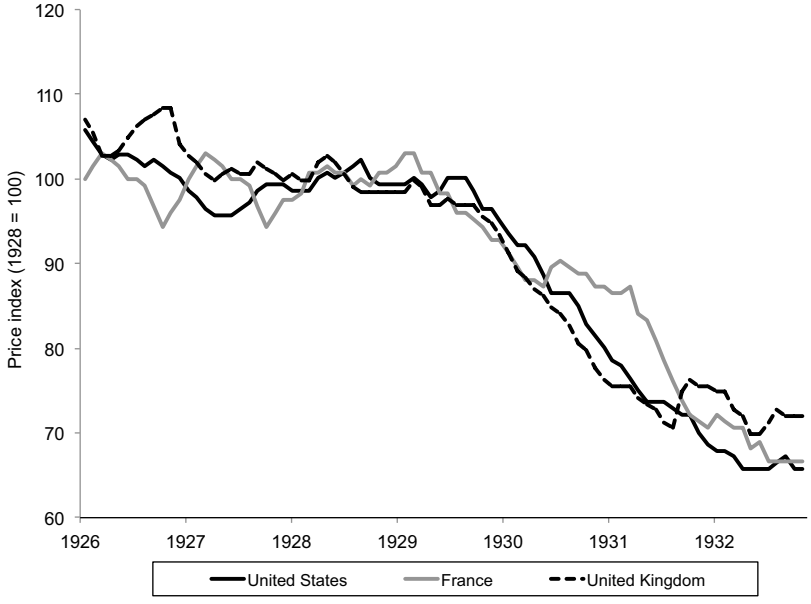
Source: Author's calculations. See text.

4. THE IMPACT OF EXCESSIVE GOLD HOLDINGS ON WORLD PRICES

In his 1752 essay "Of Money," David Hume remarked, "If the coin be locked up in chests, it is the same thing with regard to prices, as if it were annihilated." This analogy is relevant to the American and French accumulation of gold during this period. How did the massive withholding of gold from the rest of the world by the United States and France, starting in early 1929, affect world prices?

Although wholesale prices had been stable in most countries in the mid- to late-1920s, a powerful deflationary shock struck countries simultaneously in mid-1929. The precise timing of this deflationary price shock is, not coincidentally, closely related to the changes in French and American monetary policies. As Figure 9 shows,

Figure 9
Monthly Wholesale Prices, 1926–32



Source: League of Nations, *Statistical Yearbook of the League of Nations 1931/32*, various pages.

wholesale prices started falling in the summer of 1929 and did not stop until mid-1932, by which time many countries had left the gold standard. Prices fell about 5 percent in 1929, 15 percent in 1930, and another 14 percent in 1931, before stabilizing in 1932. This fall in prices was largely unanticipated (Hamilton 1992; Evans and Wachtel 1993). The onset of the Great Depression in terms of falling output and rising unemployment is largely coincidental with the sharp and synchronized decline in world prices starting in mid-1929.

Two studies have focused on the role of central banks in generating the deflation of the early 1930s. Bernanke and Mihov (2000) decompose national price movements resulting from changes in the money supply into components such as changes in the money multiplier, cover ratios, reserve-to-gold ratios, and the stock of gold. They conclude that the collapse in the world money supply was not due to a shortage of monetary gold. Rather, the monetary contraction in 1929 and 1930 resulted from the discretionary component of monetary policy, specifically the sterilization of gold by the United States and "to some extent" France, although they do not specifically apportion responsibility between the two countries. They add that "the nature of the contraction changed radically in the spring of 1931" with the onset of banking crises, which led to a decline in the money multiplier.

Using a simple accounting framework to assess changes in world prices due to changes in the supply and demand for gold, Sumner (1991, 388) concludes that "restrictive French monetary policy can explain much of the decrease in the world price level throughout the 1926–1932 period." According to his decomposition, between December 1926 and December 1932, gold supply increased 26 percent and gold demand increased 63 percent, thereby producing a 37 percent fall in world prices. Of the 63 percent increase in gold demand, 31 percentage points (49 percent) arose from France, 14 percentage points (22 percent) arose from the United States, and 17 percentage points (29 percent) arose from the rest of the world. However, this demand includes private demand (currency) as well as central bank demand. In terms of central bank demand, the Bank of France accounted for 17 percentage points of the increase in demand, whereas the Federal Reserve actually reduced its monetary demand for gold by 5 percentage points.

This paper takes a different approach by estimating the empirical relationship between the gold stock and world prices to see how much

of the decline in prices can be attributed to the deviation between the actual and effective world gold stock. Barro (1979) presents a simple model of the gold standard that gives us a more formal framework in which we can interpret the impact of changes in gold supplies on world prices. Under the gold standard, the supply of money is assumed to be a constant multiple of the monetary gold stock:

$$M_S = \lambda P_G G \tag{1}$$

where M_S is the money supply, P_G is the nominal price of gold, G is the stock of monetary gold, and λ is a multiplier that relates currency and demand deposits to the value of the monetary gold stock. Money demand is assumed to take the form

$$M_D = kPY \tag{2}$$

where M_D is money demand, P is the price level, Y is the level of real output, and k is the ratio of money demand to income. The nominal price of gold—P_G—is fixed under the gold standard, and λ is assumed to be constant. This implies the following:

$$\Delta \log P_t = \Delta \log G_t - \Delta \log k_t - \Delta \log Y_t \tag{3}$$

Unfortunately, because of insufficient data, any changes in the ratio of money demand to income over time (k) becomes part of the error term. Therefore, the empirical specification is

$$\Delta \log P_t = \alpha + \beta \Delta \log G_t + \mu \Delta \log Y_t + \varepsilon_t \tag{4}$$

This specification assumes that G is exogenous. Although there is no allowance for the possibility that a lower price level (i.e., a higher relative price of gold) could lead to an increase in the production of gold, historical evidence strongly suggests that this is an appropriate assumption. It is commonly accepted that gold production was inelastic in the short run, that is, with respect to year-to-year price fluctuations.[21] Even over the longer run, Rockoff (1984) and Eichengreen and McLean (1994) find that changes in gold supply prior to 1913 were determined by new discoveries and factors other than the price of gold.

[21] As Sumner (1991, 383) notes, "changes in the supply of monetary gold could only slightly reduce the impact of changes in gold-reserve ratios on the price level, at least in the short- to medium-term."

The coefficients of this equation have an economic interpretation. The constant term can be interpreted as the change in the price level without any growth in the supply of gold. Cassel (1928), Kitchen (1930), and others all emphasized how world commodity prices were influenced by changes in the world gold stock and concluded that the world monetary stock of gold would have to increase about 3 percent per year to maintain stable world prices. If the monetary stock rose at a slower rate, prices would fall; if the stock rose at a more rapid rate, prices would rise. This 3 percent factor reflected growing transactions and other demand for gold holdings. These economists showed this empirical regularity with an abundance of charts and tables (no regression analysis) depicting the world gold stock and a measure of world commodity prices back to the 1840s. Thus, we would expect the estimate of α to be about -0.03.

The coefficient β (the elasticity of the gold stock with respect to commodity prices) should be about 1, because a 10 percent increase in the world gold stock would increase the monetary base 10 percent and would likely increase prices 10 percent. We would expect the coefficient on income to be positive, but we would not have a strong prior opinion about its precise magnitude.

Annual data on the world monetary gold stock and wholesale price index are presented in League of Nations (1930a, 82–84).[22] Annual data on world income (real gross domestic product) for Western Europe and other offshoots (the United States, Canada, Australia, and New Zealand) come from Angus Maddison's database.[23]

The results from estimating equation (4) for the period of the classical gold standard (1870–1914) is

$$\Delta \log P_t = \underset{(0.01)}{-0.04} + \underset{(0.45)}{0.87}\, \Delta \log G_t + \underset{(0.27)}{0.72}\, \Delta \log Y_t + \varepsilon_t$$

HAC standard errors are in parenthesis and the adjusted R^2 is 0.12. The Breusch-Gofrey serial correlation test ($F = 0.36$) rejects the hypothesis that the errors are serially correlated.

[22] The most frequently used measure of world prices was the Sauerbeck-Statist index, the longest available series of world commodity prices dating back to the early 19th century. The Sauerbeck-Statist index after 1929 comes from Mitchell (1988).

[23] Maddison's database can be found online at http://www.ggdc.net/MADDISON/Historical_Statistics/horizontal-file_02-2010.xls. Accessed November 14, 2010.

The estimate of the constant term is −0.04, which supports Cassel's contention that the demand for gold was growing at about 3 percent annually and therefore world gold supplies would need to expand at least that much to maintain the world price level. The coefficient on the change in the gold stock suggests that a 10 percent increase in world gold reserves would increase world prices by almost 9 percent; one cannot reject the hypothesis that the coefficient is 1.

The sample can be extended back to 1840 ($n = 74$) if one is willing to forgo the income term. The estimated relationship is

$$\Delta \log P_t = \underset{(0.01)}{-0.03} + \underset{(0.38)}{0.92}\, \Delta \log G_t + \varepsilon_t$$

HAC standard errors are in parenthesis and the adjusted R^2 is 0.10. The Breusch-Gofrey serial correlation test ($F = 0.92$) rejects the hypothesis that the errors are serially correlated.[24]

While these estimates give us some information about the relationship between changes in gold supplies and world prices, the relationship between gold and prices may have been very different in the post–World War I period. It is difficult to test whether this is the case due to the lack of annual observations of countries on the gold standard in the 1920s. Therefore, the prediction of how prices would have behaved in the absence of the U.S. and French gold accumulation depends on the pre–World War I relationship still holding. We cannot be completely assured that this is the case, but must presume so to do the calculation.

Figure 10 shows the close historical relationship between the change in world gold reserves and the change in world prices from 1840 to 1914 (using the second estimated equation). The gold standard was suspended during World War I and thereafter, so prices and gold became delinked. Prices rose sharply during the war and fell precipitously in 1921, both of which are accounted for with dummy variables for World War I (1915–17) and the postwar price decline (1921). The equation allows us to predict the further path of prices based on the actual change in the world's monetary gold stock.

[24] Barsky and De Long (1991) estimate a bivariate regression of wholesale price inflation on gold production but find a coefficient of 2.47 for the period 1880–1913. However, they note that the coefficient should be close to unity.

The monetary gold stock grew 14 percent between 1928 and 1932, a compound annual rate of 3.4 percent. Despite the concerns about an insufficient supply of gold, there was no apparent shortage of monetary gold during this period. However, this growth is very close to the constant term α, and as a result, world prices would be expected to be roughly stable over this four-year period. Of course, instead of remaining stable, world prices *fell* 34 percent between 1928 and 1932.

Figure 10 shows actual world prices from 1840 to 1933, predicted world prices from 1840 to 1925, and the out-of-sample forecast of prices from 1925 to 1933. This illustrates the powerful deflationary shock that hit during this period and how difficult it would have been to anticipate a significant price decline given the growing supply of gold during this period. For some reason, the growth in the world's monetary gold stock was not being translated into stable world

Figure 10
Actual and Predicted Wholesale Prices, 1840–1933

Source: See text, pp. 34–36.
Note: +/−2 standard errors included with the forecast price level.

Table 4
Actual and Expected Changes in Prices (Percent)

	Change in Gold Stock	Expected Change in Prices	Actual Change in Prices	Percent Change in Effective Gold Stock	Expected Change in Prices
1929	2.4	−0.8	−5.1	−4.8	−7.4
1930	3.4	0.1	−15.7	−1.7	−4.5
1931	2.7	−0.5	−14.4	0.5	−2.5

prices. The likely reason for this outcome was the effective reduction in the monetized gold stock due to U.S. and French actions.[25]

The results are summarized in Table 4. In 1929, the world gold stock grew 2.4 percent, not enough to prevent a potential small decline in prices of nearly 1 percent. But prices actually fell 5 percent because the United States and France effectively withdrew 5 percent of the world's gold stock from circulation in 1929. Given our estimate of the elasticity of prices with respect to the gold stock (about 0.9), world prices in 1929 would have been expected to fall 7 percent ($-4.8 \times 0.9 - 0.04$), other things being equal in that year. In 1930, the effective gold stock fell nearly 2 percent, suggesting that prices would have been expected to fall almost 5 percent, when in fact they fell almost 16 percent. In 1931, the effective gold stock was stable and so prices would have been expected to fall 3 percent, when in fact they fell 14 percent. The impact on prices in 1932 matters less because many countries had left the gold standard by that point. The link between gold and prices was increasingly being severed, and France could accumulate all the gold it wanted without significantly affecting world prices.

From this simple exercise, we can conclude that the nonmonetization of gold inflows by the United States and France accounted for nearly

[25] Mazumder and Wood (forthcoming) argue that the severe deflation was inevitable once countries decided to return to prewar parity following the suspension of the gold standard during World War I and the subsequent wartime inflation. As Figure 10 indicates, the world price level did fall back to its prewar level by 1933. However, this fall was not necessarily inevitable because two major players, Germany and France, did not return to prewar parity, other smaller countries were on the gold exchange standard, and the United States never really followed the gold standard anyway. Even if one accepts the deflation as inevitable, Mazumder and Wood cannot explain the timing of the fall in prices; the evidence presented here suggests that American and French gold policies in the late 1920s were closely related to the sudden drop in prices.

40 percent of the worldwide deflation experienced between 1929 and 1931. World wholesale prices fell 34 percent during this period, of which 14 percentage points can be explained by the reduction in the world's effective gold stock over that period. Of course, once the deflationary spiral began, other factors began to reinforce it. The most important factor was growing insolvency (due to debt-deflation problems identified by Irving Fisher), which contributed to bank failures, which in turn led to a reduction in the money multiplier as the currency-to-deposit ratio increased (Boughton and Wicker 1979). However, these endogenous responses cannot be considered as independent of the initial deflationary impulse, and therefore U.S. and French policies can be held indirectly responsible for some portion of the remaining part of the price decline.

An important question that has been left unanswered is the reason for the nonneutrality of money; that is, why this deflation was associated with declining output. While falling prices need not imply contracting output and higher unemployment, recent research has shown that the Great Depression of the 1930s is somewhat unique in that the two factors were closely linked (Atkeson and Kehoe 2004; Bordo, Lane, and Redish 2004).

5. CONCLUSION

The standard account of the onset of the Great Depression usually begins with the tightening of U.S. monetary policy in 1928. However, the rapid accumulation and effective neutralization of gold reserves by France deserves equal billing in the narrative. This paper provides a simple explanation for the sudden onset of worldwide deflation in mid-1929 in terms of changes in U.S. and French monetary policy around 1928. The impact of the gold accumulation by each of the two countries was almost equally significant in producing deflationary pressure from 1929 to 1931.

Sweden's Gustav Cassel was one of the few contemporary economists to recognize this situation as it was happening. In lectures at Oxford in 1932, Cassel looked back on the preceding few years and blamed the United States and France for the economic disaster. "The fact that the gold-receiving countries failed to use their increasing gold reserves for extending the effective supply of means of payment must be regarded as abnormal and, therefore, as an independent cause of the fall in prices at the side of the maldistribution of gold," Cassel (1932, 70–71) argued. "The breakdown of the Gold Standard was the

result of a flagrant mismanagement of this monetary mechanism." He rejected the excuses given by French and American authorities for their failure to monetize the gold inflows: "The fact that France and the United States have drawn disproportionate quantities of gold to themselves is certainly very disquieting, but the defense that is offered for this behavior is still more appalling."[26]

Because of the close association of the deflation with the depression in economic output, taking action to avert deflation during this period would likely have changed the course of world history. One shudders to think of the historical ramifications of the policies pursued at this time. As Robert Mundell (2000, 331) has speculated, "Had the price of gold been raised in the late 1920's, or, alternatively, had the major central banks pursued policies of price stability instead of adhering to the gold standard, there would have been no Great Depression, no Nazi revolution, and no World War II."

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[26] Also looking back on this period, Ralph Hawtrey (1932, 38) stated, "I am inclined therefore to say that while the French absorption of gold in the period from January 1929 to May 1931 was in fact one of the most powerful causes of the world depression, that is only because it was allowed to react to an unnecessary degree upon the monetary policy of other countries."

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Comment

Charles W. Calomiris

Douglas Irwin's paper should encourage doctoral students in macroeconomics because it is one example of a broader phenomenon: the basic facts of some of the most important episodes of macroeconomic history remain obscure.

Irwin explores a key counterfactual question about the great deflation of the early 1930s. He shows that, absent the French monetary policies of that period, the great deflation would have been avoided, or at least greatly diminished. That is an important contribution; the failure of the gold standard to deliver a stable monetary regime in the interwar period was central to the history of the 20th century—not just to the monetary history of the 20th century—because without that failure, neither the Great Depression nor World War II would be imaginable. Economic historians, especially Barry Eichengreen, have been writing about the importance of the French absorption of gold in the late 1920s and early 1930s for a long time, and the conclusions Irwin reaches will not surprise them. But no one had quantified the extent of the French contribution to global deflation of the early 1930s.

Irwin's study is not just relevant for understanding the history of the Great Depression. It raises deep questions for international monetary policy today concerning the desirability of maintaining fixed exchange rate regimes. A central lesson of the French experience is that multilateral fixed exchange rate regimes like the gold standard are destined to end—and to produce catastrophic collapses when they do. Indeed, I would go further. That lesson also applies to the euro zone's currency union, even though its member countries have given up autonomous monetary policy (for now).

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National politics are incompatible with an international monetary standard because national politics always trump international relations. International monetary standards, therefore, create monetary time bombs. Nations necessarily experience different economic shocks, and their political systems necessarily respond to those shocks *nationally,* balancing the relevant national political interests. International monetary agreements that seek to constrain those independent domestic responses are simply too weak. The euro zone sought to imitate the currency union of the United States, but that goal was founded on a political fantasy. The United States can maintain a currency union among its states because its currency union spans a nation, no less and no more. The world isn't a nation, and neither is Europe. When productivity growth differs among nations adhering to an international monetary standard (as it does in Greece and Germany today), the time bomb does not have a very long fuse. Even when two countries have more in common (like Germany and Spain), shocks that hit one but not the other will derail a currency union. Today's Spanish banking crisis is a prime example of such a shock.

From its beginnings, the international exchange rate system established after World War I was destabilizing because currency parities were established far from their equilibrium values. That created the need for substantial international balance-of-payments adjustments via gold flows, including substantial gold flows into France. That problem, however, could have been resolved through adjustments in income and prices (albeit painfully) without causing international havoc. The deeper problem that produced a global depression was that participating national governments, not market processes or global authorities, ultimately controlled how their nations adjusted to international gold flows. The countries importing huge amounts of gold (France and the United States) did not expand their money supplies enough to counter the deflationary pressures from the countries that were exporting gold and deflating their money supplied. The problem in the United States was largely that the Federal Reserve placed domestic objectives above international ones, although its conceptions about domestic monetary objectives were deeply flawed (Friedman and Schwartz 1963; Meltzer 2003; Calomiris 2012).

The problem in France was not just that central bankers failed to comprehend the importance of the global supply of money for

determining prices under the gold standard. Nor was it that they failed to see the need for cooperation among central bankers. Political and economic constraints prevented the Bank of France from expanding the French money supply in tandem with France's expanding gold holdings. Domestic factors trumped the so-called rules of the game, with dramatic and unintended international consequences.

It is important to emphasize that French policy did not consciously produce a global deflation. As Eichengreen (1982; 1986) has shown, the French government and the Bank of France were constrained in their actions, and those constraints likely reflected a combination of factors, including prior French monetary and political history, and the condition of French banks. Furthermore, the nature of French economic expansion during the late 1920s—which was heavily focused on capital investment rather than export production—did not promote speedy automatic adjustment of the balance of payments in reaction to French gold inflows. Indeed, from 1926 to 1932, the French real exchange rate and real wages in tradable goods were quite stable.

The global economy, therefore, needed a forward-looking, activist French policy of monetary, credit, and fiscal expansion to make international adjustment work, but those policies were inconsistent with the actions of the Bank of France, the French government, and the French commercial banks. The central bank's "cover" reserve ratio rose consistently from 1928 to 1931, from 40 percent to 80 percent. Not only was high-powered money constrained by the lack of central bank actions, but the money multiplier was falling, mainly as the result of French banks' desire to accumulate reserves, as the French banks boosted their reserves-to-deposit ratio. And the French government ran substantial budget surpluses.

These actions were not the result of ignorance or stupidity; they were responses to the weakened institutional structure and heightened risks that plagued French public finances, central banking, and its commercial banks. Poincaré's ascendancy in 1926 was a big positive for French political and economic management, but it was not a miracle drug to instantly heal all of France's ailments (Eichengreen and Wyplosz 1986).

French budget surpluses were responding to the high risk of default on French public debt. At the end of World War I, France had a public debt-to-GDP ratio that reached nearly 200 percent. French

budget deficits did not fall as quickly as those of Great Britain; from 1920 to 1923, they consistently ranged between 5 percent and 15 percent of GDP. The curtailment of reparation payments from Germany in 1924 contributed to widespread fears of rising tax burdens or high inflation. French sovereign yields remained substantially higher than British yields as late as 1927, although they fell below British yields in 1929 (Friedman 1953; Eichengreen 1982; Bordo and Hautcoeur 2003).

Most important, the Bank of France's latitude to pursue monetary expansion had been substantially circumscribed. In April 1925, the bank was implicated in a fraud involving public finances, which led to legislation that effectively prohibited the central bank from expanding the money supply (Eichengreen 1982; 1986). Commercial banks were also in a risky position, which led them to increase their reserve ratios as gold flowed into the country (Bouvier 1984).

In hindsight, France was in the middle of a sustainable expansion—one that left it much better off than Britain, Germany, and the United States by 1930. Hindsight, as they say, is "20/20." French fiscal, financial, and economic strength were all being tested in the 1920s, and they were not apparent until the Great Depression was underway. Economic adjustment in France took those domestic constraints into account; it had little choice to do otherwise. Furthermore, the political consequences of the central bank's involvement in fiscal fraud were (unsurprisingly) far-reaching and long-lived. When a central bank loses the trust of its nation, it should expect to be stripped of much of its discretionary authority. The timing of the Bank of France's emasculation, of course, couldn't have been worse from the standpoint of the gold standard and the global economy.

What lessons can we derive from France's experience? The French gold sink reflected a "perfect storm" of economic and political circumstances, which produced a disastrous accumulation of gold, tight monetary policy, tight bank lending policy, and tight fiscal policy. The more important lesson, however, is that the reasons such storms happen have not disappeared. Nations, then and now, inevitably get into trouble, inevitably experience shocks that weaken their financial, fiscal, and monetary institutions, and inevitably handle those challenges more poorly than we economists would like since problems are addressed by imperfect political systems. The overarching lesson of France in the 1920s is that international monetary arrangements

need to take all those facts seriously, rather than design exchange rate policies on the basis of ignorant, utopian fantasies. Of course, expecting countries to behave that way would itself be an ignorant, utopian fantasy. The apparent impossibility of learning in international monetary affairs ensures that monetary history will remain an interesting subject.

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Comment

James D. Hamilton

Douglas Irwin has provided a useful investigation into what went wrong during the world's brief return to an international gold standard in the late 1920s. He has uncovered some prescient historical analysis from Keynes and others and provides useful new analysis that lays the blame on both France and the United States for trying to accumulate too much of the world's gold stock between 1928 and 1931.

Some insight into what happened can be gained by considering an economy in which there is only a single produced good, which for concreteness I will call a "potato." The aggregate price level for this economy, P, is simply the number of dollars it would cost to buy a potato. The relative price of gold, R, is the number of potatoes it would cost to buy an ounce of gold. We then have the accounting identity that the number of dollars needed to obtain an ounce of gold is given by

$$\frac{P \text{ dollars}}{\text{potato}} \times \frac{R \text{ potatoes}}{\text{ounce of gold}} = PR \frac{\text{dollars}}{\text{ounce of gold}}. \tag{1}$$

Now, if by a gold standard we mean a system in which the number of dollars necessary to obtain an ounce of gold (PR) is fixed, then a decrease in the aggregate price level P and an increase in the relative price of gold R are one and the same thing. In thinking about why countries on the gold standard—such as the United States, France, and Britain—experienced broad deflation between 1929 and 1931, we can equally well ask what factors gave rise to an increase in the relative price of gold over this period.

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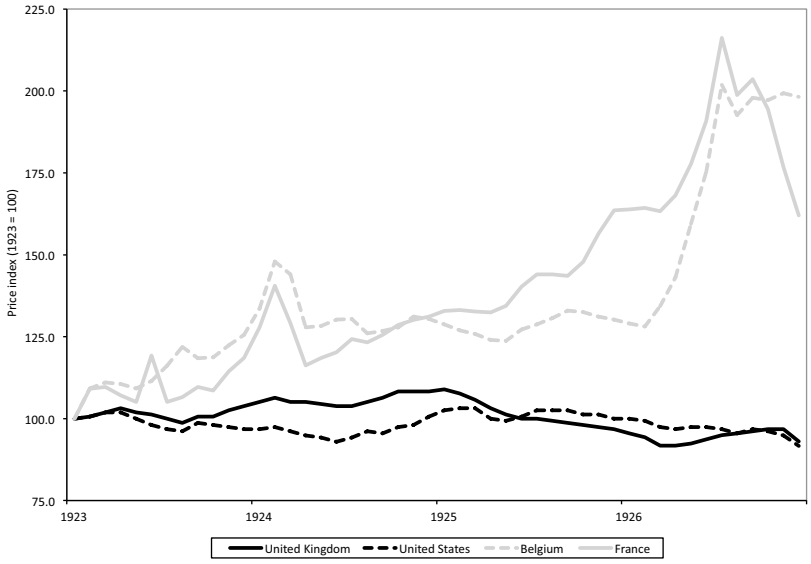
Irwin's Figure 1 provides one way to frame this question. If we think of the relative price of gold (*R* in my notation) as the value that equates gold supply with gold demand, then an event that increased the demand for gold would, for countries adhering to the gold standard, require deflation in overall money prices.

Irwin's empirical support for the claim that this is what happened is based on the amount by which France and the United States increased their holdings of gold relative to notes in circulation and demand deposits after 1928. Although the evidence is consistent with Irwin's hypothesis, it's not a necessary ingredient. Returning to the logic of Irwin's Figure 1, suppose that France and the United States had been the only two countries in the world, that the two countries were identical in all respects, and that both countries wanted to increase their gold holdings at the same time. Their respective central banks could raise interest rates to attract gold inflows but of course could not produce any new gold for the system. Instead, raising rates would have the effect of reducing domestic demand and, insofar as this depressed the domestic price level *P*, would correspond under a gold standard to an increase in the relative price of gold *R*. The logic of Figure 1 clearly implies that *P* can change without any change in the physical stocks of gold held by any central bank.

Thus we should look not just at the ex post results of which countries ended up acquiring additional gold, but also at the underlying forces that may have induced France and possibly other central banks and private citizens to want to accumulate more gold in the first place. Answering that question necessitates commenting on the experience with inflation in Europe in the years before Irwin's analysis begins.

In my Figure 1, I have plotted the price levels of France, the United Kingdom, and the United States over the three years before Irwin's Figure 9 begins: 1923–26. Although prices in the UK and the United States had been steady, France at that time was not on the gold standard and saw domestic prices double over the three-year period. In this, the country was not alone. Belgium's experience (also shown in Figure 1) was similar. Germany's hyperinflation earlier in the decade is quite famous. The 1920s also saw slightly less spectacular hyperinflations in Austria, Hungary, Poland, and Russia. This experience was what led France (along with 30 other countries that had been

Figure 1
Wholesale Prices across Countries, 1923–26



Source: *League of Nations Statistical Yearbook* (1926), available online at http://digital.library.northwestern.edu/league/stat.html.
Notes: Wholesale price level (Jan. 1923 = 100) for Belgium, France, United Kingdom, and United States, monthly, Jan. 1923 to Dec. 1926.

off gold) to try to return to the gold standard in the late 1920s. As Eichengreen and Temin (2000, 198) observed,

> France had suffered a socially divisive inflation in the first half of the twenties, when gold convertibility was in abeyance. The budget had run out of control until the government again was subjected to gold-standard discipline. Commentators came away convinced that disregard for the gold standard led to financial excesses, economic chaos and social turmoil.

And Cooper (1992, 2126–27) noted that the instability of the 1920s continued to constrain the Bank of France through the early 1930s:

> It is worth noting, however, that from late 1930 the French public, having disgorged gold on a substantial scale dur-

> ing the late 1920s, began to acquire gold on a massive scale throughout 1931–33, even while the Bank of France was acquiring gold. Thus the Bank was reminded of the possibility, indeed the likelihood, that the French public was a potential source of major conversion if they lost confidence in the national currency.

If economic recovery had begun at the end of 1930, the Great Depression would likely have been regarded as just another typical recession. I will therefore focus on the strains on the international financial system in 1931. The failure of Credit-Anstalt, Austria's biggest bank, in May 1931, was followed by bank runs in Czechoslovakia, Germany, Hungary, Poland, and Romania. Initially, following these—and in a traditional flight to safety—the gold reserves of the Bank of England increased despite a drop in its discount rate, in a traditional flight to safety (see Figure 2). However, concerns grew that some of the Bank of England's own European assets might themselves be frozen, and the country saw a rapid outflow of gold that summer. Britain abandoned the gold standard on September 19, 1931.

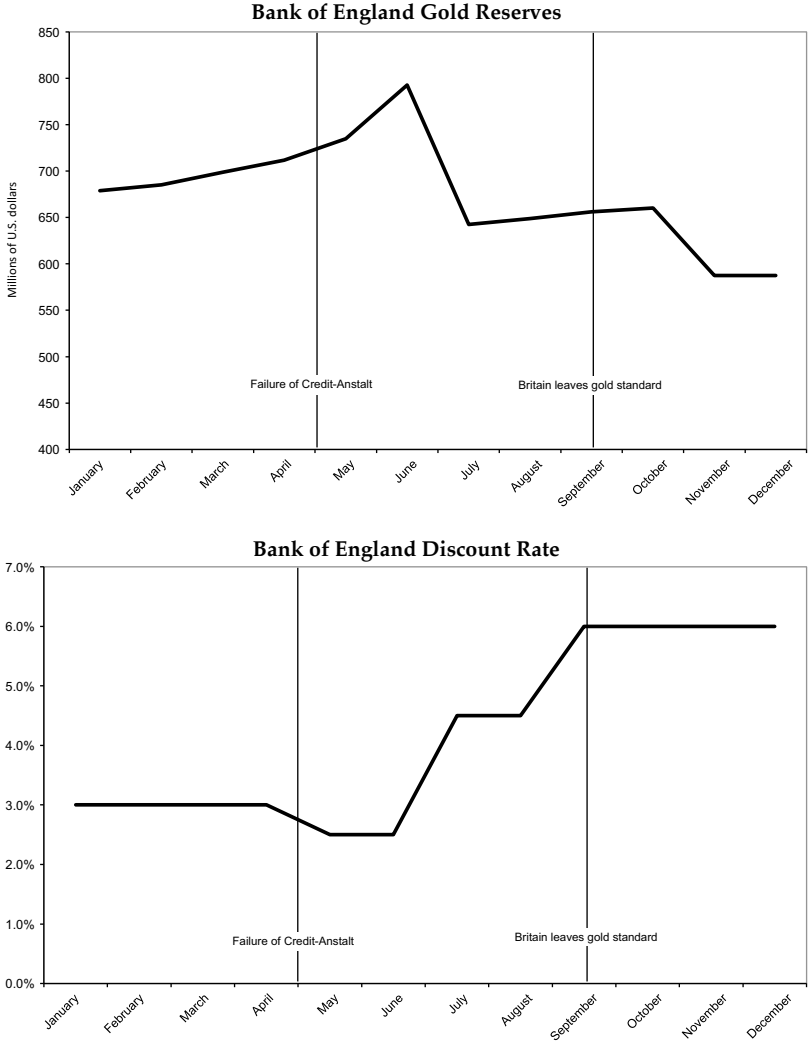
The United States, which like Britain had experienced gold inflows despite a lower discount rate in the summer of 1931, itself became the object of intense outflows after Britain had left the gold standard, under speculation that the U.S. dollar would be the next to suspend convertibility into gold (see Figure 3). The Federal Reserve entered the episode with six times as much gold as the Bank of England, and this, along with the stiff hike in U.S. interest rates, proved sufficient to end the speculative conversion of dollars to gold.

Although the United States and France managed to stay on the gold standard, the deflation they experienced was highly disruptive. Note that, for most countries, the economic recovery began when the country went off gold and thereby stopped the decline in the domestic price level *P* (see Figure 4).

This episode illustrates that the gold standard cannot by itself correct for an earlier lack of monetary and fiscal discipline. As I observed in Hamilton (1988, 87),

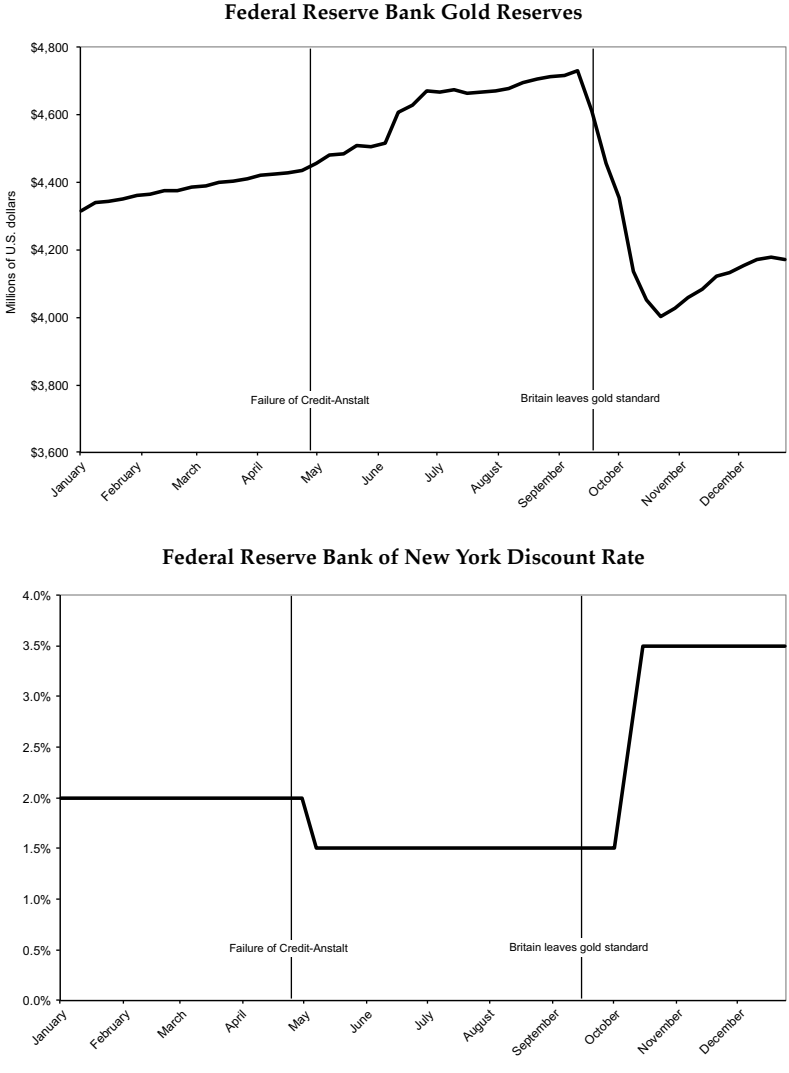
> A government lacking discipline in monetary and fiscal policy in the absence of a gold standard likely also lacks the discipline and credibility necessary for successfully adhering to a gold standard. Substantial uncertainty about the future

Figure 2
Bank of England Gold Reserves and Discount Rate, 1931



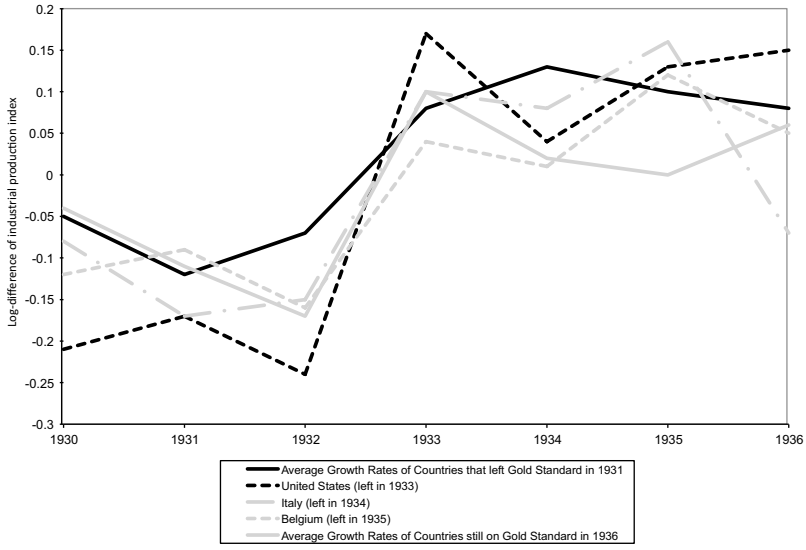
Sources: Top panel: Board of Governors of the Federal Reserve (1943, 551); Bottom panel: Global Financial Data, http://www.globalfinancialdata.com.
Note: Both panels show end-of-month values.

Figure 3
Federal Reserve Gold Reserves and Discount Rate, 1931



Sources: Top panel: Board of Governors of the Federal Reserve (1943, 385–86); Bottom panel: Board of Governors of the Federal Reserve (1943, 441).
Note: Weekly data.

Figure 4
Industrial Production for Countries Going Off the Gold Standard



Source: Bernanke and James (1991, Table 4).

> inevitably will result as speculators anticipate changes in the terms of gold convertibility. This institutionalizes a system susceptible to large and sudden inflows or outflows of capital and to destabilizing monetary policy if authorities must resort to great extremes to reestablish credibility. Such a system requires individuals to adapt their behavior to the contingencies of rapid and dramatic changes in interest rates, credit availability, and price levels. This characterizes the events of 1931 most accurately. Surely, it contributed to propagating the Great Depression.

Irwin's paper provides a good reminder of why an attempt to return to an international gold standard in 2013 would only be the beginning of our problems.

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