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THE GOLD-EXCHANGE STANDARD AND THE GREAT DEPRESSION

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ABSTRACT

A number of explanations for the severity of the Great Depression focus on the malfunctioning of the international monetary system. One such explanation emphasizes the deflationary monetary consequences of the liquidation of foreign-exchange reserves following competitive devaluations by Great Britain and her trading partners. Another emphasizes instead the international monetary policies of the Federal Reserve and the Bank of France. This paper analyzes both the exceptional behavior of the U.S. and France and the shift out of foreign exchange after 1930. While both Franco-American gold policies and systemic weaknesses of the international monetary system emerge as important factors in explaining the international distribution of reserves, the first of these factors turns out to play the more important role in the monetary stringency associated with the Great Depression.

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Two broad approaches dominate the literature on macroeconomics of the Great Depression. One, associated mainly with studies of the United States, emphasizes misguided policy responses at the national level as an explanation for the Depression's singular depth and long duration. The other, with a long tradition but associated prominently with the work of Charles Kindleberger, emphasizes instead the malfunctioning of the international system. The strength of the first approach is the transparency of the propagation mechanism, usually taken to be deflationary monetary trends. The weakness of the second is precisely the opposite, that the propagation mechanism tends to be opaque. It is not clear what dimension of the international system malfunctioned after 1929, nor through what channels its malfunctioning contributed to the Depression.

A prime suspect is surely the gold-exchange standard of the interwar years. That system was a hybrid, neither a pure gold standard like that which prevailed in various countries prior to World War I nor a fiat money system like that which succeeded the breakdown of Bretton Woods. As under a gold standard, countries were required to maintain convertibility between domestic currency and gold and to leave international gold movements unfettered. But they were permitted -- indeed encouraged -- to hold international reserves in the form of foreign exchange. This introduced into the operation of the gold standard "a new psychological element never present before the war."[1] When financial crisis culminating in currency inconvertibility struck the system in 1931, central banks alarmed by fluctuations in the foreign-exchange value of reserve currencies rushed to

liquidate their foreign asset positions. It is argued that the consequent reduction in global reserves constrained money supplies in countries required to maintain statutory ratios of reserves to notes and deposits, heightened the difficulties of gold bloc countries attempting to defend their gold standard parities, and exacerbated the monetary deflation associated with the deepening of the post-1929 slump. As a result of this experience, the gold-exchange standard has come to be viewed as inherently unstable due to its susceptibility to the operation of Gresham's Law, and its instability has come to be viewed as an important part of the explanation for the severity of the Great Depression.

The gold-exchange standard was adopted in response to the widely perceived danger of an international shortage of gold.[2] Between 1915 and 1925, prices had risen worldwide due to the inflation associated with wartime finance and postwar reconstruction. These higher prices combined with economic growth to increase the transactions demand for money. Yet world money supply was constrained by the availability of reserves. Statutory regulations prevented central banks from reducing the reserve backing of their money supplies, while recent experience with inflation deterred politicians from moving to revise those statutory regulations. The output of newly mined gold had been depressed since the beginning of World War I, and experts offered pessimistic forecasts of future supplies. The alternative to increasing either the supply of monetary gold or the intensity of its utilization, namely forcing a reduction in the world price level, was viewed as undesirable since it would only add to the difficulties of an already troubled world economy.

The solution to this problem was to permit central banks to supplement the gold backing of their currencies with exchange reserves. Much was done to encourage the habit. Observers preoccupied by the spectre of a worldwide gold shortage argued, however, that this practice was never systematized sufficiently nor carried far enough. According to their interpretation of events, when deflation set in starting in 1929, the gold shortage had come home to roost.

There are analytical difficulties with the explanation for interwar monetary problems that emphasizes a global gold shortage. For one, the danger of a shortage of gold constraining the volume of transactions was alleviated by the all but complete removal of gold coin from circulation.[3] Hence, the supply of monetary gold backed a considerably increased volume of central bank liabilities and supported a relatively stable price level through 1928. The percentage gold cover of the short-term liabilities of all central banks was little different in 1928 than it had been in 1913.[4] It is unclear why a gold shortage, after having exhibited only weak effects in previous years, should have had such a dramatic impact starting in 1929. As the Gold Delegation of the League of Nations concluded, "The world's total stock of monetary gold, apart from any considerations as to its distribution among different countries, has at all times in recent years been adequate to support the credit structure legitimately required by world trade and...the rapid decline in prices which began in 1929 cannot be attributed to any deficiency in the gold supply considered in this sense."[5]

As this quotation presages, the alternative characterization of the monetary problem associated with the operation of the gold-exchange standard

emphasizes mismanagement of gold and foreign-exchange reserves rather than their overall insufficiency. There exist two versions of this argument, one which focuses on the distribution of gold, the other which focuses on the demand for foreign exchange. The first posits a maldistribution of gold, blaming France and the United States for imposing deflation on the rest of the world by absorbing disproportionate shares of global supplies. As the point was expressed by Britain's Macmillan Committee in the summer of 1931, "The present distribution of gold is very generally held to be unsatisfactory; a maldistribution to which is to be attributed a large measure of responsibility for the heavy fall in prices in recent years."[6] Between the ends of 1928 and 1932 French gold reserves rose from $1247 million to $3257 million of constant gold content, or from 13 to 28 per cent of the world total. The gold backing of the notes and public deposits of the Banque de France rose from 47 to 78 per cent.[7] In the U.S. case, critics complained not of the rate of increase of gold reserves, which was 8 per cent over the period, but of their high level. In contrast to the period 1925-28, when the Federal Reserve facilitated the reconstruction the international gold standard by releasing substantial quantities of gold, after 1928 the U.S. persistently maintained 35 to 40 per cent of global gold reserves.[8] As shown in Table 1, by the end of 1932 France and the U.S. together possessed nearly 63 per cent of the world's central monetary gold.

The second version of this argument blames the collapse of fixed parities and central banks' systematic liquidation of foreign assets for reducing the availability of international reserves just when they were most desperately needed. Since even those central banks that devalued their currencies were

Table 1. Central Monetary Gold Reserves, 1929-1934
(In millions of U.S. dollars of contant gold content)

	Dec. 1929	Dec. 1930	Dec. 1931	Dec. 1932	Dec. 1933	Dec. 1934
1. Gold bloc	2,240	2,734	3,983	4,632	4,275	4,399
France	1,631	2,099	2,683	3,257	3,015	3,218
Switzerland	115	138	453	477	386	368
Belgium	163	191	354	361	380	348
Netherlands	180	171	357	415	371	338
Poland	79	63	67	56	53	56
Other[a]	72	72	69	66	70	71
2. U.S.A. and Philippines	3,903	4,228	4,054	4,046	4,013	4,866
3. European countries with exchange control in 1935	987	988	724	700	670	548
Germany	560	544	251	209	109	36
Italy	273	279	296	307	373	306
Other[b]	154	165	177	184	188	206
4. British Empire and sterling bloc	1,344	1,380	1,223	1,216	1,584	1,610
United Kingdom[c]	711	722	590	587	933	938
British Dominions and colonies[d]	444	469	430	402	398	419
Egypt and Siam	19	20	44	61	33	32
European countries with currencies linked to sterling[e]	170	169	159	166	220	221
5. European countries with fluctuating curriencies not included in 4 above[f]	527	508	472	465	487	488
6. Latin America	715	555	370	363	360	376
Argentina	405	411	252	248	238	238
Brazil	150	11	--	--	--	4
Other[g]	160	133	118	115	122	134
7. Japan	542	412	234	212	212	232
World total, excluding U.S.S.R.	10,258	10,805	11,060	11,634	11,601	12,519
8. U.S.S.R.	147	249	328	na	416	439

Notes:
a. Danzig, Lithuania, Albania, Algeria, Morocco, Belgian Congo, Netherlands Indies.
b. Czechoslovakia, Roumania, Hungary, Bulgaria, Latvia, Turkey, Yugoslavia.
c. Including Irish Free State.
d. India, Canada, Union of South Africa, New Zealand, Australia, Straits Settlements.
e. Sweden, Norway, Denmark, Portugal, Finland, Estonia.
f. Spain, Austria, Greece.
g. Uruguay, Venezuela, Mexico, Columbia, Chile, Peru, Bolivia, Ecuador and other countries.
na. Not available.

Source: League of Nations (1935), p. 250.

obliged to back their notes and (in many cases) sight liabilities, the shift out of foreign exchange, by reducing the available stock of reserves, could have reduced the money supplies that could be supported. Any one central bank might succeed in importing additional gold to be used to back an expansion of its note circulation but only at the expense of heightened monetary stringency abroad. Between 1928 and 1932 the share of foreign exchange in the reserves of 24 European countries fell from 42 to 8 per cent (see also Table 2). In large part this liquidation reflected the persistent efforts of the Banque de France to convert its foreign assets into gold.[9] But when France is excluded, the share of foreign exchange in the reserves of the remaining 23 countries still declines dramatically, from 36 per cent in 1928 to 11 per cent in 1932.[10]

The major portion of the decline in the share of foreign exchange in global reserves took place between the ends of 1930 and 1931. Prior to 1931, the share of exchange in the reserve portfolios of 23 European countries, excluding France, remained steady, varying only between 35 and 40 per cent.[11] Between 1930 and 1931, it fell from 35 to 19 per cent. Because of its timing, this dramatic decline is blamed on the 1931 financial crisis, the imposition of exchange control in Europe, and the devaluation of sterling, which combined to undermine faith in the stability of the two reserve currencies, sterling and the dollar, and induced central banks to substitute gold for foreign exchange in the effort to avoid capital losses on their reserves.[12] To some extent, the liquidation of exchange reserves was a consequence of central bank statutes, many of which required the liquidation of sterling reserves once the pound was rendered inconvertible. But in addition, the newly-introduced element of risk due to foreign devaluation discouraged central banks from

Table 2. Foreign Assets as Percentage of Total Gold and Foreign Assets Holdings of Twenty-Nine Central Banks

End of:	1929	1931	1934	1935
Australia	30.2	55.9	98.7	98.4
Egypt	88.1	81.5	72.7	76.7
Albania	90.5	75.5	61.4	60.2
India	67.4	42.1	65.3	65.5
Finland	69.3	65.9	81.6	73.7
Sweden	52.0	19.2	61.2	60.7
Ecuador	84.1	63.6	38.3	7.9
Austria	79.7	42.5	22.1	38.9
Hungary	32.9	18.8	30.8	47.5
Norway	31.1	12.6	23.2	20.0
Union of South Africa	46.8	na	32.1	30.9
Bulgaria	45.5	14.5	7.3	22.0
Portugal	66.3	64.3	21.7	24.9
Latvia	70.1	31.7	7.9	13.7
Estonia	78.9	70.8	22.5	14.3
Colombia	40.7	33.7	11.7	14.2
Roumania	42.5	3.2	10.6	15.3
Czechoslovakia	64.3	39.1	7.9	2.9
Spain	3.8	11.0	11.1	11.1
Lithuania	69.2	39.8	13.8	32.8
Peru	11.2	28.3	10.1	16.4
Poland	42.8	26.2	5.3	5.7
Danzig	100.0	53.9	11.0	30.7
France	38.5	23.9	1.2	2.0
Switzerland	37.2	4.2	0.4	0.5
Chile	85.9	48.7	1.1	0.9
Italy	49.8	27.8	1.2	10.8
Netherlands	32.9	8.9	0.1	0.3
Belgium	33.0	0	0	0

na = not available.

Source: League of Nations (1937).

holding exchange reserves. Countries holding London balances which had previously harbored no doubts about the stability of reserve currencies learned an expensive lesson from sterling's devaluation and altered their behavior accordingly. For example, after having lost 25 per cent of the domestic value of its £12 million sterling reserve, the National Bank of Belgium quickly moved to liquidate its dollar balances.[13] When speculative pressure shifted from sterling to the dollar, such Eastern European countries as Poland, Czechoslovakia and Bulgaria also shifted their balances out of New York.[14] As one contemporary expert observed, "The risks involved in currency depreciation have been very forcibly -- and for some gold exchange central banks, disastrously -- demonstrated during the recent period."[15]

In this paper I provide the first systematic analysis of the international distribution of gold and foreign-exchange reserves under the interwar gold-exchange standard with which these issues can be addressed. I analyze both the exceptional behavior of the U.S. and France and the shift out of foreign exchange after 1930. While both U.S. and French gold policies and systemic weaknesses of the exchange standard emerge as important factors in explaining the international distribution of reserves, the first of these factors turns out to play the more important role in the monetary stringency associated with the Depression.[16]

It is important to bear in mind the implications of this analysis for the literature on the Great Depression. A number of authors have emphasized international aspects of the Depression, arguing that the boom and slump are properly understood not simply as an outcome of misguided U.S. policy but as a result of an unstable international system subjected to a shock to

confidence.[17] One way in which "international interactions across boundaries" could have magnified an initial disturbance was through the collapse of the international monetary system. Convertibility crises, forced devaluations and a loss of confidence in the stability of reserve currencies, by inducing central banks to shift out of foreign assets reduced the stock of international reserves available to back domestic liabilities. If the availability of reserves remained a constraint on monetary authorities' willingness to increase national money supplies, then the collapse of the gold-exchange standard and the liquidation of foreign-exchange reserves would have limited the scope for reflation and exacerbated the money stringency that contributed to the severity of the Depression.[18]

Alternatively, if Federal Reserve and Banque de France policies leading to the concentration of gold in the U.S. and France rather than the scramble for gold unleashed by the gold-exchange standard's disintegration were primarily responsible for exacerbating monetary stringency throughout the world, then responsibility for the Depression should be assigned not to systemic weaknesses of the gold-exchange standard system but to misguided national policies. Note, however, that the national policies blamed for the Depression need not be limited to the United States and still may be transmitted across national borders by the international monetary system.

Finally, it is possible that this entire emphasis on international monetary forces is misplaced. If the collapse of the gold-exchange standard, the liquidation of foreign assets and the advent of exchange-rate flexibility offered central banks the opportunity to free their monetary policies from the reserve constraint, they could have chosen to initiate an expansionary

response to the Depression regardless of the state of international reserves. Were this the case, international aspects of the Depression would have had to operate through different channels than those emphasized in the literature on international monetary forces.

This focus on external constraints on domestic monetary policies is not new.[19] However, previous studies which have acknowledged the role of external constraints have analyzed them on a national basis rather than considering global monetary conditions and the global availability of reserves as factors in the global Depression. Even if national policies rather than systemic failures ultimately prove dominant in the explanation for the Great Depression, an implication of this paper is that their effects can only be fully understood when analyzed in an international setting.

I. The Mechanics of the Gold Exchange Standard

Had the interwar gold-exchange standard possessed a birth certificate, it would have read 'born in Genoa during the Economic and Financial Conference of 1922.' The distinguishing feature of the new monetary regime was not the practice by central banks of holding foreign currency reserves, for many countries, particularly smaller ones and members of the British Empire, had done so on a substantial scale prior to 1913.[20] The significance of Genoa lay rather in the effort to institutionalize and encourage the practice. The Financial Commission of the Genoa Conference proposed the adoption of an international monetary convention, formally entitling countries "in addition to any gold reserve held at home, [to] maintain in any other participant

country reserves of approved assets in the form of bank balances, bills, short-term securities, or other suitable liquid resources."[21] Participating countries were required to fix their exchange rates against one another, with any failing to do so losing the right to hold the reserve balances of other participants. Foreign exchange would be used in the same manner as gold to settle accounts and defend exchange rates. The principal creditor nations were encouraged to take early steps to "establish a free market in gold and thus become gold centres" where the bulk of foreign-exchange reserves would be held.

If the official convention advocated by the Financial Committee failed to materialize, it nonetheless exercised considerable influence over the practices of central banks.[22] The first effect of the Genoa resolutions was to encourage the adoption of statutes permitting central banks to back notes and sight deposits with foreign exchange as well as gold. Central banks of countries that stabilized their currencies with League of Nations assistance, including Austria, Hungary, Bulgaria and Greece, were empowered to hold the entirety of their reserves in convertible foreign bills and balances. The newly created Latin American central banks designed by Kemmerer Commissions were permitted to hold both gold and foreign exchange, generally in proportions of their choosing. Various restrictions were placed on the form of eligible exchange reserves: the reserve of new Central Bank of Chile, for example, was to consist of gold coin and bars in the vaults of the Bank, earmarked gold abroad, and deposits payable in gold on demand in banks of high standing in London and New York. In the later 1920s, the statutes adopted by newly created or reformed central banks tended to require that a specified

minimum proportion of total reserves be held in the form of gold; these proportions ranged from 33 per cent in Albania to 75 per cent in Belgium, Poland and Germany.[23] Finally, a number of the older central banks retained long-standing regulations requiring them to back their liabilities exclusively with gold. Central banks whose eligible reserves were limited to gold included those of Denmark, France, Japan, the Netherlands, Norway and, of course, the two reserve currency countries, the United States and the United Kingdom.[24]

Statutes regulating central banks also differed in the amount of backing required. Most of the older central banks, exemplified by the Bank of England and the Norges Bank, were required to back only notes in circulation but, after an exemption for the fiduciary issue (a certain fixed quantity of notes), to maintain 100 per cent cover on the margin. Newer banks, as well as such older institutions as the Netherlands Bank and Banque de France which had modernized their statutes, typically had no fiduciary issue but were required instead to hold proportional backing against liabilities, on the order of 35 or 40 per cent. This was viewed as a useful method of economizing on the use of gold. But the statutes requiring proportional reserves often extended the definition of liabilities to be backed to include not only notes but in addition sight deposits at the central bank, an amendment which tended to increase the use of reserves.[25] According to one expert, the move to proportional backing and the requirement to back sight liabilities other than notes had roughly offsetting effects on the global demand for international reserves.[26]

The upshot of these regulations was that there existed under the

gold-exchange standard a stable if somewhat flexible relationship between international reserves and the domestic monetary base. Although that relationship differed across countries and was more elastic than under a gold coin or even a gold bullion standard, it existed nonetheless. It existed as much because of convention as official regulation, since statute provided only a general guide as to the relationship between money supplies and reserves. The minimum gold cover, for example, was under normal circumstances never employed. Banks of issue attempted to maintain excess reserves over their minimum legal requirements, typically on the order of 7 to 10 percent of liabilities.[27] Not only was this prudent banking practice, but it provided leeway for open market operations designed to insulate the domestic economy from the impact on domestic money supplies of gold outflows.[28] Moreover, the minimum was not always binding. Some banks of issue, including those of Austria, Chile, Czechoslovakia and Hungary, were entitled, upon payment of a special tax, to temporarily reduce their gold cover ratios below the statutory minimum. Denmark and South Africa required only a special government permit. In Salvador the central bank was merely required to raise its discount rate by half a percentage point for each per cent by which its reserve fell below 30 per cent.[29] Similarly, the proportions in which central banks held gold and exchange reserves only loosely followed statutory regulation. Some central banks entitled to hold foreign exchange chose not to do so. Others without this right chose to maintain large amounts of exchange outside their legal reserve.

Critics of this system noted the wide variation across countries in the relation of gold reserves to money supplies, arguing that in principle "the

gold which a central bank holds ought to have no particular relation to its note issue."[30] They were especially critical of the practice of holding excess reserves. They admitted, however, that so long as other central banks maintained conventional backing ratios, public confidence in any one country's currency hinged upon its continuing to do the same. A solution to this problem was to arrange an internationally coordinated reduction in cover ratios which would not undermine confidence in any particular currency.[31] In practice, the major central banks could not be brought to cooperate in such action.

Even most of those countries which went off the gold standard following the onset of the Great Depression maintained gold cover ratios not far different from those which had traditionally prevailed, either because of statutory requirements or out of concern to prevent depreciation due to loss of confidence. Some countries, including of course the members of the gold bloc, simply left their cover regulations unchanged. In contrast, Germany and Italy suspended central bank reserve requirements in 1932 and 1935, respectively. Although four countries with a fixed fiduciary system varied the amount of the maximum uncovered issue, most of those variations were small. The Bank of England's limit was raised from £260 million to £275 million on August 1st, 1931, in response to pressure on sterling, and returned to £260 million on March 31st, 1933, when the dollar was under attack. The Bank of Sweden's was raised from 250 to 350 million kroner in 1933 to facilitate an expansion of the domestic money supply. The most dramatic change was that of Japan, where the limit was raised in 1932 from 120 to 1000 million yen. Of the proportional reserve countries, legal cover ratios were

lowered by Austria in 1932 (from 24 to 20 per cent), by Danzig in 1935 (from 40 to 30 per cent), and in 1936 by Denmark, Bulgaria and Latvia (from 33 1/3 to 25 per cent, from 33 1/3 to 25 per cent, and from 50 to 30 per cent, respectively).[32]

An implication of the preceding discussion is that the positive association between domestic money supplies and international reserves depended ultimately on central bank preferences rather than the mechanical linkages posited by theoretical models of the gold standard. What then determined the preferences of central banks? Contemporary observers such as Keynes, Gayer and Nurkse argued that the basic motivation for holding reserves was precautionary, deriving from the desire to smooth the impact of temporary fluctuations in export earnings on the capacity to purchase imports. They suggested that deviations of the reserve proportion from the 33 to 40 per cent norm were explicable in terms of costs and benefits of financing instead of adjusting to temporary disturbances to the balance of payments. As Charles Hardy put it, "The size of the gold stock which a country needs depends on the size and also on the character of the probable gold movements out of the country."[33] Arthur D. Gayer termed this "the magnitude of the probable external drain, the amount a country is likely to require for equalizing the balance of its international payments in the interval during which corrective measures are being applied internally to remove the causes of the gold export and thus restore equilibrium."[34]

Observers agreed that agricultural producers, particularly those whose exports were heavily concentrated in a single crop, were especially vulnerable to fluctuations in export earnings and therefore in need of additional

reserves to insure their ability to purchase imports.[35] They noted that, along with countries with highly variable exports, those with large shares of exports and imports in GNP had reason to maintain additional reserves, since the costs of responding to an export shortfall by foregoing imports were highest where trade was most important. At the same time, they acknowledged that the precautionary motive for holding reserves was a luxury good. Nurkse likened the demand for reserves to the individual's demand for cash balances. "A rich man can afford and will probably want to hold a large idle cash reserve, while a poor man will not. In the same way a poor country is less likely than a rich one to sacrifice potential imports and to tie up some of its limited wealth in an international cash reserve."[36]

Readers will note the resemblance of these interwar analyses to modern discussions of optimal international reserves.[37] Attempts to estimate models of optimal reserves specify the demand for reserves as a function of income, openness and some measure of balance-of-payments variability. The specification estimated by Frenkel (1974) is typical:

$$(1) \qquad r = \alpha_0 + \alpha_1 t + \alpha_2 s + \alpha_3 y$$

where r is reserves, t is the import-to-GNP ratio, s is balance-of-payments variability measure, y is GNP, and the α_i are parameters to be estimated. The expectation is that α_1, α_2 and α_3 are positive. The specification suggested by the above discussion differs only by the addition of a measure of domestic monetary base h:

$$(2) \qquad r = \alpha_0 + \alpha_1 t + \alpha_2 s + \alpha_3 y + \alpha_4 h$$

where α_4, the cover ratio, is positive.[38] Variants of this specification are estimated below.

The internal consistency of inferences about the effects of a decline in willingness to hold exchange reserves and/or a rise in the central bank demand for gold can be analyzed theoretically by embedding eq. (2) in a model like that which informs Nurkse's (1944) discussion. Since I am concerned with the impact of global reserves on global money supply and global income, the framework for analysis is, as in Barro (1979), a model of the world economy under fixed exchange rates. Although it is straightforward to analyze the impact of changes in the supply and demand for reserves in a multicountry setting, as in Eichengreen and Sachs (1986), for present purposes the multicountry analysis is unnecessarily elaborate.

The first equation, the demand for reserves, is eq. (2) above. r now measures global reserves, y global income, etc., and all variables are expressed in nominal terms. (For simplicity, remaining equations will also be expressed nominal form.)

Total reserves are the sum of gold g and foreign-exchange f:

$$(3) \qquad g = \sigma_0 + \sigma_1 t + \sigma_2 s + \sigma_3 y + \sigma_4 h$$

$$(4) \qquad f = \gamma_0 + \gamma_1 t + \gamma_2 s + \gamma_3 y + \gamma_4 h$$

where $\alpha_i = \sigma_i + \gamma_i$ (i = 0, 1, 2, 3, 4) and r = g + f. While the global supply of monetary gold g is exogenously fixed (hence ignoring mining and nonmonetary uses of gold), the supply of exchange reserves f is demand determined.[39]

The demand for nominal money balances is assumed to take Cambridge transactions demand form:

(5) $m = \lambda y$

The broadly-defined money supply can be decomposed into the base and the multiplier,

(6) $m = \psi_0 + \psi_1 h$

Equations (3) through (6) and the identity $r = g + f$ (equivalently (2) and the coefficient restrictions) determine five endogenous variables: r, f, h, m and one to be selected. It is not obvious why openness or export variability might be affected by financial market conditions, and in any case such effects are remote from the questions at hand. Income is therefore the logical remaining endogenous variable.

It is useful to consider how this approach compares to conventional models of the money supply process under the gold standard. The textbook model of the gold standard, as in McCloskey and Zecher (1976) or Barro (1979), assumes that the money supply m bears a fixed relationship to the stock of reserves r:

(7) $m = \theta r$

In contrast to (7), eqs. (1) and (2) focus on the relationship of reserves to the monetary base rather than to the broadly-defined money supply. They introduce other variables affecting the link between reserves and the base and leave open the possibility that other factors may influence the relationship between the base and broad monetary aggregates. In addition, eq. (2) differs from conventional treatments of the monetary base by not explicitly mentioning

that the base is the sum of domestic credit and foreign reserves. This difference is apparent rather than real, however, since domestic credit is simply the difference between h and r, and the implicit central bank reaction function determining credit can be derived by solving (2) for h - r.[40] In treating foreign exchange as a component of international reserves, this paper differs from Fremling (1985, p. 1183), who questions this procedure on the grounds that "what is a foreign reserve asset for one country is an equally sized liability for another." As the framework of this section makes clear, the import of this observation hinges on the form in which foreign reserves were held. When they were held as government securities, they do not need to be netted out of the money supply available to domestic residents, and the argument has no force. When they were held as deposits in commercial banks, they should be subtracted from m. But since m is a multiple of h and h is a multiple of r, any such adjustment has only minor implications for the analysis conducted here.

I consider the impact on income of two exogenous shocks: a shift out of foreign exchange into gold ($d\gamma_0 = -d\sigma_0 < 0$), and a decline in the willingness to hold foreign exchange <u>not</u> accompanied by a rise in the demand for gold ($d\gamma_0 < 0$).

The effects of the latter are particularly simple. Since the stock of exchange reserves is demand determined while stock of gold reserves is exogenously given, the monetary base is determined by eq. (3) alone. The base determines the money supply through (6), which determines nominal income through (5). Changes in γ_0, i.e. in the willingness to hold foreign exchange reserves, have no impact on h and therefore no implications for m or y. A

decline in the demand for foreign exchange not accompanied by a rise in the demand for gold therefore has no direct effect on money supply or income, since the supply of foreign exchange simply adjusts to accommodate it.

In the case of a shift out of foreign exchange into gold, the results are dramatically different:

$$(8) \qquad \frac{dy}{d\gamma_0} = \frac{-\psi_1}{\lambda\sigma_4 - \psi_1\sigma_3}$$

which is negative, assuming the denominator to be positive (a necessary condition for an increase in gold to be expansionary). The shift into gold ($d\sigma_0 > 0$) reduces the monetary base that can be supported by a given gold supply. The consequent decline in income increases with the elasticity of money supply with respect to the base ψ_1 and the income elasticity of demand for gold σ_3, and falls with the income elasticity of money demand λ and the elasticity of gold demand with respect to the base σ_4. Thus, what is crucial is not whether the demand for foreign exchange fell significantly after 1929 but whether any such fall was accompanied by a rise in the demand for gold.

II. Empirical Analysis

Despite the popularity of the explanation that ascribes the concentration of gold reserves to the beggar-thy-neighbor policies of the United States and France and the growing reliance on gold rather than foreign exchange to the uncertainties created by the gold standard's collapse, it is not obvious that observed movements in the distribution of reserves reflect these factors rather than the effects of changes in incomes, balance-of-payments variability

and openness which normally affect the demand for reserves, especially since the Great Depression was marked by dramatic fluctuations in all three variables. Merely to note, as did the Gold Delegation of the League of Nations, that in 1928 a mere 15 countries held over 90 percent of the world's monetary gold reserves does not establish the existence of a problem. As Nurkse expressed the point somewhat later, "the fact that the distribution of reserves was highly unequal in the later 'thirties does not itself prove that it did not represent an equilibrium position from the point of view of the individual countries concerned, given the existing structure of basic conditions."[41]

In order to analyze the international distribution of reserves and its determinants, I estimate demands for gold and foreign exchange by 24 countries using a specification based on eq. (2). To test the hypothesis that the U.S. and France held reserves in excess of those which can be ascribed to the normal determinants of reserve demand, I introduce dummy variables for these countries. To test the hypothesis that the years after 1930 witnessed a liquidation of foreign exchange reserves, with or without an accompanying shift into gold, I introduce dummy variables for individual years.

The sample of countries included in the econometric analysis was dictated by data availability. Some countries were excluded because of the lack of reasonable national income estimates, others because the absence of a central bank meant that information on money and foreign reserves was not provided on a compatible basis. Nonetheless, most of the important repositories of gold and foreign assets are included in the sample.[42] Note that the sample of countries is not the same as in Table 2.

Data on reserves are taken from the Statistical Bulletins and Monetary Reviews of the League of Nations, which draw in turn on published returns of central banks.[43] I utilize figures on the book value of gold and exchange reserves of central monetary institutions (apart from Exchange Equalization Funds) at the end of calendar years. Gold reserves are valued at legal parities. Although the paper value of gold exceeded its book value in countries which continued to value that specie at par despite having depreciated their exchange rates, I only revalue these reserves when this was done by the central bank itself, since this was when capital gains on gold were reflected in the central bank's backing ratio.[44]

In contrast to gold, foreign assets are valued at market rates, since this was the practice of central banks. As already noted, a number of central banks functioned under restrictions on what type of foreign assets qualified for backing liabilities. Most of these countries held their foreign assets exclusively in eligible form. But for a small minority, there was a difference between the total and eligible foreign assets of the monetary authorities. Since total foreign assets is the more encompassing measure of exchange reserves, in those few cases where the two figures differed, the total was used. The two exceptions are Germany and Denmark, which reported negative total foreign assets (but positive eligible assets) for selected years.[45] Since it is impossible to analyze these negative figures using the standard specification which takes as its dependent variable the log of foreign reserves, for those years where total foreign assets were negative, eligible foreign assets were used instead.

Except for data for the U.S. and U.K., which are drawn from U.S.

Department of Commerce (1976) and Feinstein (1972), respectively, the remaining variables are assembled from sources described in the appendix to Eichengreen and Portes (1986). The share of imports in GNP is used as the measure of openness, note circulation as the measure of the monetary base, and the variance of exports over three years (centered upon the year for which the dependent variable is defined) as the measure of balance-of-payments variability.

Since the controversy surrounding the international distribution of gold centers on the years 1931-33, the period spanned by the 1931 devaluation of sterling and the 1933 devaluation of the dollar, I estimate the model for a period bracketing those years: 1929-35. 1929 is the first year following the revaluation of the Banque de France's gold stock and France's official return to gold, events commonly taken to indicate that reconstruction of the international monetary system was complete, while 1935 is the last year before the collapse of the gold bloc and final demise of the gold-exchange standard.

Equation (2) is estimated using two-stage least squares to account for the endogeneity of money. The appropriate instruments are the arguments of the demand for money function, taken to be income, the opportunity cost of holding money, and lagged money balances.[46] Results for individual years and for the entire period 1929-35 are reported in Table 3. The demand for reserves is an increasing function of log GNP, the import share and export variability, as in modern estimates of models of optimal international reserves. With the exception of export variability, the coefficients consistently exceed zero at the 90 percent confidence level or better. Even the coefficient on export variability is consistent with modern estimates, in

Table 3. Demand for Reserves: Equilibrium Model
(Dependent variable is log of gold
plus foreign exchange reserves)

Year	Constant	Log GNP	Import Share	Export Variability	Log Money	R^2	n
1929	-3.498	0.777	3.431	7.517	0.266	.94	22
	(3.83)	(6.79)	(3.23)	(1.52)	(3.43)		
1930	-4.098	0.861	2.815	1.040	0.283	.97	22
	(5.77)	(8.93)	(3.76)	(1.20)	(4.55)		
1931	-4.008	0.849	2.893	1.437	0.255	.95	22
	(4.55)	(7.33)	(2.29)	(1.79)	(3.43)		
1932	-3.576	0.849	4.005	4.516	0.192	.94	22
	(3.94)	(7.14)	(1.81)	(1.78)	(2.45)		
1933	-3.485	0.866	4.520	7.188	0.161	.92	22
	(3.96)	(6.63)	(3.20)	(0.22)	(1.89)		
1934	-4.386	0.918	7.602	12.10	0.151	.86	22
	(2.91)	(4.94)	(2.32)	(1.71)	(1.26)		
1935	-3.769	0.875	5.849	15.57	0.150	.88	22
	(2.89)	(5.43)	(1.89)	(1.97)	(1.46)		
1929-35	-3.936	0.877	3.592	1.672	0.213	.90	154
	(11.05)	(17.91)	(6.74)	(2.58)	(6.52)		

Notes:
Two-stage least squares estimates. t-statistics in parentheses.
All variables are measured in millions of units of domestic currency.
Instruments for log money are inflation and log money lagged.

Variable definitions:
Import share: imports/GNP
Export Variability: variance of exports over t-1, t, t+1.

Source: See text.

which the coefficient on balance-of-payments variability tends to be unstable.[47]

Changes in money consistently exhibit the anticipated positive association with the demand for reserves. The pooled time-series cross-section estimate suggests for the entire period a gold and foreign exchange cover of 21 per cent on the margin, confirming that, despite their maintenance of excess reserves, central banks were concerned to increase their reserves when increasing money supplies. However, both the size of the coefficient and its statistical significance tend to decline over time, suggesting that once countries began to leave the gold standard in 1931 the links between money supplies and international reserves were loosened. This is consistent with the steps, described above, to alter but not eliminate legal cover ratios. I consider below whether the link between money supplies and international reserves loosened significantly as the period progressed, and whether shifts in this linkage were sufficient to neutralize the potential impact on money supplies factors constricting the availability of reserves.

These four economic characteristics of countries explain a large share of international distribution of reserves, ranging from 86 to 97 per cent depending on year and averaging 90 per cent over the period. In other words, it may be unnecessary to appeal to exceptional French and American appetites for gold or to the collapse of the gold-exchange standard to account for the observed distribution.

This specification does not explicitly test the hypothesis that the observed distribution of reserves was an equilibrium allocation. This may be a significant omission since, in a period marked by convertibility crises and

Table 4. Demand for Reserves: Disequilibrium Model
(Dependent variable is log of gold
plus foreign exchange reserves)

Year	Constant	Log GNP	Import Share	Export Variability	Log Money	Percent Appreciation	R^2	n
1929	-3.633	0.804	3.828	9.406	0.219	6.435	.96	22
	(4.42)	(7.77)	(3.94)	(2.08)	(3.03)	(2.21)		
1930	-4.027	0.874	2.852	1.243	0.251	4.616	.97	22
	(5.84)	(9.34)	(3.94)	(1.46)	(3.94)	(1.45)		
1931	-3.921	0.844	2.869	1.439	0.252	0.367	.95	22
	(4.08	(7.02)	(2.21)	(1.74)	(3.31)	(0.27)		
1932	-3.508	0.837	3.803	4.641	0.199	-0.238	.94	22
	(3.60)	(6.34)	(1.56)	(1.74)	(2.33)	(0.24)		
1933	-3.494	0.872	4.596	4.858	0.156	0.119	.92	22
	(3.85)	(6.33)	(3.03)	(0.14)	(1.710)	(0.17)		
1934	-4.387	0.918	7.600	12.10	0.151	-0.005	.86	22
	(2.55)	(4.78)	(2.11)	(1.66)	(1.22)	(0.002)		
1935	-3.612	0.865	6.217	15.54	0.146	5.492	.89	22
	(2.75)	(5.35)	(1.99)	(1.96)	(1.42)	(0.99)		
1929-35	-3.944	0.876	3.597	1.675	0.215	-0.114	.90	154
	(11.01)	(17.90)	(6.76)	(2.58)	(6.54)	(0.30)		

Note: Two-stage least squares estimates with t-statistics in parentheses.

Source: See text.

unanticipated devaluations, countries may have been unable to maintain their desired reserve stocks. To test this hypothesis, the rate of change of the exchange rate over the preceding period is added to the model.[48] The exchange rate is measured as a percentage of its 1929 gold parity, so negative values signify depreciation.[49] The sign of its coefficient is theoretically ambiguous: if devaluation was forced, as was the case for several primary producers in 1929-30, then depreciation should be associated with reserve losses and the coefficient should be positive; but if devaluation was voluntary, as in the case of the U.S. depreciation of 1933-34, then depreciation should be associated with reserve gains and the coefficient should be negative.

The results of estimating the disequilibrium model are reported in Table 4. The only year for which the coefficient on depreciation differs significantly from zero is 1929, when countries forced to depreciate held reserves significantly less than desired.[50] In general, the results tend to support the equilibrium specification.

In Tables 5 and 6 I estimate separately the demand for the two components of international reserves: monetary gold and foreign assets. Consider first the pooled time-series cross-section results. Both demands depend positively on income, openness and export variability. While the coefficients on export variability again exhibit instability, their movement displays no obvious pattern. However, only gold and not foreign exchange reserves are consistently related to the size of national money supplies at standard significance levels, especially after 1930. This result is broadly consistent with the views of Nurkse (1944): since the primary objective of backing the

Table 5. Demand for Gold Reserves
(Dependent variable is log of gold reserves)

Year	Constant	Log GNP	Import Share	Export Variability	Log Money	R^2	n
1929	-2.762	0.644	0.709	7.118	0.343	.91	24
	(2.42)	(4.50)	(0.53)	(1.15)	(3.55)		
1930	-3.597	0.762	0.823	1.176	0.335	.97	24
	(5.28)	(8.23)	(0.53)	(1.41)	(5.613)		
1931	-4.167	0.797	2.095	1.176	0.329	.94	24
	(4.60)	(6.88)	(1.66)	(1.47)	(4.48)		
1932	-4.176	0.814	3.718	3.660	0.294	.94	24
	(4.60)	(6.84)	(1.68)	(1.44)	(3.76)		
1933	-5.360	0.967	4.680	-18.73	0.244	.89	24
	(4.48)	(5.44)	(2.44)	(0.43)	(2.10)		
1934	-6.659	1.042	8.739	8.57	0.245	.84	24
	(3.62)	(4.59)	(2.18)	(0.99)	(1.67)		
1935	-5.730	0.993	6.915	13.22	0.198	.83	24
	(3.14)	(4.40)	(1.59)	(1.19)	(1.38)		
1929-35	-3.961	0.789	2.605	1.514	0.305	.88	168
	(10.13)	(14.31)	(4.21)	(1.93)	(7.75)		

Note: Two-stage least squares estimates with t-statistics in parentheses.

Source: See text.

note circulation was "to maintain confidence in the currency," Nurkse suggested that backing for notes would tend to be held in the confidence-inspiring form of gold, while reserves maintained for other purposes would be held in the form of foreign exchange as well.[51] The Table 5 coefficients on money supplies are significantly greater than zero at the 90 percent level or better for every year except the last and tend to decline over time. While in Table 6 there appears to be no association between exchange reserves and money supplies after 1930, contrary to Nurkse there is weak evidence of an association in the gold standard years 1929-30. It appears that both gold and foreign exchange were used to smooth external transactions and, to a lesser extent for gold than foreign exchange, to back the central bank's domestic liabilities during the period of the global gold-exchange standard; once that standard began to collapse, however, while gold was still held both to smooth external transactions and to provide backing for money supplies, foreign assets were held only for the first of these purposes.

Table 7, where dummy variables for the U.S. and France are added, can be used to assess the contention that the Federal Reserve and the Banque de France held reserves in excess of those explicable by their economic characteristics and normal patterns of central bank behavior.[52] It is not clear that the proper interpretation of this contention is that the two countries held disproportionate quantities of global reserves or disproportionate quantities of gold. The results lend support to both interpretations. From the third equation, U.S. gold reserves were fully 110 percent and French gold reserves 280 percent above levels that can be

Table 6. Demand for Foreign Exchange Reserves
(Dependent variable is log of
foreign exchange reserves)

Year	Constant	Log GNP	Import Share	Export Variability	Log Money	R^2	n
1929	-5.605	0.930	5.992	11.01	0.127	.94	20
	(5.64)	(7.45)	(5.10)	(2.04)	(1.51)		
1930	-6.207	0.955	5.481	1.335	0.221	.91	20
	(4.77)	(5.40)	(4.02)	(0.84)	(1.98)		
1931	-5.509	0.916	4.855	2.626	0.083	.88	20
	(3.95)	(4.98)	(2.40)	(2.05)	(0.72)		
1932	-3.617	0.806	2.773	6.306	0.001	.74	20
	(2.08)	(3.51)	(0.63)	(1.27)	(0.01)		
1933	-3.352	0.853	-0.682	9.80	-0.114	.59	20
	(1.63)	(2.80)	(0.21)	(1.32)	(0.58)		
1934	-4.361	0.951	3.197	8.74	-0.187	.51	20
	(1.62)	(2.86)	(0.54)	(0.69)	(0.87)		
1935	-5.427	1.021	2.771	6.85	-0.056	.60	20
	(2.03)	(3.06)	(0.42)	(0.42)	(0.26)		
1929-35	-5.298	0.960	5.055	3.513	0.001	.70	140
	(7.99)	(10.53)	(5.06)	(2.93)	(0.02)		

Note: Two-stage least squares estimates with t-statistics in parentheses.

Source: See text.

accounted for by their economic characteristics and the behavior typical of the sample of countries.[53] From the sixth equation, U.S. monetary gold stocks were nearly three times and French gold stocks nearly five times those predicted by the international cross section.[54]

These magnitudes are economically important in the context of the Great Depression. Recall that in 1931 France and the United States possessed between them some 60 per cent of the global stock of monetary gold. The results in Table 7 suggest that, had France and the U.S. adhered to the same patterns as other countries, their combined share would have been less than one-quarter, almost exactly doubling the gold reserves of other countries. Assuming that central banks were concerned to retain some proportion between their reserves and domestic liabilities, like that shown in Tables 4 and 5, and that they were constrained in their desire to reflate by the availability of gold, this redistribution of reserves would have provided considerable scope for an expansion of money supplies.

Table 8 adds dummy variables for years subsequent to 1929 to analyze shifts over time in the willingness to hold reserve assets.[55] The interpretation of reserve movements which emphasizes the shift out of exchange and into gold due to the collapse of the gold-exchange standard predicts negative coefficients for later years in the demand-for-exchange-reserves equations and significant positive coefficients in the equations for gold. Only the first of these predictions receives strong support. Except in 1932, the demand for exchange reserves is significantly lower in every year after 1930 than in 1929.[56] As before, the orders of magnitude are striking: by 1931 the demand for foreign assets has fallen by almost exactly 50 per cent

Table 7. Demand for Reserves: U.S. and French Effects

Independent Variables	Dependent Variable						
	Log Reserves			Log Gold			Log Foreign Exchange
Constant	-3.666	-3.854	-3.556	-3.687	-3.879	-3.578	-5.368
	(10.42)	(10.92)	(10.25)	(9.53)	(10.08)	(9.44)	(7.87)
Log GNP	0.857	0.863	0.840	0.771	0.774	0.753	0.966
	(18.03)	(17.72)	(17.87)	(14.36)	(14.21)	(14.28)	(10.47)
Import Share	3.335	3.819	3.575	2.307	2.879	2.588	5.114
	(6.43)	(7.14)	(6.93)	(3.81)	(4.68)	(4.34)	(5.06)
Export Variability	0.148	1.819	0.228	-0.326	1.713	-0.231	3.895
	(0.19)	(2.84)	(0.31)	(0.35)	(2.21)	(0.25)	(2.67)
Log Money	0.201	0.211	0.198	0.290	0.302	0.285	0.005
	(6.33)	(6.54)	(6.35)	(7.55)	(7.81)	(7.61)	(0.08)
France	1.262		1.343	1.504		1.605	-0.321
	(3.51)		(3.80)	(3.43)		(3.74)	(0.46)
U.S.		0.657	0.745		0.929	1.024	
		(2.30)	(2.71)		(2.70)	(3.08)	
R^2	.91	.91	.91	.89	.88	.89	.70
n	154	154	154	168	168	168	140

Note: Pooled time-series cross-sections. Two-stage least squares estimates with t-statistics in parentheses.

Source: See text.

compared to 1929.[57] This is more than a restatement of the fact that between 1929 and 1931 the share of foreign exchange in the reserves of 24 countries fell from 37 to 19 percent (37 to 13 percent when France is excluded). It establishes that the decline in income, contraction of trade and changes in money supplies associated with the Depression cannot by themselves account for this development.

The results do not provide compelling support for the contention that this liquidation of foreign exchange was at the same time a shift into gold. While in the equations for gold the coefficients on 1930 and subsequent years are uniformly positive, they tend to differ insignificantly from zero. On the basis of these estimates one cannot reject the null hypothesis that the demand for gold rose insignificantly at the same time the demand for exchange reserves fell. Unfortunately, neither do these results permit one to reject a range of other equally plausible null hypotheses, such as that the demand for gold rose by approximately a third. Evidence on this question must be judged inconclusive. Nevertheless, on the basis of point estimates the exceptional demands for gold by the U.S. and France contributed more to the global reserve stringency than the liquidation of the gold-exchange standard.

The conclusion that the demand for gold reserves rose insignificantly is entirely consistent with the finding that the demand for foreign exchange fell. What may have happened starting in 1931 as a result of the gold exchange standard's collapse was that countries reduced their propensities to hold exchange reserves as backing for their money supplies without substituting additional gold. The devaluations which led to the scramble out of exchange reserves at the same time loosened the reserve constraint on

Table 8. Demand for Reserves: U.S., French and Year Effects

Independent Variables	Dependent Variable					
	Log Reserves		Log Gold		Log Foreign Assets	
Constant	-4.209	-3.845	-4.343	-3.962	-4.455	-4.484
	(10.08)	(9.48)	(9.30)	(8.80)	(5.81)	(5.69)
Log GNP	0.885	0.848	0.803	0.766	0.935	0.937
	(17.80)	(17.34)	(14.26)	(14.24)	(10.28)	(10.18)
Import Share	3.956	3.919	3.969	2.920	4.042	4.073
	(6.89)	(6.97)	(4.50)	(4.56)	(3.80)	(3.76)
Export Variability	1.087	0.483	1.537	-0.239	3.332	3.488
	(2.80)	(0.62)	(1.90)	(0.25)	(2.73)	(2.31)
Log Money	0.209	0.194	0.300	0.280	0.014	0.245
	(6.33)	(6.19)	(7.50)	(7.39)	(0.22)	(0.25)
France		1.246		1.573		-0.123
		(3.44)		(3.59)		(0.18)
U.S.		0.775		1.044		
		(2.79)		(3.12)		
1930	0.128	0.161	0.153	0.193	-0.065	-0.069
	(0.59)	(0.78)	(0.60)	(0.80)	(0.16)	(0.16)
1931	-0.030	0.020	0.192	0.253	-0.700	-0.705
	(0.14)	(0.10)	(0.74)	(1.03)	(1.67)	(1.67)
1932	0.258	0.263	0.411	0.417	-0.479	-0.477
	(1.16)	(1.24)	(1.57)	(1.69)	(1.13)	(1.12)
1933	0.328	0.304	0.326	0.298	-0.821	-0.816
	(1.48)	(1.44)	(1.25)	(1.21)	(1.94)	(1.92)
1934	0.248	0.227	0.237	0.210	-1.019	-1.014
	(1.10)	(1.05)	(0.91)	(0.85)	(2.38)	(2.35)
1935	0.312	0.293	0.361	0.338	-0.679	-0.674
	(1.39)	(1.37)	(1.38)	(1.37)	(1.59)	(1.57)
R^2	.91	.92	.88	.89	.72	.72
n	154	154	168	168	140	140

Note: Pooled time-series cross-sections. Two-stage least squares estimates with t-statistics in parentheses.

Source: See text.

national money supplies. Rather than substituting gold for recently liquidated foreign assets, some central banks appear to have simply reduced their excess gold reserves.

Perhaps the strongest evidence against the hypothesis that there occurred in the course of the 1930s an upward shift in the global demand for gold is that the coefficients for 1930 and 1931 in the gold equations are virtually indistinguishable. 1931 was the year of the most serious uncertainty due to Continental financial crises, Central European exchange control, sterling devaluation, and competitive depreciation, the year over which the share of foreign exchange in the reserves of 23 European central banks fell from 35 to 19 per cent. If uncertainty ever increased the demand for gold, it should have been between the ends of 1930 and 1931. That the point estimates of the dummy variables for those years indicate increases of no more than five per cent is difficult to reconcile with the gold-exchange-standard-liquidation view.

This conclusion contrasts with the implications of the analysis of French and American behavior. When the dummy variables for years are added to Table 8, the coefficients on the dummy variables for France and the U.S. remain positive and significant at the 99 per cent level in the equations for both gold and total reserves. Because the practice of backing money supplies with gold remained, the exceptional demands for gold by the Federal Reserve and Banque de France placed downward pressure on global money supplies. This effect is large relative to any which might be ascribed to the liquidation of the gold-exchange standard.

III. Summary and Implications

This paper has presented the first systematic analysis of the distribution of international reserves under the gold-exchange standard. The demand for reserves has been shown to depend on, among other variables, national money supplies. That dependence changed, however, in important ways after 1930. Where it had previously been the practice of gold-exchange standard countries to back their money supplies with both foreign assets and gold, the instability of reserve currencies caused central banks to liquidate that portion of their reserve portfolios which had taken the form of foreign assets. Had no other change in behavior occurred, this would have placed downward pressure on money supplies. Yet the results of empirical analysis do not permit us to rule out other changes sufficiently important to eliminate any such effect. Instead of attempting to maintain the overall reserve backing of their money supplies by substituting gold for foreign exchange, central banks may have reduced their cover ratios to permit the maintenance of previously established relations between money supplies and gold reserves. It is not clear that the deflationary linkage running from international monetary instability to domestic financial stringency was operative.

But since central banks attempted on average to maintain previously established ratios between money supplies and gold, any factor which reduced the availability of gold reserves served as an impediment to monetary expansion. Here the gold policies of the Federal Reserve and the Banque de France emerged as crucial. According to the estimates provided here, the exceptional policies of these two countries reduced the the gold reserves

available to other countries by fully one half, an effect larger than any which can be ascribed to the liquidation of the gold-exchange standard.

As noted in the introduction, these findings have clear implications for the literature on monetary forces in the Great Depression. These implications only emerge, however, when the demand for reserves and supply of money are viewed on a global basis. Since central banks generally maintained a relatively stable relationship between their money supplies and gold reserves, any factor which constrained the availability of gold constrained their ability, given regulations and attitudes, to engage in monetary reflation. U.S. and French gold policies must therefore share the blame for exacerbating the monetary aspects of the Great Depression.

These findings also have implications for the dichotomy between explanations for the Great Depression which emphasize national policies and those which emphasize the international system. They suggest that the distinction is overdrawn. The conclusions of this paper are entirely consistent with the view that the Depression can only be fully understood as a global phenomenon. They support the notion that international considerations were significant determinants of national monetary policies. But they suggest that national monetary policies, rather than systemic features of the international regime, were the source of the most important destabilizing monetary impulse transmitted by the international system.

Another way of looking at these results is in terms of the debate over the exchange-rate devaluations of the 1930s. Previously, Jeffrey Sachs and I have argued, in contradistinction to the existing literature, that the devaluations of the 1930s were useful reflationary initiatives when taken

individually, although as executed they had beggar-thy-neighbor effects abroad.[58] Had they been undertaken more widely, we speculated, they would have had at worst no effects and at best extremely favorable effects, depending on accompanying monetary measures. The only caveat to this conclusion lay in the possibility that the uncoordinated manner in which devaluation was undertaken created uncertainty which led to a shift out of exchange reserves and into gold, putting downward pressure on global reserves and national money supplies. The results reported here confirm the shift out of exchange reserves, but provide no compelling support for the implication of deflationary consequences.

Appendix: Demand for Reserves: U.S., French and Interactive Year Effects

Independent Variables	Dependent Variable					
	Log Reserves		Log Gold		Log Foreign Assets	
Constant	-3.983	-3.611	-4.090	-3.701	-4.970	-4.952
	(10.85)	(10.06)	(10.16)	(9.47)	(7.63)	(7.38)
Log GNP	0.881	0.845	0.803	0.766	0.931	0.929
	(17.58)	(17.53)	(14.25)	(14.25)	(10.46)	(10.33)
Import Share	3.799	3.714	2.947	2.852	3.862	3.840
	(6.63)	(6.61)	(4.47)	(4.44)	(3.75)	(3.65)
Export Variability	1.882	0.294	1.610	-0.349	2.902	2.790
	(2.69)	(0.35)	(1.92)	(0.35)	(2.33)	(1.77)
Log Money	0.191	0.176	0.263	0.242	0.115	0.115
	(4.67)	(4.51)	(5.37)	(5.22)	(1.58)	(1.56)
France		1.312		1.609		0.080
		(3.51)		(3.58)		(0.12)
U.S.		0.755		1.037		
		(2.70)		(3.09)		
1930 * Log Money	0.019	0.029	0.022	0.033	-0.002	-0.001
	(0.61)	(0.94)	(0.60)	(0.94)	(0.02)	(0.01)
1931 * Log Money	-0.006	0.009	0.027	0.044	-0.104	-0.103
	(0.17)	(0.28)	(0.71)	(1.20)	(1.72)	(1.68)
1932 * Log Money	0.028	0.030	0.059	0.061	-0.093	-0.093
	(0.88)	(1.00)	(1.53)	(1.70)	(1.56)	(1.54)
1933 * Log Money	0.030	0.025	0.048	0.043	-0.159	-0.159
	(0.93)	(0.82)	(1.28)	(1.20)	(2.69)	(2.68)
1934 * Log Money	0.025	0.019	0.041	0.035	-0.183	-0.184
	(0.75)	(0.62)	(1.06)	(0.96)	(3.04)	(3.03)
1935 * Log Money	0.032	0.027	0.051	0.045	-0.114	-0.114
	(0.99)	(0.89)	(1.33)	(1.26)	(1.90)	(1.90)
R^2	.90	.92	.88	.89	.73	.73
n	154	154	168	168	140	140

Note: Pooled time-series cross-sections. Two-stage least squares estimates with t-statistics in parentheses.

Source: See text.

Footnotes

1. The phrase is from Brown (1940).

2. The leading exponent of the gold shortage theory was Gustav Cassel. A summary of his views is Cassel (1932). The interpretation summarized in the remainder of this paragraph is elaborated in Hardy (1936). Many of these propositions are scrutinized below.

3. Between 1913 and 1926 the circulation of gold coins in Europe shrank from 9.9 to 0.2 million marks. Mlynarksi (1929), p. 72.

4. This statement refers to short-term liabilities. Palyi (1982), pp. 125-126.

5. League of Nations (1932a), p. 190.

6. Committee on Finance and Industry (1931), cited in Palyi, p. 179.

7. League of Nations (1937), Tables V-VI; Eichengreen (1986), p. 65.

8. Mlynarksi (1929), chapter III.

9. Under the monetary law of 1928 which marked France's official return to the gold standard, the Banque de France was no longer permitted to purchase foreign exchange. When the law was passed, the Bank already possessed contracts for foreign exchange for forward delivery. As these contracts matured late in 1928, the Bank's foreign exchange holdings rose substantially and, given the dubious legal status of these reserves, the French authorities engaged in persistent efforts over the subsequent year to convert them into gold. These efforts were renewed following sterling's depreciation in September 1931.

10. These are the calculations of Nurkse (1944), p. 41 and Appendix II.

11. Nurkse (1944), pp. 34-35. This stability was especially pronounced among countries that stabilized either very early or very late -- that is, among those which stabilized before or together with Britain in 1925 and those which did not carry out stabilization programs before 1929. Brown (1940), p. 737.

12. Withdrawing sterling balances remained straightforward even once the pound was rendered inconvertible. Countries simply sold sterling for convertible currencies on the London foreign exchange market at the current rate and, if they wished, proceeded to convert those currencies into gold.

13. For example, the Netherlands Bank, in its Annual Report for 1931-32, defended its failure to avoid losses on its London balances by joining the run on sterling on the grounds that "Management were of opinion that they should not do this because they were convinced that the British Government and the Bank of England firmly intended to maintain the gold standard and to make the

gold stock of the said Bank entirely available for this purpose. This conviction was based on the conversations which Dr. Vissering and Dr. Tetrode had with the Management of the Bank of England on August 26th, 1931, when anxiety concerning the financial position of England began to prevail." Cited in Brown (1940), pp. 1170-1171. On the National Bank of Belgium, see Kindleberger (1973), pp. 161-168.

14. Nurkse (1944), pp. 39-40.

15. Pasvolsky (1933), p. 49.

16. In this paper I do not analyze the causes of the initial downturn, as opposed to reasons for its singular depth and long duration; my central concern is to analyze instead the response to that event. The argument that follows is compatible with both real and monetary explanations for the initial contraction, as advanced by Temin (1976) and Friedman and Schwartz (1963). Nor do I explore the bases of the French and U.S. gold policies that emerge as critical, not because they are unimportant but because, unlike the issues addressed here, they are fully analyzed elsewhere. I have analyzed the reasons for France's post-1928 import of gold in Eichengreen (1986). U.S. policy is the subject of a considerable literature, including Wicker (1966), Friedman and Schwartz (1963) and Kindleberger (1973).

17. See Kindleberger (1973). The phrase in the next sentence, "international interactions across boundaries," is from Kindleberger (1986), p. 437.

18. The role of monetary stringency in the Depression is discussed, for example, by Friedman and Schwartz (1963) and, more recently, by Hamilton (1986) for the U.S., Temin (1973) for Germany, and Jonung (1981) for Sweden.

19. Recent studies emphasizing the external constraint on monetary policy include Eichengreen (1981) and Eichengreen, Watson and Grossman (1985) for the U.K., Epstein and Ferguson (1984) for the U.S. and Temin (1971) for Germany.

20. Nurkse (1944), pp. 28-30; Lindert (1969), passim.

21. The text of the resolutions and related correspondence, from where this paragraph's quotations are drawn, are to be found in United Kingdom (1924).

22. Nurkse (1944), p. 28.

23. In August 1930 the National Bank of Belgium shifted from a gold to a gold bullion basis. Royal Institute (1931), p.134. This did not prevent it from holding foreign exchange outside its eligible reserve, as described below.

24. This is a partial list. For a complete list of countries legally permitted to hold only gold reserves and countries permitted to hold foreign exchange, see League of Nations (1930b).

25. The origin of these ratios is "somewhat obscure," in the words of C.H. Kirsch, quoted in Royal Institute (1931), p.151. The regulations emulated what legislators viewed as prudent banking practice, often taken to be Bank of England practice prior to Peel's Act of 1844, when it was the Bank's convention to maintain a 33 per cent cash reserve against notes and deposits. Or as the League of Nations (1930), p.19 put it, "But the minimum reserves which are required by law today are to a large extent the outcome, not of these considerations, but of past tradition, of convention and habit, of the natural fear which each individual legislature has that a departure from general practice may impair confidence in the currency."

26. Palyi (1972), p. 125.

27. League of Nations (1930b), p. 14.

28. The major central banks, with the notable exception of the Banque de France and National Bank of Switzerland, all possessed the power to undertake open market operations. League of Nations (1938), p. 86.

29. Nurkse (1944), p. 95.

30. J.M. Keynes, quoted in Royal Institute (1931), p. 186.

31. This solution was suggested by the Gold Delegation of the League of Nations (1932) and the Macmillan Committee (1931). See also Keynes (1929).

32. League of Nations (1938), pp. 87-89. The League mentions four other countries which adopted more complicated measures to effect small reductions in their cover ratios.

33. Hardy (1936), p. 96.

34. Gayer (1937), pp. 78-79.

35. Keynes, cited in Royal Institute (1931), p. 186; League of Nations (1930b), p. 19; Nurkse (1944), p. 90.

36. Nurkse (1944), p. 90.

37. Contributions to this literature include Kenen and Yudin (1965), Heller (1966) and Frenkel (1974).

38. The monetary variable used to explain movements in the demand for reserves should be treated as endogenous since, unless gold and foreign exchange flows are completely sterilized, disturbances affecting the stock of reserves are likely to result in a change in the base. This, however, is a matter of estimation rather than specification, and is considered further below.

39. Ignoring the impact on stocks of the flow supply of new gold is appropriate only given a short time horizon. Fremling (1985) notes that there was in fact a considerable flow supply of new monetary gold in the 1930s. Since the issue of whether that new supply was or was not a response to deflation induced changes in the real price of gold is distinct from the issues with which this paper is concerned, the exogeneity assumption is maintained throughout.

40. Denoting domestic credit as c,

$$c = (1-\alpha_4)h - \alpha_0 - \alpha_1 t - \alpha_2 s - \alpha_3 y.$$

Alternatively, domestic credit can be written as a function of reserves and other variables:

$$c = \frac{1-\alpha_4}{\alpha_4} r - \frac{\alpha_0}{\alpha_4} - \frac{\alpha_1}{\alpha_4} t - \frac{\alpha_2}{\alpha_4} s - \frac{\alpha_3}{\alpha_4} y.$$

Since the sign of dc/dr is theoretically ambiguous, no implicit assumption is necessarily made about whether central banks play by the "rules of the game."

41. Nurkse (1944), p. 93.

42. To facilitate the pooling of time series and cross section data, in the final analysis I included only those countries for which data were obtained for all years. Hence Belgium is excluded because income estimates are available only for selected years. The countries analyzed are Austria, Hungary, Czechoslovakia, Argentina, Colombia, Mexico, Australia, Japan, Chile, the United Kingdom, Bulgaria, Denmark, Finland, France, Germany, Italy, the Netherlands, Norway, Roumania, Spain, Sweden, Guatemala, El Salvador, and the United States.

43. The main sources are League of Nations (1937) and League of Nations (1939).

44. Attitudes toward revaluation and the toward the disposition of capital gains are discussed in Eichengreen and Sachs (1985).

45. In the case of Germany, the difference is due to the $100 million loan made in 1931 by the Bank for International Settlements, the Bank of England, the Bank of France and the Federal Reserve Bank of New York, which was fully repaid only in 1933. In the Danish case the discrepancy is due to an item listed in the National Bank's balance sheet as correspondents abroad. The results proved insensitive to the exclusion of these observations.

46. Since the variable to be instrumented is nominal money supply, the instruments are nominal income and lagged nominal balances, along with the opportunity cost variable. In the absence of market interest rates for the entire sample of countries, the inflation rate is used to measure the opportunity cost of holding money.

47. See the discussion in Kenen (1986). A possible explanation for this problem is that export variability is only one component of balance-of-payments variability. But studies which have used more comprehensive measures of the balance of payments such as the variance of recent changes in the level of reserves or the variability of detrended reserves are marked by the same instability of coefficient estimates. A notable aspect of the results in Table 2 is that the point estimate of the income elasticity of the demand for reserves tends to be less than unity, rather than greater than unity as in modern estimates and as suggested by the luxury good argument. This result is attributable to the inclusion of log money as an additional explanatory variable. The total elasticity of the demand for reserves with respect to national income is the direct elasticity plus the income elasticity of money demand times the coefficient on log money. If the income elasticity of money demand is unity, the two coefficients simply can be added, yielding a total income elasticity of demand for reserves on the order of 1.1.

48. Edwards (1983) estimates a similar specification, including a dummy variable for years preceding a devaluation and interpreting the coefficient estimate of -0.3 as suggesting that, prior to devaluation, reserves were some 30 percent below desired levels.

49. This follows Eichengreen and Sachs (1985). More precisely, it is measured as the change in the annual average exchange rate between the current and preceding years. Since reserves are measured at the end of the year, the use of annual average exchange rates should minimize simultaneity bias due to the impact of changes in reserves on changes in the exchange rate.

50. In contrast, in 1931, a year marked by major convertibility crises, the disequilibrium model adds nothing to the explanation provided by the equilibrium version. A plausible explanation for this failure is that the variable conflates the effects of Britain's convertibility crisis, which should yield a positive coefficient, and the effects of simultaneous devaluations by countries attempting to protect their shares of British markets, which should yield a negative coefficient. However, adding a dummy variable for Britain interacted with the rate of depreciation variable does not change the result.

51. Nurkse (1944), p. 96 and <u>passim</u>.

52. It might be argued that a dummy variable for the U.K. should also be included to pick up any effects associated with its (and America's) reserve currency roles (and their liabilities to the outside world). Adding such a variable yields a uniformly insignificant coefficient, with a t-statistic of 0.45 in the pooled equation in Table 4 and one of 0.27 in the third equation of Table 7, for example. In the latter instance the coefficients on individual years remain uniformly insignificant.

53. Since the dummy variables for France and the U.S. are 1.343 and 0.745, respectively, the gold reserves are $e^{1.343} = 3.83$ and $e^{0.745} = 2.11$ times those predicted by their characteristics and the average behavior of other countries.

54. In contrast, French exchange reserves differ insignificantly from those of other countries with similar characteristics.

55. An alternative specification is to interact the dummy variables for years with money, under the assumption that what shifted over time was not the average propensity to hold reserves but their elasticity with respect to the money supply. Since the results of estimating this alternative specification, shown in the appendix, are virtually indistinguishable from the results of estimating the basic specification only the latter are discussed in the text.

56. The coefficients differ significantly from zero at the 95 percent level for the one-tail test and at the 90 per cent level for the two-tail test.

57. $e^{-0.7} = .496$.

58. Eichengreen and Sachs (1985).

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