Asymmetric Propagation of Financial Crises During the Great Depression

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July 2011

Abstract

This paper aims to identify the main factors of international financial crisis propagation during the 1930s. Based on an extensive cross-country dataset documenting exchange market turbulence, bond spreads and stock market returns at a monthly frequency and using Principal Component Analysis, I explore the main factors of co-movement in the international financial series. I find that the 1931 crash accounts for most of the co-movement between countries on all financial markets. Not only was the 1931 crisis the main global shock of the Great Depression, but it also acted divisively. Some countries remained unaffected by the shock and even benefited from the crisis. I suggest that these countries' specific path over the 1930s was related to their position as net exporters of capital during the credit boom of the previous decade.

*Email: O.Accominotti@lse.ac.uk. I am grateful to Marc Flandreau and Barry Eichengreen for advice and for sharing data with me. I also thank Vincent Bignon, Michael Bordo, Harold James, Hugh Rockoff, Stefano Ugolini and seminar participants at Rutgers University for comments. Funding from the Niehaus Center for Globalization and Governance at Princeton University is gratefully acknowledged. All errors are mine.

1 Introduction

One of the most striking features of the Great Depression is its global dimension. One can hardly find in the economic history of the modern world a macroeconomic slump of such magnitude and affecting so many countries. The 1930s were also a period of intense financial turbulence, with troubles spreading rapidly from country to country. However, while international contagion and crisis transmission have been the focus of numerous studies on modern financial markets, the international spread of the financial crash of the 1930s has remained much less explored. The purpose of this paper is to identify the main factors of crisis propagation during the Depression.

After the East Asian and Russian crises, financial contagion has ranked high on international economists' agenda. Researchers have proposed definitions of the phenomenon (Pericoli and Sbracia, 2003) and elaborated a battery of empirical tests to measure it and identify its determinants (Eichengreen, Rose and Wyplosz, 1996b, Forbes and Rigobon, 2002).[1] The emerging market crises of the 1990s have been a privileged field of exploration of the phenomenon but historians have also noted similarities between these recent episodes and the decade of the 1930s (James, 2001). Recently, scholars have proposed to compare the intensity of contagion during these two periods, relying on the modern definition (Bordo and Murshid, 2001, Morsy, 2002).[2] Yet, while these attempts constitute valuable contributions, there is still a need for a more comprehensive approach to exploring the determinants of crisis propagation during the 1930s.[3] Indeed, it appears that the timing, intensity and geographical coverage of the financial crash of this period have in fact never been quantified systematically in the literature. What were the main global financial shocks of the Great Depression and to which extent did they impact the various countries? This paper proposes to shed light on these questions. To this end, it presents an original cross-country dataset documenting exchange market turbulence, bond spreads and stock returns at a monthly frequency during the 1930s. In order to describe crisis propagation, this paper relies on Principal Component Analysis (PCA). This method, by reducing the dimensionality of a dataset, allows

[1] In recent works, the term 'contagion' has been used to designate the reinforcement of international financial linkages that sometimes occurs in periods of financial stress. See Valdés(1996) for an early implementation of this definition.

[2] Relying on a dataset documenting weekly changes in bond prices during the interwar period, Bordo and Murshid (2001) compare cross-country correlations in crisis vs. tranquil times. They find very little evidence of contagion on this market during the 1930s and conclude that the phenomenon has been much stronger in the recent period. In another paper however, Morsy (2002) revisits this issue, based on data for stock market returns. Comparing the years 1930-2 to the EMS crisis of 1992-93, he finds a significant increase in global co-movement after May 1931 and concludes that contagion was stronger then that it is now.

[3] See Temin (1993) for a possible framework

identifying the main factors driving co-movement in statistical series. PCA is used here in order to extract the most relevant information from the international series and to establish the global financial shocks of the period.

The main results are the following. I find that the 1931 crash accounts for most of the observed co-movement in international financial markets during the 1930s. Not only was the 1931 crisis the most global financial shock of the Great Depression, but it also acted divisively. Indeed, while stock markets plunged everywhere, the situation was different on the exchange and bond markets, where a few countries resisted and even benefited from the crisis, experiencing negative exchange pressure and a decline in bond spreads. I suggest that this specific trajectory was related to their position as net exporters of capital during the credit boom of the late 1920s. Indeed, the year 1931 was marked by a drying up of liquidity in international capital markets and by a huge liquidation of financial assets. Countries that were previously relying on foreign borrowing to finance their current account deficits were confronted to a capital flow reversal. The sudden stop in capital inflows was associated with speculative attacks and undermined the debt sustainability of the debtor countries.[4] In the largest creditor countries of the 1920s, by contrast, holders of international assets shifted their portfolios towards domestic claims. The repatriation of capital was accompanied by an upward pressure on the currency and a decline in default risk. This explains these countries' resistance to contagion in the midst of the global financial crisis and the specific path they followed on financial markets during the 1930s.

The rest of the paper is organized as follows. Section 2 provides a chronology of the global financial crisis of the 1930s. Section 3 describes the data and sources used in the paper. Section 4 presents the results of a Principal Component Analysis run on a monthly international dataset for exchange market pressure, sovereign bond spreads and stock market returns. Section 5 relates the results of section 4 to the position of the different countries on international capital markets during the 1920s and to the capital flow reversal of the early 1930s. Section 6 concludes.

[4]For convenience, the term 'debtor countries' (resp. 'creditor countries') refers in this paper to the net importers (resp. exporters) of capital.

2 Chronology of the Financial Crash

In the second half of the 1920s, the world economy experienced a boom in commercial credit, bond markets and stock exchanges. After the monetary turmoil that followed the war, most countries managed to achieve fiscal stability, and therefore, to stabilize their currencies. Austria and Hungary relied on international credit schemes, the League Loans, named so because their attribution and supervision were conducted under the auspices of the League of Nations. Through the Dawes plan, Germany also found the path towards fiscal and exchange stability, in 1924. The gold convertibility of the pound sterling was re-established in 1925 in Britain (at the pre-war parity) by Winston Churchill's government. In France, the Premier Raymond Poincaré also managed to achieve fiscal balance at the end of the year 1926 and stabilize the currency. Capital started flowing massively from the creditor countries (United Kingdom, United States, France, the Netherlands, Switzerland) to the debtors: Germany in particular, but also Central Europe, the British Empire and Latin America (RIIA, 1937). International investments were taking the form of long-term bonds as well as short-term bills of exchange. The market for commercial paper (or bankers' acceptances) considerably increased in volume in the 1920s (Diaper, 1986, Accominotti, 2011, Ferderer, 2003), while the New York sovereign bond market was booming (Lewis, 1948, Mintz, 1951, Gaillard, 2007). Under the gold exchange standard system, central banks were holding substantial amounts of reserves in the form of sterling and dollar deposits or short-term assets placed in London and New York. These reserves were in turn recycled by the British and US financial systems and used to further extend credit.

But the boom in credit was soon followed by a burst. At the very end of the 1920s, the international financial system fell prey to a rampant liquidty crisis (Kindleberger, 1986). Foreign investments by creditor countries reached a peak in 1928, and then declined abruptly (Feinstein and Watson, 1995). After the boom in trade finance of the mid-decade, the volume of outstanding commercial credit contracted and sovereign bond issues collapsed in New York (Flandreau, Gaillard and Packer, 2009). The drying up of capital flows was then strengthened by the Wall Street Crash of October 1929. At the same time, the first cracks appeared in the international gold standard system (Eichengreen, 1992). At the turn of the decade, there was a significant decline in commodity prices. International trade began contracting in a dramatic spiral, unprecedented in history (Kindleberger, 1986). Large exporters of agricultural products were the first to suffer from the deflation and soon devalued their currencies. Australia, New Zealand

and Argentina abandoned the gold standard as early as 1929.

However, it is only two years later that the financial crash really took its global dimension. In May 1931, the failure of the largest Austrian bank (the Credit Anstalt) marked the starting point of a wave of exchange and banking crises across the world. Austria, Germany and Hungary were the first hit. In Austria, the speculative attack on the Schilling resulted from the decision of the National Bank to bail out the Credit Anstalt (through monetary expansion) in order to halt the banking panic at play (Schubert, 1991, James, 2001). The run on the Schilling continued until the government devalued and introduced exchange controls, in October 1931 (Ellis, 1941). Hungary's problems dated back to the year 1929, when the economy, mostly agricultural, was hit by deflation and the shrinkage in capital imports (Ellis, 1941, James, 2001). In May 1931, depositors started running on the large General Credit Bank. When the panic became general by mid-July, the Hungarian government reacted by imposing controls on capital outflows from the country. Last, Germany also fell victim of joint banking and currency troubles in the summer of 1931 (James, 1984, Schnabel, 2003, 2009). A moratorium was declared on 15 July on all payments abroad so as to avoid the depreciation of the Reichsmark. International creditors agreed to reschedule all German short-term debts through the Standstill Agreements.

Two months after the panic in Central Europe, a major international currency of the interwar monetary system, the pound sterling, fell victim of a speculative attack. The pound's gold adherence had been considered by investors as poorly credible since the year 1929 (Accominotti, 2009). In the summer of 1931, the troubles endured by British banks as a consequence of the panic in Central Europe were the final trigger for the pound's crisis (Accominotti, 2011). The sterling collapse resulted in the immediate disintegration of the existing international monetary system. The pound was at that time a major reserve currency (Eichengreen and Flandreau, 2009) and its devaluation therefore resulted in the liquidation of the gold exchange standard mechanism. Britain was immediately followed in its decision to leave the gold standard by several other countries: Denmark, Sweden, Norway, Finland, Portugal and, a few months later, Japan. Together with Australia and New Zealand, these countries gave birth to an informal currency block: the Sterling Area. The 1931 crisis also had severe repercussions on the New York bond market, where prices collapsed dramatically. A wave of sovereign defaults took place in the course of the year, especially in Latin America.[5]

After sterling, investors came to doubt the credibility of another major currency: the US dollar.

[5]Bolivia defaulted in January 1931, Peru in April, Chile in August, the Dominican Republic in October and Brazil in December (Gaillard, 2007).

The US banking system was at that time under intense pressure and the domestic economy was feeling the pinch of a contractionary monetary policy that strengthened deflationary pressures (Friedman and Schwartz, 1963, Eichengreen, 1992). This situation lasted for more than one year. In November 1932, Franklin D. Roosevelt was elected on the promise to halt deflation, while maintaining the gold standard. But the two objectives soon revealed impossible to conciliate. In March 1933, shortly after taking office, Roosevelt took the decisive step to suspend gold convertibility. The run on the dollar was coupled with a run on US banks and was halted by a nation-wide Bank Holiday (Wigmore, 1987, Silber, 2009). At the same time, the wave of defaults on sovereign debt issued in New York was propagating to other Latin American and European countries.[6]

At the end of the year 1933, almost all countries in the world had already been hit by a currency crisis and left the gold standard. The early devaluers, Britain in particular, were the first to show signs of economic recovery (Eichengreen and Sachs, 1985). Only a few European countries (Belgium, France, the Netherlands, Poland and Switzerland) had maintained an effective gold parity. These countries publicly proclaimed their unconditional commitment to the gold standard in 1933. However, the so-called "Gold Block" also fell victim of deflationary pressures and broke up, eventually. Belgium, whose economy very much depended on international trade and therefore suffered the most from the loss of competitiveness, was the first to devalue, in March 1935. The final collapse occurred in September 1936 and was initiated by the French government's decision to suspend gold convertibility.

Although the abandonment of the gold standard was closely associated with economic recovery, the disintegration of the "Gold Block" did not put an end to the world's financial troubles. France, for example, never returned to currency stability before WWII. The situation on the bond market remained bleak too ; there was a new wave of defaults in 1936-1937 (Germany, Costa Rica, Poland, Austria). Last, although stock markets recovered in the year 1935, a new fall took place two years after, when the US economy fell back into recession.

[6]The Latin American countries defaulting in the year 1933 were Colombia, Cuba, Guatemala, Panama, Salvador and Uruguay. In Europe, sovereign defaults concerned Bulgaria, Germany, Greece, Hungary, Rumania and Yugoslavia.

3 Data and Sources

3.1 Exchange market pressure

The 1930s were therefore a period of extreme turbulence on all financial markets, with troubles coming in successive waves. What were the main factors behind the propagation of the crash and how were various markets connected? In order to explore these questions, this paper relies on an extensive cross-country dataset documenting exchange market turbulence, sovereign default risk and stock market returns at a monthly frequency during the Great Depression.

For quantifying turbulence on the exchange markets, I rely on an exchange market pressure (EMP) index. This methodology was first introduced by Girton and Roper (1977) and has been popularized by the works of Eichengreen, Rose and Wyplosz (1995, 1996a, 1996b). Yet, EMP indices have never been constructed for the interwar period. Existing research has mostly concentrated on the determinants of countries' decisions to leave or remain on the gold standard (Wandschneider, 2008, Wolf, 2008), taking devaluation as a policy measure rather than as a consequence of a currency crisis. Looking at an index of exchange pressure instead allows considering all speculative attacks -whether successful or not- and to provide a measure of the intensity of currency troubles, which a simple binary variable is unable to provide. The index I am relying on here is a weighted average of the monthly changes in countries' international reserves and exchange rates:

$$EMP = \frac{\Delta e}{e} - \frac{\Delta R}{R} * \frac{\sigma_e}{\sigma_R} \tag{1}$$

, where $\frac{\Delta e}{e}$ and $\frac{\Delta R}{R}$ are the percentage changes of (respectively) the exchange rate (in units of domestic currency per gold dollar of 1929) and the international reserves. Exchange rates are measured relative to the price of gold, which is defined as the anchor. The weigths σ_e and σ_R are chosen so as to equalize the two components' volatilities.[7] The index was then standardized to have a mean of zero and a standard deviation of one.

[7] In their initial EMP index, Eichengreen, Rose and Wyplosz (1995, 1996a, 1996b) added a third component: the interest rate. Data for market interest rates are only available for a few countries during the interwar period. However, the League of Nations' *Statistical Year-Book* and *Monthly Bulletin and Statistics* provide data for central bank interest rates for the countries in the sample. A three-component EMP index was constructed as well. However, since bank rates do not appear as comparable across countries, the two-component index was preferred for the purpose of the calculations in this paper. Results were unchanged when using the three-component index. Other works relying on a two-component index include Kaminsky and Reinhardt (1999), Sachs et al. (1996) and IMF (2009).

Although this methodology is straightforward, collecting historical data for computing the index reveals a difficult task. A monthly dataset was constructed for documenting exchange rates and international reserves (including gold and foreign exchange reserves) for as many countries as possible over the years 1926 to 1938. Data were collected in various published and non-published sources. Monthly series for exchange rates can be found in the League of Nations' *Statistical Year-Book*. Gold reserves were collected in the Federal Reserve Board of Governors' *Banking and Monetary Statistics* and League of Nations' *Monthly Bulletins of Statistics*. The most challenging task however, was to construct monthly series documenting foreign currency reserves. When available, these data were directly derived from the national central banks' published (weekly or monthly) statements. Handwritten registers found at the Bank of France's archives (*Bilans des banques centrales étrangères*) and detailing foreign central banks' balance sheets as well as other publications by the League of Nations were then used to complement this information. I then cross-checked the data with various other sources providing similar series at a lower frequency. Combining all the different sources, an EMP index could be built for 23 countries over the period from January 1929 to December 1937. Appendix A1 provides full details on the sources used and methodology for data collection.

3.2 Sovereign bond spreads

Default risk is measured by spreads on sovereign bonds traded in New York. Monthly prices (in US dollars) of sovereign bonds on the New York market come from the Official Quotation of the New York Stock Exchange.[8] I concentrate here on a sample of 29 countries over the period from January 1928 to February 1934.[9] Spreads are measured relative to the yield on long-term United States bonds. Full details on the different bonds' references and characteristics (name, coupon, maturity) are also presented in the data appendix.

3.3 Stock market returns

Last, I have built monthly series for stock market returns covering 14 national stock exchanges from February 1928 to December 1936. Various sources displaying stock market indices were used for this purpose (see appendix A1). The stock market returns are measured in gold US dollars of 1929.

[8] I am grateful to Marc Flandreau for communicating me these data.
[9] For the Netherlands, the data end in January 1932.

4 Principal Component Analysis

4.1 Component scores and component loadings

The outcome of the data collection process described above is a set of three monthly series for each country in the sample. Principal Component Analysis (PCA) offers a convenient way to analyse these data and identify the main patterns of co-movement between the financial series. The idea of PCA is to reduce the dimensionality of a dataset by only keeping the most relevant information. This is done by computing the eigenvectors of the series' variance-covariance matrix and by expressing the data in terms of these vectors.

Results from PCAs performed on respectively the EMP indices, the sovereign bond spreads and the stock market returns are presented in Tables 1, 2 and 3. In each case, the table indicates the components' scores as well as the factor loading of each data vector (i.e. country). The countries are classified by groups. I present first the members of the Gold Block (Belgium, France, the Netherlands and Switzerland),[10] followed by the Sterling Area (United Kingdom, Denmark, Finland, Japan, Norway, Sweden) and the United States. Finally, results for other continental European and Latin American countries are presented.

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Component scores can be compared with previous results from the literature. Table 4 compares the scores obtained on the three datasets with those of two papers having used PCA on historical financial data: Bordo and Murshid (2006) and Morsy (2002). The first two components of the sovereign bond spreads dataset explain 87% of the variance in the data over the 1928-1934 period (Table 2). This is comparable, though slightly higher than the scores obtained by Bordo and Murshid (2006) on a sample of 13 countries during the years 1880-1914. The component scores for the stock market returns' database during the years 1928 to 1936 are also very similar in size to those obtained by Morsy (2002) on the years 1930-32. The first component is found to explain 37% of the total variation, while the second one explains an additional 9% (Table 3). In contrast, co-movement on the exchange market appears to

[10] Poland is classified here among "Other Europe", although it was formally a member of the Gold Block.

have been lower during the years 1929 to 1936 than during both the 1885-1914 and 1977-2001 periods, according to Bordo and Murshid's (2006) results. This is not surprising since almost all countries in Bordo and Murshid's (2006) sample for the nineteenth century had adopted a gold parity, while the 1930s have been characterized by successive waves of devaluations and the formation of regional currency areas.

< Table 4 around here >

The analysis of the component loadings provides an interesting perspective. Here, a striking result emerges. Looking at the first principal components in Tables 1 and 2, we see that some countries can be immediately singled out. Indeed, almost all countries disclose a positive correlation with the first principal component of both the EMP indices' and sovereign bond spreads' datasets. These positive factor loadings are very uniform in the case of bond spreads, and more heterogenous in the case of the EMP dataset, where correlations with the first principal component are higher for the members of the Sterling Area. But there are also noticeable exceptions to this general pattern. In both Tables 1 and 2, a few countries exhibit negative factor loadings. These countries are Belgium, France, the Netherlands and Switzerland in Table 1 and France, the Netherlands, and Switzerland in Table 2. Therefore, while almost all countries were moving together in the first principal component, a small group was moving in exactly the opposite direction. The same distinction also appears in the second principal component of Tables 1 and 2 but the relationship is now reversed. Factor loadings are high for Switzerland, the Netherlands and France (and in the case of bond spreads, the UK) and low for all other countries. By contrast, a similar distribution between countries is not apparent on the stock market. In Table 3, first principal component factor loadings are all positive. All countries, except Japan and, to a lesser extent, Poland, load equally on the first component, the only one to explain a significant share of the variance.

4.2 Behind the components: the financial shocks of the 1930s

In their crude form, the previous results might look quite abstract at a first glance. For interpreting them, we can think of the first principal component as the main global factor, which affected each market over the period. It therefore seems that this most important factor impacted a small group of countries in the exact opposite way as the rest of the world on both the exchange and bond markets. The next question, then, is: what was this global factor?

In order to answer it, it is convenient to examine the principal components more closely. Figures 1, 2 and 3 are time plots of the first components of respectively the EMP indices', sovereign bond spreads' and stock market returns' databases.[11] The first principal component is in each case the linear combination of maximum variance of the different data vectors. The periods covered by the three graphs are different since data availability is not similar for all three financial series.

< Figure 1 around here >

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In Figures 1, 2 and 3, an easy interpretation can be given to the first principal components. Dominant in all three graphs is the period surrounding the year 1931. On the exchange market, a period of intense global stress is clearly identifiable from April 1931 to January 1932, with the first component peaking in October. The same is true for the bond market; the first component of the bond spreads' dataset rises as of July 1931 and displays three peaks during the following months (September and December 1931, May 1932). Last, September 1931 is also the month at which the first component of the stock market returns' dataset reaches its lowest value (-7.7%), even though global stress on this market started from as early as October 1929 on.

The first conclusion therefore is that the crash of the year 1931 was the main global financial shock of the Great Depression. The crisis appears as the defining moment on all financial markets. However, while the shock affected national stock markets uniformly, component loadings suggest that it acted divisively on the exchange and bond markets, by isolating a few countries. In order to understand what this means, it is useful to compare the different countries' behavior on these two markets during the 1931 turmoil. Figures 4 and 5 present two indicators of crisis intensity for each sample country. The first one measures currency crisis intensity: it is the average of each country's monthly EMP index over the months from April 1931 to January 1932. The second one is a debt crisis intensity indicator: it is defined as the relative change in each country's sovereign bond spread (relative to the US) between June 1931 and May

[11] In order to compute the principal components, the PCAs had to be re-run based on datasets excluding countries whose financial series disclose gaps over the period. The countries concerned are the Netherlands for the bond spreads' dataset (quotations of Dutch bond prices end in March 1932) and Germany for the stock market returns' dataset (the German Stock Exchange was closed from July 1931 to April 1932). Results of the PCA were unchaged when excluding these countries. The full results are available upon request.

1932.[12] The time windows for calculating the crisis indicatiors were chosen so as to fit the periods of global financial stress identified above by the first principal component of each variable.

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The same distinction between countries that emerged from the PCAs is again apparent in these two figures, focused on the year 1931: countries exhibiting distinctive component loadings were also affected differently from the others by the global financial crisis. Examining Figure 4 first, we see that almost the whole sample experienced speculative pressure during the crisis window, with the Sterling Area and Central Europe appearing on the right side of the graph as the most severely affected regions. On the other side of the spectrum however, currency crisis intensity turns out to be negative for Switzerland, the Netherlands, France, Yugoslavia and Belgium. This means that these countries were confronted to pressure to re-value rather than devalue their currencies. Figure 6 illustrates the relationship between the first component loadings of the EMP indices' dataset and the severity of the 1931 crisis on the exchange market. The figure displays the correlation between each country's first principal component loading and its currency crisis intensity indicator. We see that the 1931 crash accounts for most of the cross-country variation in the factor loadings. This is more evidence of the importance of this crisis in the first principal component.

< Figure 6 around here >

In Table 5, exchange market developments are decomposed in more detail. For each country, the table displays the percentage changes in the two components of the EMP index over the crisis period. The countries are ranked by decreasing order of crisis intensity. The table also indicates whether the different countries were protected by exchange controls at the onset of the crisis or introduced controls during the period. The most seriously hit countries experienced both large international reserve outflows and currency depreciation (Finland, Austria, Japan, Sweden, Denmark). The Finnish krona registered the highest depreciation rate after the abandonment of the gold parity. Austria only devalued by 22 per cent, but the National Bank lost almost 70 per cent of its reserves between May and December. This

[12]For the Netherlands, the change in spreads is measured between June 1931 and March 1932. Countries in default (Brazil, Bolivia, Chile, Greece and Peru) as well as those whose spread increased by more than 500% during the crisis period (Salvador, Bulgaria and Hungary) are excluded from figure 5.

is clearly the consequence of a late renunciation to defend the parity. While the run on the reserves started in May, it is only in October that the Austrian government adopted capital controls. By contrast, Germany and Hungary, where controls were introduced as early as July, lost much less reserves and avoided devaluation. Reserve losses were also less acute for the future members of the Sterling Area which instead opted for devaluation. The US monthly EMP index peaked in October 1931 just after the sterling crisis, due to a loss in reserves of more than ten per cent from September to October. However, gold started flowing into the country as of November again and average exchange pressure over the crisis period was therefore close to zero. Last, we see that the upward currency pressure experienced by the future members of the Gold Block was mostly the consequence of large reserve inflows. Switzerland's reserves in particular, increased by more than 160% during the crisis period.

< Table 5 around here >

Figure 5 shows that developments were similar on the bond market. The rise in sovereign bond spreads was almost generalized during the 6/1931-5/1932 period. Among non-defaulting countries, Germany and Latin America were the most seriously hit on the New York bond market, but the increase in spreads was also very substantial for certain members of the Sterling Area (Finland, Japan, Denmark). On the other hand, a few countries also saw their spreads declining during the crisis: Switzerland, the Netherlands, the UK and France. Again, these were the same countries that exhibited specific component loadings in Table 2.[13] The crisis indicators therefore confirm that the 1931 international financial crisis was the divisive moment between countries on financial markets.

5 Explaining Asymmetry: the 1931 Capital Flow Reversal, Currency Crises and the Increase in Default Risk

5.1 Exporters vs. importers of capital

Having identified the main financial shock of the 1930s and the division it operated between countries, there now remains to find an explanation to the observed pattern. Why were a few countries affected differently from the others by the global crisis of 1931? Looking at the position of these countries on

[13]The first component loading of the UK is positive in table 2 but much lower than those observed for all other countries (excluding Switzerland, the Netherlands and France).

capital markets during the previous decade provides interesting insights. Indeed, there appears to be a close association between the behavior of the different countries on financial markets during the 1930s and the amount of capital they received during the credit boom of the late 1920s. Table 6 illustrates this feature. It shows the annual average of the ratio of capital inflows to GDP of 17 countries over the years 1924-1930. Capital inflows are measured as the sum of the current account deficit and accumulation of gold and foreign reserves (see appendix A1 for sources). A positive sign indicates a net import of capital. The sample was chosen for reasons of data availability.

< Table 6 around here >

At the bottom of the table lie the largest debtors of the 1920s: Austria, Hungary, Germany, Argentina. These countries received substantial amounts of capital during the period. For example, Austria's annual capital inflows amounted to almost 8% of its GDP on average during the years 1924 to 1930. Interestingly, these were also the most severely affected countries in 1931. On top of the table are the net exporters of capital. The parallel here is evident with the results from the previous section. The three largest creditor countries (relative to their GDP), Switzerland, the Netherlands and France, are those that were found to behave differently from the others on the interwar currency and bond markets. They were the only ones to experience both upward currency pressure and a decline in spreads in 1931.

5.2 The sudden stop in capital inflows

The problems of the debtor countries during the year 1931 appear more evident if we consider the developments of the late 1920s and early 1930s on international capital markets. Kindleberger (1986, 2000) has depicted the years 1929-1931 as a period of global liquidity shortage. Credit first froze up as a consequence of the decline in agricultural prices, which altered the quality of loans. The Wall Street stock market boom also diverted investments from the bond market towards the stock exchange in early 1929, and the subsequent collapse provoked heavy liquidations from all investors.[14] Based on balance-of-payments statistics, Feinstein and Watson (1995) have shown that capital exports from creditor countries slowed down as of 1929 and became negative in 1931. Table 7 illustrates the implication of this trend

[14]Kindlberger (2000, p. 66): "As the stock market moved toward its apex, call money rose from $6.4 billion at the end of December 1928 to $8.5 billion in early October. Funds were diverted from consumption and production. (...) When the crash came, the credit system suddenly froze. Lending on imports, for example, seems to have come to a complete stop"

for the debtor countries. It displays the decline in net capital inflows (as a percentage of 1931 GDP) experienced by the debtors of the previous table between their last peak and the year 1931. The table provides evidence that the capital inflow reversal endured at that time was very severe. The reduction in capital imports amounted to almost fifteen per cent of GDP for Argentina and to more than ten per cent for Finland, Austria and Germany.

< Table 7 around here >

Therefore, the shock endured by the debtors in the early 1930s was very similar to the sudden stop in capital inflows that Latin American countries have experienced after the Russian default of 1998 (Calvo and Reinhart, 2000, Calvo, Izquierdo and Talvi, 2003) or to the capital imports shrinkage that affected eastern European economies in 2009 as a consequence of the subprime crisis. Confronted to losses in the stock exchange and to the deteriorating quality of loans, liquidity-constrained investors started selling off their foreign claims.[15] For these countries, which were previously relying on foreign borrowing to finance their current account deficits, the move in investors' portfolios immediately transformed into currency pressure. There was no other option than to sell reserves in order to cushion the shock (see Table 5). But international reserves were soon depleted and ultimately, importers of capital had to cut their current account deficits. In order to do so, some opted for devaluation, while others imposed capital controls. Table 8 and Figure 7 show that the decline in current account deficits was abrupt and substantial. It amounted to 4.4% of GDP on average for the eleven debtors on which information is available. The capital inflow reversal also affected the debt sustainability of the debtors. This is because these countries needed their currencies to depreciate (in real terms) in order to shrink their current account deficits, and governments' debts were mostly denominated in dollars.[16]

< Table 8 around here >

< Figure 7 around here >

[15] Calvo (1999) shows that, in the presence of information asymmetries, fire sales by informed, liquidity-constrained investors might be interpreted as a signal of deteriorating quality of the assets. In this context, a general sell-off can be an equilibrium.

[16] Calvo (1998), Calvo, Izquierdo and Talvi (2003) and Calvo, Izquierdo and Mejia (2004) argue that, in the presence of capital inflow reversals, the decrease in demand needed to shrink the current account deficit induces a decline in the prices of non-tradables relative to tradables, i.e. a real currency depreciation. When liabilities are denominated in foreign currency, fiscal sustainability can be altered.

Figure 8 illustrates this development, by showing the annual ratio of capital inflows to GDP for our sample of eleven debtors during the years 1924 to 1935, in line with their average bond spread. As apparent in the graph, capital inflows to these countries slowed down progressively as of 1928 before coming abruptly to a halt and even reversing in 1931. This dramatic drop was accompanied by an increase in perceived default risk, clearly reflected in the bond spreads. The situation of the large creditors -Switzerland, the Netherlands, France- was very different from this perspective. Indeed, investors from these countries were now selling foreign holdings - i.e. repatriating capital from abroad- in order to meet their liquidity requirements. This explains the large reserve inflows experienced in the year 1931 (see Table 5). The capital flow reversal was also associated with an improvement, rather than a deterioration, of these countries' solvency, explaining the decline in spreads (see Figure 5).

< Figure 8 around here >

Before concluding this paper, two further remarks are worth adding. The first one concerns the case of the United Kingdom. From Table 6, we see that Britain was a net exporter of capital during the years 1924-1930 and the spread on British (gold) bonds followed a similar path as those of Switzerland, the Netherlands and France in the early 1930s. But Britain was hit by a currency crisis in 1931 and the results of Table 1 suggest that it behaved like a debtor country on the exchange market. This apparent contradiction might be solved when considering the particular position of London in the interwar international monetary system. Though a net exporter of capital, the United Kingdom was characterized by the huge short-term external liabilities of its banking system (Committee on Finance and Industry, 1931, Williams, 1963). This is because foreign banks (e.g. central banks) and investors were holding sterling balances in the London financial center. Short-term capital withdrawals might explain part of British currency troubles in 1931. But in a context of current account surplus, this movement should not have altered the UK's debt sustainability.[17]

The second remark concerns stock market returns. Results from the PCA (Table 3) showed that global shocks on the stock markets affected all countries - there was no such distinction between creditors and debtors. This result is actually consistent with the argument developed in this paper. Indeed, if liquidity constraints were the cause of the general sell-off of international investments of the early 1930s, and of the ensuing capital flow reversal, we should not expect domestic stock markets to have recovered

[17] Another exception is Sweden, which was also a net exporter of capital in 1924-1930 but was still hit by the 1931 crisis. This might have been due to the country's strong trade linkages with the UK and other members of the Sterling Area

at the same time, even in creditor countries. Investors trying to improve their liquidity position probably sold their stocks on all - foreign and domestic - markets. In the context of a liquidity shortage, the fact that stock markets collapsed globally appears as a natural phenomenon.

6 Conclusion

This paper has explored the main features of international crisis propagation during the 1930s. Using Principal Component Analysis, it has proposed to identify the largest common financial shocks of the period and to explore their geographical distribution. I then asked why some countries were affected by these shocks, and others not. The results suggest that global stress in the early 1930s was related to a liquidity shortage on international capital markets, which culminated in the huge capital flow reversal of the year 1931. In this context, the geography of financial troubles at the beginning of the 1930s closely matched the distribution of countries between creditors and debtors. The crisis first propagated to the large importers of capital. With the huge liquidation of international investments, countries that were previously relying on foreign borrowing to finance their current account deficits fell victim of speculative attacks and their debt sustainability was negatively impacted. By contrast, the largest creditors of the 1920s, Switzerland, the Netherlands and France, followed a radically different destiny at the same time. These countries were where capital flows were suddenly redirected in the early 1930s. This explains why they leant against the global financial storm of 1931.

Looking at the interwar developments from the point of view of the recent financial crises offers an interesting perspective. Indeed, the last decades have been marked by cycles of surges and contraction in international liquidity. The Mexican crisis of 1994, East Asian crisis of 1997-98 and Russian default of 1998 have all been associated with a dramatic contraction in capital flows to emerging markets (Calvo, Izquierdo and Mejia, 2004). The last of these episodes is actually underway. In the wake of the subprime crisis, large international investors have recently been confronted to losses and to the deteriorating quality of the credits in their portfolios. They have therefore tried to improve their liquidity by selling off their investments. Again, large importers of capital (eastern European countries, Iceland, Ireland...) have been the first to which the crisis has propagated. Since the last two years, they are facing increased pressure on their currencies and an abrupt rise in spreads on their governments' debts. The severity of the troubles endured by these countries will ultimately depend on the evolution of global economic growth as well

as on the ability of international institutions, governments and investors to coordinate and organize a rescue. Nevertheless, the experience of the 1930s is a lesson of pessimism for all countries now confronted to the global liquidity shortage.

This paper also opens an agenda for future research. Based on an extensive monthly dataset, I have proposed here to study the spread of the financial crash of the 1930s using a set of country-specific crisis indicators. I have suggested that the main patterns of co-variation in asset prices were related to movements in international investors' portfolios. The next step is to observe what happened directly in the portfolios. Micro-level evidence on large investors' strategies and liquidity management should provide valuable insights on how the financial crash of the 1930s propagated.

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Table 1: **Principal Component Analysis, Exchange Market Pressure Index, 2/1929-12/1937**

	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6
Gold Block						
Belgium	-0.05	0.17	-0.01	-0.01	-0.20	-0.12
France	-0.10	0.44	0.01	-0.16	0.04	0.03
Netherlands	-0.03	0.45	0.01	0.06	0.19	-0.08
Switzerland	-0.17	0.41	-0.13	0.08	0.10	0.01
Sterling Area						
United Kingdom	0.33	0.08	-0.21	-0.09	-0.11	-0.15
Denmark	0.28	0.04	-0.11	-0.17	0.01	-0.03
Finland	0.37	0.06	-0.25	0.00	-0.13	0.21
Japan	0.25	0.06	-0.31	-0.05	-0.02	0.22
Norway	0.40	0.06	-0.13	0.12	-0.11	-0.04
Sweden	0.35	0.00	0.08	-0.17	-0.02	-0.08
United States	0.13	-0.01	-0.01	0.58	0.11	-0.13
Other Europe						
Albania	0.06	0.14	-0.09	0.33	-0.29	-0.32
Austria	0.35	0.00	0.21	-0.08	0.05	0.00
Bulgaria	0.14	-0.02	0.18	0.06	0.11	-0.17
Czechoslovakia	0.13	0.33	0.27	-0.15	-0.06	0.10
Estonia	0.09	0.13	-0.10	0.55	0.14	-0.20
Germany	0.11	0.00	0.35	0.02	-0.12	0.46
Hungary	0.06	-0.02	0.38	0.21	0.17	0.14
Latvia	0.02	0.48	0.13	-0.10	0.06	-0.09
Poland	0.11	-0.02	0.34	0.11	0.24	0.34
Yugoslavia	0.04	-0.05	-0.26	-0.11	0.58	0.26
Latin America						
Argentina	0.24	-0.07	0.30	-0.09	0.11	-0.48
Chile	0.08	-0.05	-0.16	-0.09	0.53	0.04
Variation explained	16%	29%	36%	43%	49%	55%

Table 2: **Principal Component Analysis, Sovereign Bond Spreads, 1/1928-3/1934**

	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6
Gold Block						
Belgium	0.19	0.16	-0.15	0.20	-0.25	0.08
France	-0.12	0.21	-0.19	0.67	-0.26	-0.01
Netherlands	-0.03	0.39	0.47	-0.01	0.11	0.06
Switzerland	-0.08	0.38	0.38	0.13	-0.01	0.08
Sterling Area						
United Kingdom	0.07	0.43	0.04	0.03	0.05	-0.05
Denmark	0.21	0.07	-0.18	0.03	-0.08	0.11
Finland	0.22	-0.03	-0.07	-0.05	-0.19	-0.02
Japan	0.17	-0.22	0.14	0.28	0.24	0.20
Norway	0.21	0.03	-0.13	0.06	0.01	0.23
Sweden	0.20	0.14	0.02	0.17	0.02	-0.02
Other Europe						
Austria	0.17	0.18	-0.41	0.04	0.34	-0.01
Bulgaria	0.21	-0.13	0.06	0.03	-0.06	-0.10
Czechoslovakia	0.19	0.13	-0.03	-0.01	-0.06	0.63
Germany	0.21	0.01	-0.09	0.00	0.16	-0.34
Greece	0.17	-0.23	0.20	0.29	0.19	0.01
Hungary	0.21	0.03	-0.17	0.04	0.03	-0.31
Italy	0.14	0.27	0.02	0.00	-0.16	-0.36
Poland	0.20	0.08	0.15	-0.35	-0.20	0.02
Latin America						
Argentina	0.21	0.05	0.04	-0.03	-0.18	-0.11
Bolivia	0.21	-0.11	0.07	-0.03	-0.01	0.10
Brazil	0.22	-0.04	-0.07	-0.13	-0.05	0.08
Chile	0.21	-0.10	-0.05	0.03	-0.06	0.03
Cuba	0.20	0.09	0.16	-0.11	0.13	-0.19
Dominican Republic	0.21	-0.10	0.14	0.08	0.08	-0.02
Haiti	0.21	0.02	0.12	-0.14	-0.03	0.14
Panama	0.13	0.29	-0.20	-0.14	0.53	0.09
Peru	0.21	-0.08	0.12	-0.02	-0.17	0.05
Salvador	0.17	-0.19	0.31	0.30	0.23	-0.14
Uruguay	0.21	0.02	0.05	0.01	-0.28	-0.08
Variation explained	71%	87%	91%	93%	95%	97%

Table 3: **Principal Component Analysis, Stock Market Returns, 2/1928-12/1936**

	Component 1	Component 2	Component 3	Component 4	Component 5	Component 6
Gold Block						
Belgium	0.24	0.47	0.15	-0.35	-0.09	-0.25
France	0.25	0.12	-0.45	0.38	0.08	-0.18
Netherlands	0.36	-0.07	0.01	-0.24	0.04	-0.27
Switzerland	0.31	-0.29	-0.17	-0.14	0.06	0.07
Sterling Area						
United Kingdom	0.32	0.13	0.01	0.23	-0.08	-0.24
Japan	0.06	0.34	0.47	0.28	0.68	0.21
Norway	0.31	0.03	0.09	0.12	0.14	-0.15
Sweden	0.25	-0.39	-0.20	0.11	0.23	0.49
United States	0.35	-0.10	-0.08	-0.02	0.20	-0.14
Other Europe						
Austria	0.30	0.24	-0.13	0.01	-0.15	0.17
Czechoslovakia	0.24	0.19	-0.14	-0.40	0.03	0.36
Germany	0.25	-0.03	0.44	-0.18	-0.31	0.39
Poland	0.14	-0.54	0.46	-0.04	0.05	-0.33
Spain	0.21	0.03	0.21	0.56	-0.52	0.14
Variation explained	37%	46%	55%	62%	69%	74%

Table 4: **Comparison of results: Component scores**

	Component 1	Component 2	Component 3
EMP index			
Bordo and Murshid (2006): 1880-1914, 10 countries	36%	47%	57%
Bordo and Murshid (2006): 1977-2001, 10 countries	25%	38%	49%
Table 1: 1929/2-1937/12, 23 countries	16%	29%	36%
Sovereign bond spreads			
Bordo and Murshid (2006): 1880-1914, 13 countries	61%	78%	83%
Bordo and Murshid (2006): 1994-2000, 10 countries	63%	82%	86%
Table 2: 1928/1-1934/3, 29 countries	71%	87%	91%
Stock market returns			
Morsy (2002): 1930-1932, 13 countries	37%	46%	54%
Morsy (2002): 1991-1994, 14 countries	22%	38%	51%
Table 3: 1928/2-1936/12, 14 countries	37%	46%	55%

Table 5: **The 1931 crisis on the exchange market: 4/1931-1/1932**

Country	Currency Crisis Intensity	Δ Reserves (%)	Δ Exchange Rate (%)	Exchange Controls
Finland	1.77	-49.09	68.00	Yes
Austria	1.75	-69.43	21.55	Yes
Japan	1.35	-48.34	37.22	No
Sweden	1.34	-51.28	39.58	No
Denmark	1.21	-39.43	41.27	Yes
Argentina	1.02	-33.51	33.79	Yes
Norway	0.91	-21.85	43.32	No
Germany	0.91	-56.53	0.85	Yes
United Kingdom	0.77	-15.91	41.59	No
Chile	0.67	-45.14	0.00	Yes
Czechoslovakia	0.39	-30.78	0.00	Yes
Hungary	0.21	-22.65	-0.57	Yes
Latvia	0.18	-19.35	0.00	Yes
Bulgaria	0.18	-18.97	0.00	Yes
Poland	0.15	-16.45	0.00	No
Albania	-0.01	-7.44	-0.52	No
United States	-0.01	-6.37	0.00	No
Estonia	-0.03	-6.67	-0.37	Yes
Belgium	-0.19	7.71	0.00	No
Yugoslavia	-0.21	4.71	-1.12	Yes
France	-0.22	8.73	-0.51	No
Netherlands	-0.61	44.32	-0.25	No
Switzerland	-1.57	164.68	-1.54	No

Sources: Author's computations based on own dataset (see data appendix). Exchange controls are from the League of Nations' *Statistical Year-Books*.

Table 6: **Debtor and creditor countries, 1924-1930**

Country	**Average Capital Inflow (% of GDP)**
Switzerland	-3.05
Netherlands	-1.75
France	-1.20
Sweden	-1.02
United Kingdom	-0.91
United States	-0.75
Denmark	0.42
Japan	0.62
Italy	0.65
Yugoslavia*	0.69
Finland	0.84
Bulgaria	1.73
Norway	1.95
Argentina	2.93
Germany	3.17
Hungary**	4.28
Austria	7.75

*: 1926-1930 **: 1925-1930. Sources: see appendix A1.

Table 7: **Decline in capital inflows from last peak to 1931 (% of GDP)**

Country	**Last Peak Year**	**Decline (% of 1931 GDP)**
Argentina	1930	14.89
Finland	1928	13.11
Austria	1924	11.66
Germany	1928	10.28
Italy	1927	7.58
Bulgaria	1928	5.58
Hungary	1927	5.38
Japan	1926	5.22
Denmark	1930	1.23
Norway	1928	0.20
Yugoslavia	1930	-1.48

Sources: see appendix A1.

Table 8: **Decline in current account deficit from last peak to 1931 (% of GDP)**

Country	**Last Peak Year**	**Decline (% of 1931 GDP)**
Finland	1928	12.65
Argentina	1930	9.45
Germany	1927	8.05
Austria	1924	6.03
Bulgaria	1929	4.93
Hungary	1928	4.32
Italy	1928	3.08
Yugoslavia	1930	1.92
Japan	1928	0.29
Norway	1930	-0.92
Denmark	1930	-0.94

Sources: see appendix A1.

Figure 1: **First Principal Component, EMP index, 2/1929-12/1937**

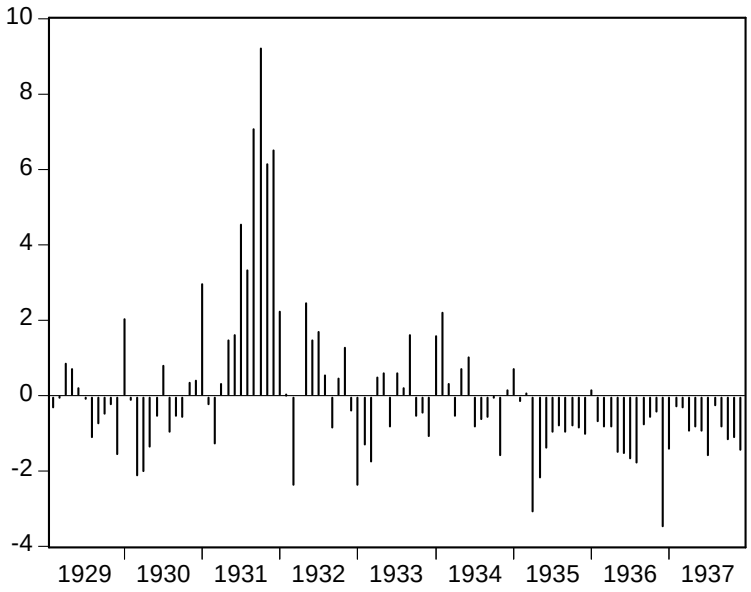


Figure 2: **First Principal Component, sovereign bond spreads, 1/1928-3/1934**

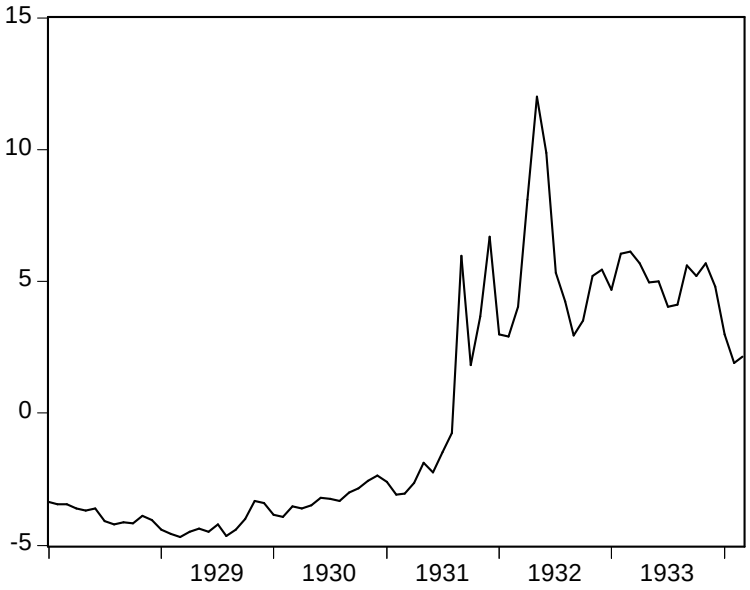


Figure 3: **First Principal Component, stock market returns, 2/1928-7/1936**

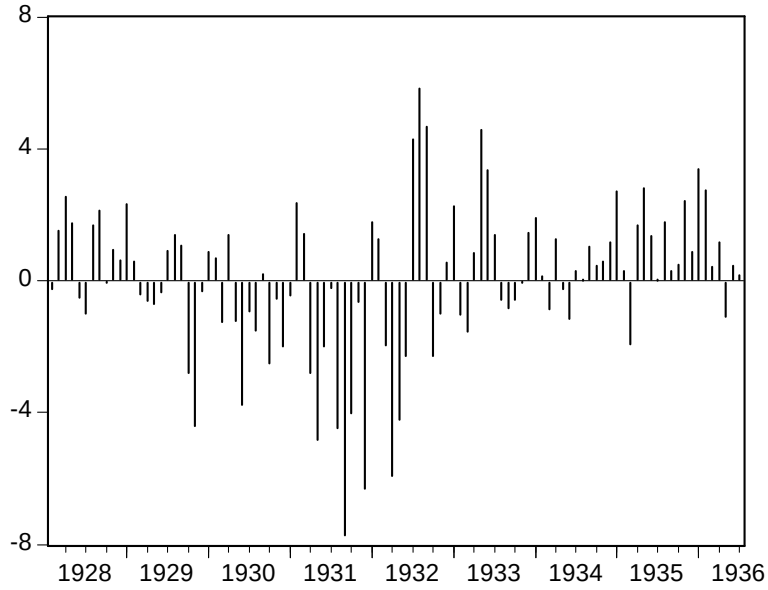


Figure 4: **Currency crisis intensity: Average EMP index, 4/1931-1/1932**

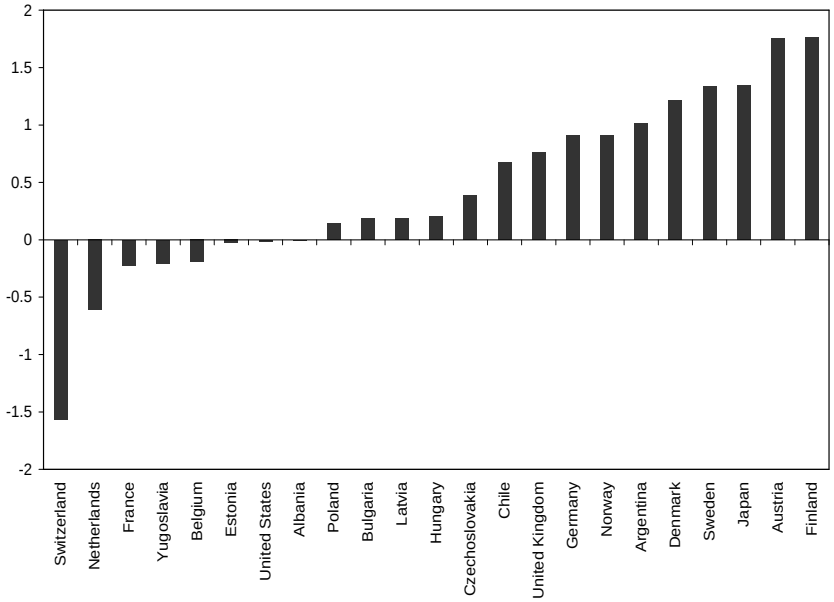


Figure 5: **Debt crisis intensity: Relative change in sovereign bond spreads, 6/1931-5/1932**

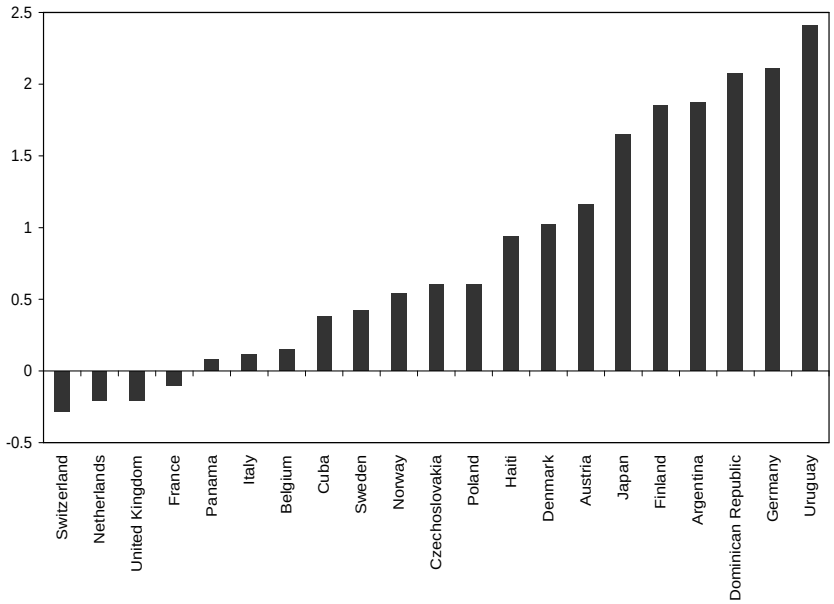
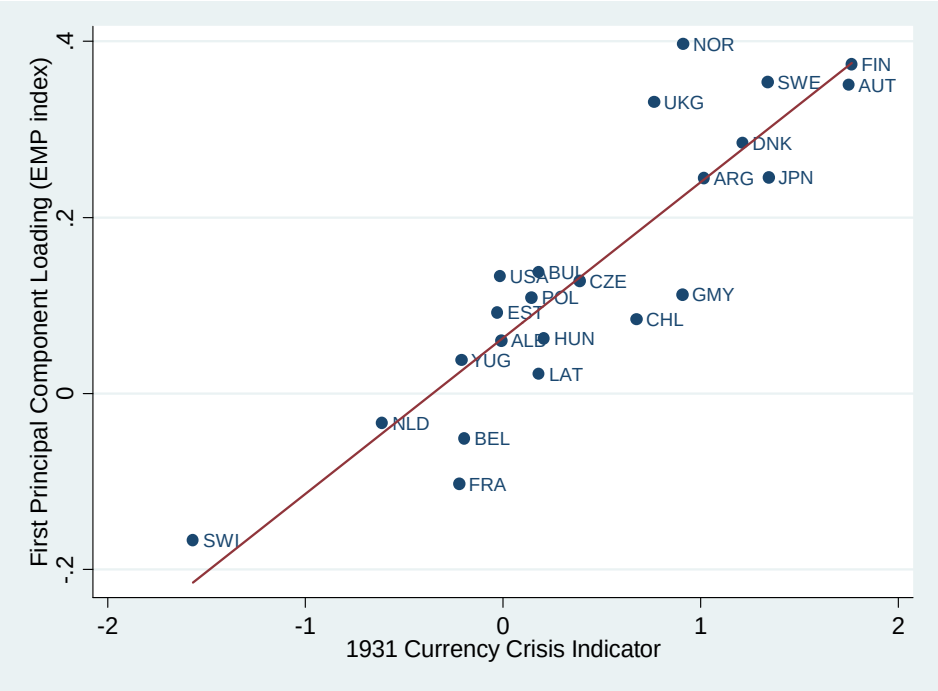
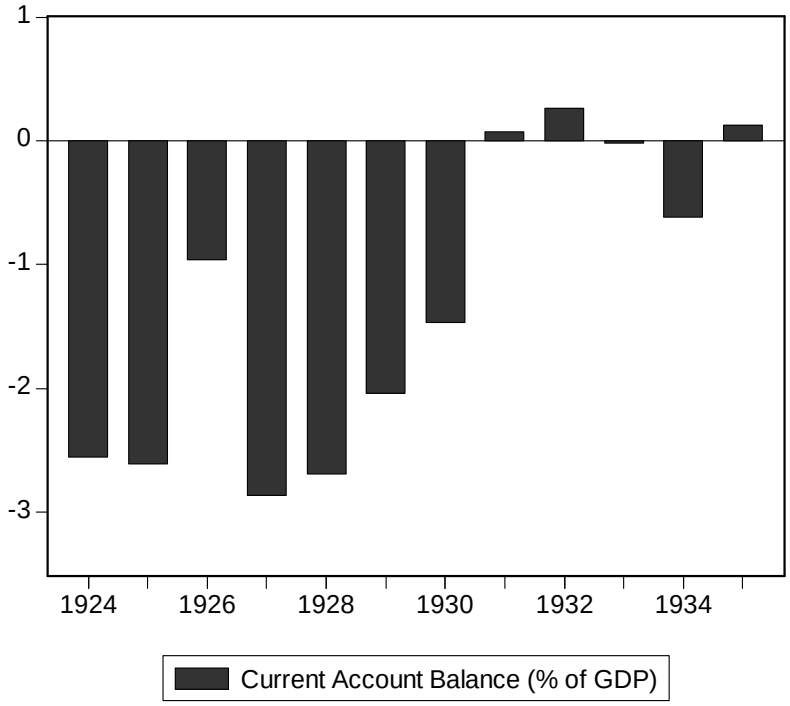


Figure 6: First Principal Component Loadings (EMP index) and 1931 Currency Crisis Indicator



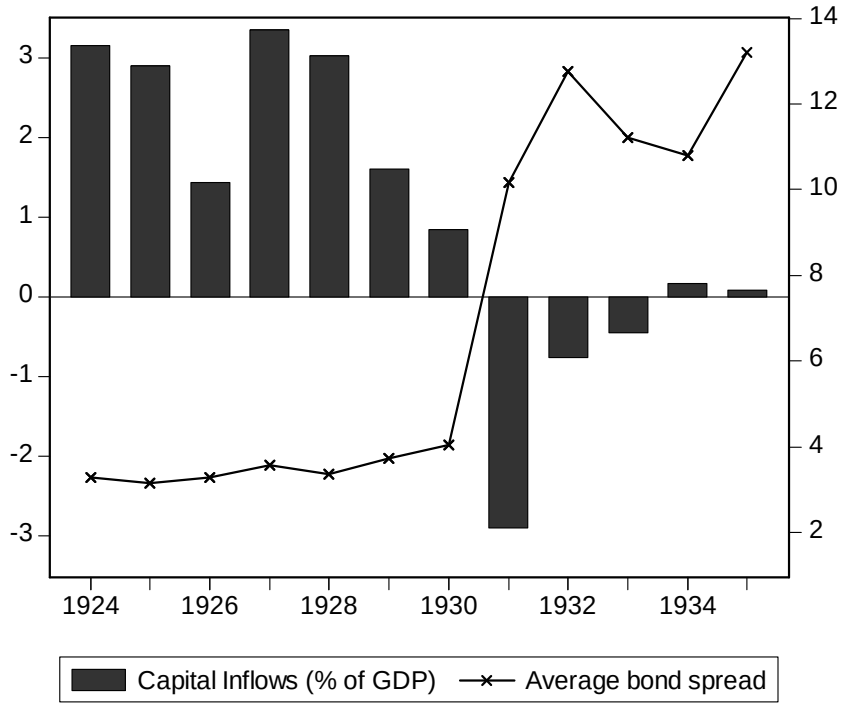
Sources: Author's computations (see text and data appendix).

Figure 7: **Current Account Balance (% of GDP), 11 debtor countries, 1924-1935**



Countries included are Argentina, Austria, Bulgaria, Denmark, Finland, Germany, Hungary, Italy, Japan, Norway and Yugoslavia. The bars show the total current account balance of the 11 countries as a percentage of their total GDP. Current account data are missing for Hungary (1924), Yugoslavia (1924-25) and Italy (1933-1935). Sources: Author's computations (see text and appendix A1).

Figure 8: **Capital inflow reversal and sovereign bond spreads, 11 debtor countries, 1924-1935**



Countries included are the same as in figure 7. Right scale: the bars show the total capital inflows for the 11 countries as a percentage of their total GDP; Left scale: The line represents the average sovereign bond spread (relative to US bond yield) of the 11 countries in December of each year (for 1935, November). Data for capital flows are missing for Hungary (1924), Yugoslavia (1924-25) and Italy (1933-1935). Data for bond spreads are missing for Bulgaria (1924-1925) and Italy (1924). Sources: Author's computations (see text and appendix A1).

Appendix A1: Data and Sources

I. Exchange rates

Monthly exchange rates are from the *Statistical Year-Book* of the League of Nations. Data are indicated in US cents/NCU until 1932/12 and in percentage of the 1929 gold parity afterwards. I used this information for calculating the gold dollar of 1929/NCU exchange rates.[18]

II. Gold reserves

Monthly gold reserves data come from Board of Governors of the Federal Reserve System, 1943, *Banking and Monetary Statistics, 1914-1941*[19] and from the League of Nations' *Monthly Bulletin of Statistics*.

The amount of gold held by central banks was usually reported on their balance sheets. However, central banks were often valuing gold at a legal (former or current) parity rather than at the current exchange rate. In order to convert the series into a common unit, one first needs to identify the parity used for valuation.

The Federal Reserve Board's *Banking and Monetary Statistics* provide correctly valued gold reserves for 57 countries for the end of each year from 1913 to 1927 and for the end of each month from June 1928 to December 1941.[20] Data for the Unites States are monthly since January 1914.[21] All data are valued in gold US dollars.[22] The publication also provides extensive information on the exchange rates at which gold reserves were converted in the different countries from 1913 onwards.[23]

For the period 1/1926-12/1928, not covered by the Federal Reserve, I used (when possible) the League of Nations' *Monthly Bulletins* for constructing monthly series of the gold reserves. Data in the *Monthly Bulletins* are reported in local currencies but were converted into gold US dollars using the valuation parities indicated by the Federal Reserve Board.[24]

III. Foreign exchange reserves

Monthly data for foreign exchange reserves come from various international and national, published and unpublished sources. Reserves held in foreign currencies were usually reported on the issuing institutes' balance sheets. When available, I have directly derived these data from the national central banks' published statements. When I could not identify a national source, I used alternatively handwritten registers found at the Bank of France's archives (*Bilans des banques centrales étrangères*) or the League of Nations' *Monthly Bulletins of Statistics*. The collection of foreign reserves data poses several challenges. A first challenge concerns the definition of foreign reserves. When access to the central banks' statements is possible, one needs to identify the items of the balance sheets, which were effectively corresponding to assets held in foreign currency. Other sources like the League of Nations' *Monthly Bulletins* give the total amount of foreign reserves for the different countries without mentioning the balance sheets' items to which they correspond. In that case, there is a need to confront the

[18] Original data for Argentina (1926/1-1926/12) were indicated in US cents/peso papel. I used the parity 1 peso oro=2.27268444 peso papel for expressing the exchange rate in terms of peso oro during the whole period. For Belgium (1927/1-1938/12), original data were in US cent/Belga and I used the parity 1 belga=5 francs for calculating a gold dollar of 1929/Belgian Franc exchange rate over the whole period.

[19] Section 14: "Gold", pp. 521-555

[20] Table 160, "Gold Reserves of Central Banks and Governments, by Countries", pp. 544-555.

[21] Table 156, "Analysis of Changes in Gold Stock of United States", column: Gold Stock ("end of period"), pp. 536-538.

[22] defined as 1 ounce of fine gold= 20.67 gold dollars between 1/1913 and 12/1933 and 1 ounce of fine gold=35 gold dollars as of 1/1934.

[23] Ibid. pp. 528-535

[24] For Chile (12/1931-12/1934) and Ecuador (12-6/1932), inconsistencies were found in the data of the Federal Reserve Board. I have therefore relied on the *Monthly Bulletins* for the whole 1/1926-12/1938 period.

data with more detailed balance sheets (available at a lower frequency) in order to make sure that the figure indicated effectively corresponds to the total amount of foreign assets. A second challenge concerns valuation issues. All sources indicate the amount of foreign reserves in national currency (the holding country's currency) and it is therefore necessary to identify the exchange rate used by the different central banks for valuing their foreign holdings.

In order to deal with the first challenge, I relied on the detailed annual balance sheets published by the League of Nations in its *Money and Banking* volumes (1937-1938, 1938-1939 and 1940-42). When no detailed balance sheet was available at a monthly frequency, I systematically compared the total amount of foreign reserves I obtained from another source with the end-of year balance sheets found in the *Money and Banking* volumes. I was therefore able to identify the items of the balance sheet to which the total amount of foreign reserves actually corresponded.

For dealing with valuation issues, I kept track of all the indications given in the sources on the valuation rates. I also compared converted data with two other sources: Nurkse (1944) and Bank for International Settlements (1932). Nurkse (1944) gives the end-of-year amount, in US dollars, of foreign reserves for a sample of 24 European countries from 1924 to 1931. Bank for International Settlements (1932) reports the Swiss franc amount of foreign reserves for a sample of 26 European countries and the United States, at the end of each year from 1924 to 1931 and for the months of March, June and September 1931 and 1932.

Detailed sources for each country are presented below:

- Albania:

1/1929-12/1937 : League of Nations, *Monthly Bulletin of Statistics*.

- Argentina

1/1929-12/1937: Board of Governors of the Federal Reserve System (1943). The figure for the gold reserve indicated by the Federal Reserve's Board corresponds to the sum of two items of the Banco Central de la Republica Argentina's balance sheet "Gold at home" and "Gold abroad and foreign exchange". This figure therefore already includes foreign assets.

- Austria

1/1929-12/1936: Oesterreichische Nationalbank, *Mitteilungen des Direktoriums der Oesterreichischen Bank*, various issues. Weekly statements are reported in the section: "Geschäftsübersicht für das Jahr 19.. nach den veröffentlichen Ständen".

1/1937-12/1937: League of Nations, *Monthly Bulletin of Statistics*.

- Belgium

1/1929-12/1937: Banque Nationale de Belgique, *Rapport présenté à l'assemblée générale*, various issues.

- Bulgaria

1/1929-12/1931: Archives, Bank of France, "Bilans des banques centrales étrangères" (handwritten registers).

1/1932-12/1937: League of Nations, *Monthly Bulletin of Statistics*.

- Chile

1/1929-12/1937: League of Nations, *Monthly Bulletin of Statistics*.

- Czechoslavakia

1/1929-12/1937: National Bank of Czechoslovakia, *Bulletin* (weekly statements).

- Denmark

1/1929-12/1937: League of Nations, *Monthly Bulletin of Statistics*.

- Estonia

1/1929-12/1937: League of Nations, *Monthly Bulletin of Statistics.*

- Finland

1/1929-12/1937: Archives, Bank of France, "Bilans des banques centrales étrangères" (handwritten registers).

- France

1/1929-12/1937: *Situation hebdomadaire de la Banque de France* (available on the Bank of France's website through Annhis).

- Germany

1/1929-12/1937: League of Nations, *Monthly Bulletin of Statistics.*

- Hungary

1/1929-12/1937: National Bank of Hungary, weekly balance sheets.

- Latvia

1/1929-12/1937: League of Nations, *Monthly Bulletin of Statistics.*

- Netherlands

1/1929-12/1937: The Netherlands Bank N.V., *Reports presented by the President and Commissaries to the General Meeting of Shareholders*, "Statements of the Bank's weekly Returns", various issues.

- Norway

1/1929-12/1937: Klovland, Jan Tore, 2004, "Monetary aggregates in Norway, 1819-2003", in Oyvind Eitrheim, Jan T. Klovland and Jan F. Qvigstad (eds.), *Historical Monetary Statistics for Norway, 1819-2003*, Norges Bank Occasional Paper n35, chapter 5, pp. 181-240.

- Poland

1/1929-12/1937: Archives, Bank of France, "Bilans des banques centrales étrangères" (handwritten registers). See also Bank Polski, Service des Etudes, *Bulletin (trimestriel).*

- Sweden

1/1929-12/1937: Sveriges Riksbank, *Tillgangar och skulder.* (Assets and Liabilities) (weekly returns).

- Switzerland

1/1929-12/1937: Banque Nationale Suisse, *Rapport annuel.*

- Yugoslavia

1/1929-12/1937: Banque Nationale du Royaume de Yougoslavie. Service des études économiques. *Bulletin trimestriel*, various issues.

IV. Sovereign bond spreads

Monthly data for sovereign bond prices (in US dollars) quoted in New York were communicated by Marc Flandreau and come from the Official Quotation of the New York Stock Exchange. Bond yields were calculated using the coupon/price formula and spreads were then measured relative to the yield on US long-term bonds (NBER Macro History Database, Series m13033a, "US Yield On Long-Term United States Bonds 01/1919-02/1944"). The full reference (name, coupon, maturity) for the bonds used for calculating the yields are presented below:

- Argentina: Argentina Govt Loan extn s f g 6s Issue of Oct 1 1925. Coupon: 6%. Maturity: 1959.
- Austria: Austrian Govt gtd g ln s f 7s w i. Coupon: 7%. Maturity: 1943.
- Belgium: Belgium Kingdom 25yr extn loan g 6,5s int rcts. Coupon: 6.5%. Maturity: 1949.
- Bolivia: Bolivia Republic ester sec g 7s temp. Coupon: 7%. Maturity: 1958.
- Brazil: Brazil Ext s f g 6,5s temp Bonds of 1926. Coupon: 6.5%. Maturity: 1957.
- Bulgaria: Bulgarian Kingdom of sec s f g 7s w l. (as of January 1934, Bulgarian Kingdom of sec s f g 7s(July 1 1933 cpn on)stpd to paymt of $17.5per$1bond and Jan 1 1934cpn on stamped $17.5). Coupon: 7%. Maturity:

1967.
- Chile: Chile Republic exter s f g 6s. Coupon: 6%. Maturity: 1960.
- Cuba: Cuba Rep 30-yr s f g 5,5s Interim cfs. Coupon: 5.5%. Maturity: 1953.
- Czechoslovakia: Czecholovak Republic interim ctfs for 8% sec ext s f gold loan of 1922 due 1951. Coupon: 8%. Maturity: 1951.
- Denmark: Denmark Kingdom 20-yr exterl gold 6% loan. Coupon: 6%. Maturity: 1942.
- Dominican Republic: Dominican Rep 20-yr Cus Adm s f 5,5 s int cfs. Coupon: 5.5%. Maturity: 1942.
- El Salvador: El Salvador Rep of 1st ln Customs s f 8s series A. Coupon: 8%. Maturity: 1948.
- Estonia: Estonia Rep of 7s dollar bds. Coupon: 7%. Maturity: 1967.
- Finland: Finland Rep of extnl ln s f g 6s. Coupon: 6%. Maturity: 1945.
- France: French Rep Govt of temp a f extn ln 1924 g 7s. Coupon: 7%. Maturity: 1949.
- Germany: German extnl ln 1924 g 7s. Coupon: 7%. Maturity: 1949.
- Greece: Greek Govt s f g 7s (as of April 1934, called: Greek Govt s f g7s(May 1933 coupon on). Coupon: 7%. Maturity: 1964.
- Haiti: Haiti Republic of Cus & Gen Rec Extrni s f g 6s ser A interim ctfs. Coupon: 6%. Maturity: 1952.
- Hungary: Hungary Kingdom s f g 7,5 s. Coupon: 7.5%. Maturity: 1944.
- Italy: Italy Kingdom of exter s f g 7s. Coupon: 7%. Maturity: 1951.
- Japan: Japanese Govt sfg 6,5 s. Coupon: 6.5%. Maturity: 1954.
- Netherlands: Netherlands Kingdom of the 50-yr s f 6s ser A. Coupon: 6%. Maturity: 1972.
- Norway: Norway Kingdom 30-yr s f exterl g 6s. Coupon: 6%. Maturity: 1952.
- Panama: Panama Rep of 30-yr s f g extrnl sec trst receipts 5,5s. Coupon: 5.5%. Maturity: 1953.
- Peru: Peru Rep sec s f g 7s temp. Coupon: 7%. Maturity: 1959.
- Poland: Poland Rep of g 6s. Coupon: 6%. Maturity: 1940.
- Sweden: Sweden Kingdom extnl loan g 5,5s intrm ctfs. Coupon: 5.5%. Maturity: 1954.
- Switzerland: Switzerland Govt of ext ln g 5,5 s tmp. Coupon: 5.5%. Maturity: 1946.
- United Kingdom: United Kingdom of Great Britain and Ireland 20-yr 5,5% gold bonds (g 5,5 s). Coupon: 5.5%. Maturity: 1937.
- Uruguay: Uruguay Republic of exterl loan 25-yr 8% s f gold bonds. Coupon: 8%. Maturity: 1946.

Sources for end-year spreads in Figure 8 have been completed for Argentina (1924: Argentina Govt Loan temp s f g 6s Ser.A, coupon: 6%, maturity: 1957), Austria (1935: Austrian Govt intertiol loan sfg 7s, coupon: 7%, maturity: 1957) and Yugoslavia (1924-1935: Serbs Croats & Slovenes Kingdom sec exter g 8s, coupon: 8%, maturity: 1962).

V. Stock market returns

Monthly stock market indices over the period 1928-1936 were taken from the following sources:
- Austria: *International Abstract of Economic Statistics*, completed with the League of Nations' *Statistical Year-Book* for January, October and November 1931.
- Belgium, Czechoslovakia, France, Japan, Netherlands, Poland, Spain, Sweden: *International Abstract of Economic Statistics*.
- Germany: *International Abstract of Economic Statistics* (The German Stock Exchange was closed from August 1931 to April 1932.)
- Norway: Klovland, Jan Tore, 2004, "Historical Stock Price Indices in Norway, 1914-2003", in Oyvind Eitrheim,

Jan T. Klovland and Jan F. Qvigstad (eds.), *Historical Monetary Statistics for Norway 1819-2003*, Norges Bank Occasional Paper No. 35, chapter 8, pp. 329-348. "Stock Price Index/Total".
- Switzerland: Swiss National Bank, *Historical Time Series*, Capital and stock markets, table 8.1.
- United Kingdom: 1928-1934: League of Nations, *Statistical Year-Book*, various issues; 1935-1936: *International Abstract of Economic Statistics*.
- United States: NBER Macro-History Database, Series m11025, S&P Index of all common stock prices.

The title *International Abstract of Economic Statistics* refers to the two following publications:
- 1928-1930: International Conference of Economic Services, 1934, *International Abstract of Economic Statistics, 1919-1930*, London: International Conference of Economic Services.
- 1931-1936: International Statistical Institute, 1938, *International Abstract of Economic Statistics, 1931-1936*, The Hague: International Statistical Institute.

VI. Balance-of-Payments Statistics

Current account balances and capital flows are derived from balance-of-payment statistics. Feinstein and Watson (1995) have published the net capital inflows of 22 European countries during the years 1924 to 1937. However, the published data are aggregated by subperiods (1924-1930 and 1931-1937) and annual data are not available. I have therefore reconstructed an annual database documenting the current account balance, gold and reserves outflows and capital inflows of 17 countries for the years 1924 to 1938. In order to identify the sources, I have relied on the detailed indications provided by Feinstein and Watson (1995). For each country, capital inflows are measured as the sum of the current account deficit and accumulation of gold and foreign reserves. The sources used are the following:
- Argentina, Bulgaria, Denmark, Finland, Germany, Hungary, Italy, Norway, Sweden, Switzerland, Yugoslavia:
Data for capital inflows come from United Nations, 1949, *International Capital Movements during the Inter-War Period*, New York: United Nations, table 1, pp. 10-12.
Data for capital inflows published by United Nations (1949) are for the balance of current account and gold but do not take changes in foreign exchange reserves into account (see Feinstein and Watson, 1995). The data were therefore corrected so as to subtract the increase in foreign reserves from the figure for capital inflows indicated in the United Nations' volume.
Annual data (December of each year) for gold reserves come from Board of Governors (1943). Annual foreign reserves data are from League of Nations, *Statistical Year-Book, 1926* for the year 1923, from Nurkse (1944) for 1924-1932 and derived from the monthly dataset (see section III of this appendix) for 1933-1938, except for Bulgaria, Hungary (1933-1938: League of Nations, *Money and Banking* volumes) and Germany (1931-1938: League of Nations, *Money and Banking* volumes).
- Austria
Data for Austria's current account balance were kindly communicated by Clemens Jobst and come from an internal database of the Austrian National Bank. Data for capital inflows were constructed by deducting the increase in gold and foreign reserves from the current account balance. Annual data for gold reserves are from Board of Governors (1943). Annual foreign reserves data are from League of Nations, *Statistical Year-Book, 1926* for the years 1923-1925, and derived from the monthly dataset (see section III of this appendix) for 1926-1937.
- France
1924-1934: Data for France's current account balance, gold and foreign reserves outflows are from Sicsic, P., 1993, "The Inflow of Gold to France from 1928 to 1934", *Banque de France. Notes d'Etudes et de Recherche*, No 22.

Table 6, pp. 203-204.
Data for capital inflows were constructed by deducting the increase in gold and foreign reserves from the current account balance.
1934-1938: Data for capital inflows come from United Nations (1949) and were corrected by deducting the increase in foreign reserves (see above). Gold and foreign reserves outflows come from the monthly database (see section III of this appendix). Annual data for gold reserves are from Board of Governors (1943). Annual foreign reserves data are from League of Nations, *Money and Banking* volumes.
- Japan
Data for Japan's current account balance, gold outflows, foreign reserves outflows and capital inflows are from Ohkawa, K., and M. Shinohara, 1979, *Patterns of Japanese Economic Development. A Quantitative Appraisal*, New Haven: Yale University Press, Table A31, pp. 334-335.
- Netherlands
Data for the Netherlands' current account balance are from Bakker, G. P. den, T.A. Huitker and C. A. Van Bochove, 1990, "The Dutch Economy, 1921-1939: Revised Macroeconomic Data for the Interwar Period", *Review of Income and Wealth*, vol. 36(2),pp. 187-306, Table 6, pp. 203-204.
Data for capital inflows were constructed by deducting the increase in gold and foreign reserves from the current account balance. Annual data for gold reserves are from Board of Governors (1943). Annual foreign reserves data are from The Netherlands Bank N.V., *Reports presented by the President and Commissaries to the General Meeting of Shareholders*, "Statements of the Bank's weekly Returns", "Foreign Bills".
- United Kingdom
Data for the UK's current account balance, and (total) international reserves outflows are from Sayers, R., 1976, *The Bank of England, 1891-1944*, Cambridge: Cambridge University Press, vol. 3, Appendix 32, pp. 312-313.
Data for capital inflows were constructed by deducting the increase in international reserves from the current account balance.
- United States
Data for the US current account balance, and (total) international reserves outflows are from US Department of Commerce, 1975, *Historical Statistics of the United States, Colonial Times to 1970*, Washington: Bureau of the Census, Table U 1-25: "Balance of International Payments: 1790 to 1970", p. 867.
Data for capital inflows were constructed by deducting the increase in international reserves from the current account balance.

VII. GDPs

Annual GDPs (1924-1938) come from the following sources:
- Argentina: 1924-1938: Oxford Latin American Economic History Database (Oxlad).
- Austria, Bulgaria, Hungary, Yugoslavia: 1924: Derived from Mitchell (1992) and Maddison (2006). 1925-1938: Mitchell (1992).
- Denmark, Finland, France, Italy, Japan, Norway, Sweden, United Kingdom, United States: 1924-1938: Jones and Obstfeld (2001).
- Germany: 1924: Derived from Ritschl and Spoerer (1997) and Maddison (2006); 1925-1938: Ritschl and Spoerer (1997).
- Netherlands: 1924: Derived from Bakker et al. (1990) and Maddison (2006); 1925-1938: Bakker et al. (1990).
- Switzerland: 1924: Derived from Siegenthaler (1996) and Maddison (2006); 1925-1938: Siegenthaler (1996).