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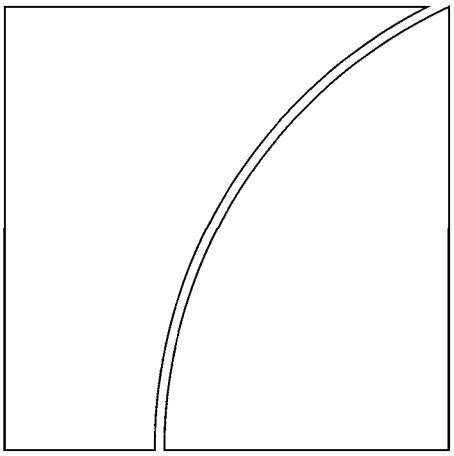

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The international propagation of the financial crisis of 2008 and a comparison with 1931

by William A Allen and Richhild Moessner

Monetary and Economic Department

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Keywords: Financial crisis, liquidity, international monetary system, Great Depression.

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The international propagation of the financial crisis of 2008 and a comparison with 1931[1]

William A Allen[2] and Richhild Moessner[3]

Abstract

We examine the international propagation of the financial crisis of 2008, and compare it with that of the crisis of 1931. We argue that the collateral squeeze in the United States, which became intense after the failure of Lehman Brothers created doubts about the stability of other financial companies, was an important propagator in 2008. We identify some common features in the propagation of the two crises, the most important being the flight to liquidity and safety. In both crises, deposit outflows were not the only important sources of liquidity pressure on banks: in 1931, the central European acceptances of the London merchant banks were a serious problem, as, in 2008, were the liquidity commitments that commercial banks had provided to shadow banks. And in both crises, the behaviour of creditors towards debtors, and the valuation of assets by creditors, were very important. However, there was a very important difference between the two crises in the range and nature of assets that were regarded as liquid and safe. Central banks in 2008, with no gold standard constraint, could liquefy illiquid assets on a much greater scale.

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1. Introduction

Understanding how financial crises are propagated from country to country is important because it can help in designing crisis-management policies to interrupt the positive feedback loops that are characteristic of such crises. In this paper, we examine the financial crisis of 2008 and consider how it was propagated from country to country, and compare it with the crisis of 1931. We choose these two particular crises because they were both global in scope; because they both affected the world's principal financial centres, and because the crisis of 1931 had catastrophic consequences. Moreover, although the world economy is, at the time of writing, clearly recovering from the deep recession that followed the failure of Lehman Brothers in September 2008, it is still possible that there will be a relapse and that it will turn out that the crisis is not yet over. Having identified, as far as we can, the channels of propagation that operated during the two crises in Sections 2 to 4, we identify similarities and differences between the two crises in Section 5. Finally, Section 6 concludes.

2. International flows of funds during the crisis of 2008

The failure of Lehman Brothers on 15th September 2008 was a severe shock to US financial markets, because it undermined the prevailing assumption that no systemically-important financial institution would be allowed to fail, even if it was not a bank. The event was followed by very heavy international flows of funds, which are described in this section. International flows of funds through commercial banks in the second half of 2008 are summarised in table 2.1.

Table 2.1

Exchange-rate adjusted changes in commercial banks' net external liabilities in the second half of 2008

(US$ billion)

	Total	Domestic currency	Foreign currency
USA	256.8	269.7	–12.9
Japan	134.8	129.8	5.1
Euro area	–311.4	88.2	–399.6
Switzerland	73.5	28.3	45.2
UK	9.9	–47.5	57.4
Australia	–82.1	12.6	–94.6
Denmark	–29.7	–10.1	–19.7
Sweden	–35.7	14.9	–50.5
Korea	–37.8	0.0	–37.8

Note: countries are included in this table if the total net external liabilities of banks located in that country changed by more than $30 billion in 2008Q4

Source: BIS international banking statistics, table 2.

Several features stand out. First, there were very large domestic-currency-denominated flows to the United States and Japan, which we discuss in section 3 below. Second, in most

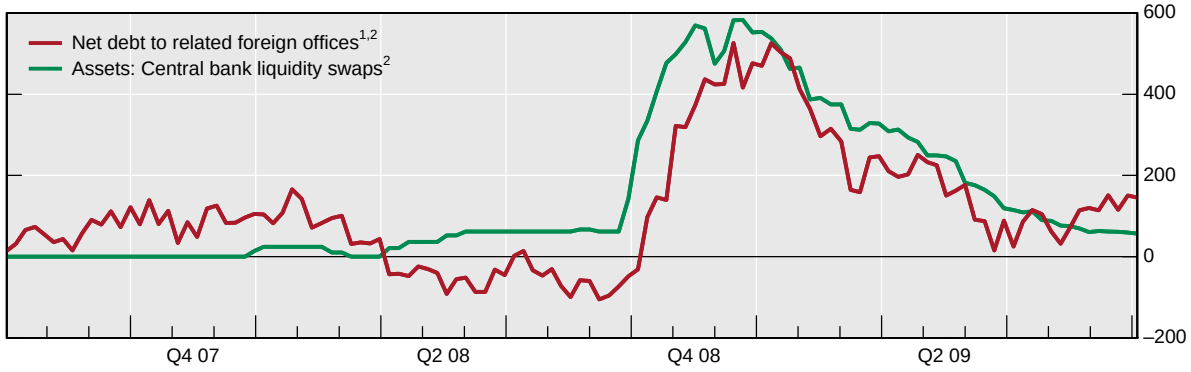
cases, flows were towards the country of origin of the currency in which they were denominated (ie most of the entries in the 'domestic currency' column of table 2.1 are positive). Third, there were large foreign-currency denominated outflows from the euro area, Australia, Denmark, Sweden and Korea. Finally, as graph 2.1 shows, the inflow of funds to the United States was concentrated in the period after Lehman Brothers failed.

The large flows of dollars to the United States made it impossible for commercial banks located outside the United States that had been financing longer-term US dollar-denominated assets with shorter-term wholesale funding to renew their funding from commercial sources, and it thus created a shortage of dollars outside the United States, which in turn caused severe stresses in financial markets. It was largely relieved by swap lines provided by the Fed, but some of the financial market stresses persisted (see Allen and Moessner 2010). The withdrawal of external funding from commercial banks outside the United States caused their domestic lending to contract, as Aiyar (2011) shows in the case of the United Kingdom. The provision of dollar funds by the Fed to foreign central banks was closely correlated with the inflow of funds to the United States through banks located in the United States, as graph 2.1 shows.

Graph 2.1

US commercial banks' net debt to related foreign offices and Fed swaps outstanding

In billions of US dollars



[1] All commercial banks; not seasonally-adjusted. [2] Wednesday level.

Sources: Federal Reserve tables H8 and H4.1.

3. Channels of propagation of the 2008 crisis

The purpose of this section is to suggest ways in which the financial crisis of 2008 was internationally propagated, by reference to banking and other published statistics. We identify three channels and describe how, in our judgment, they assisted the propagation of either crisis or both.

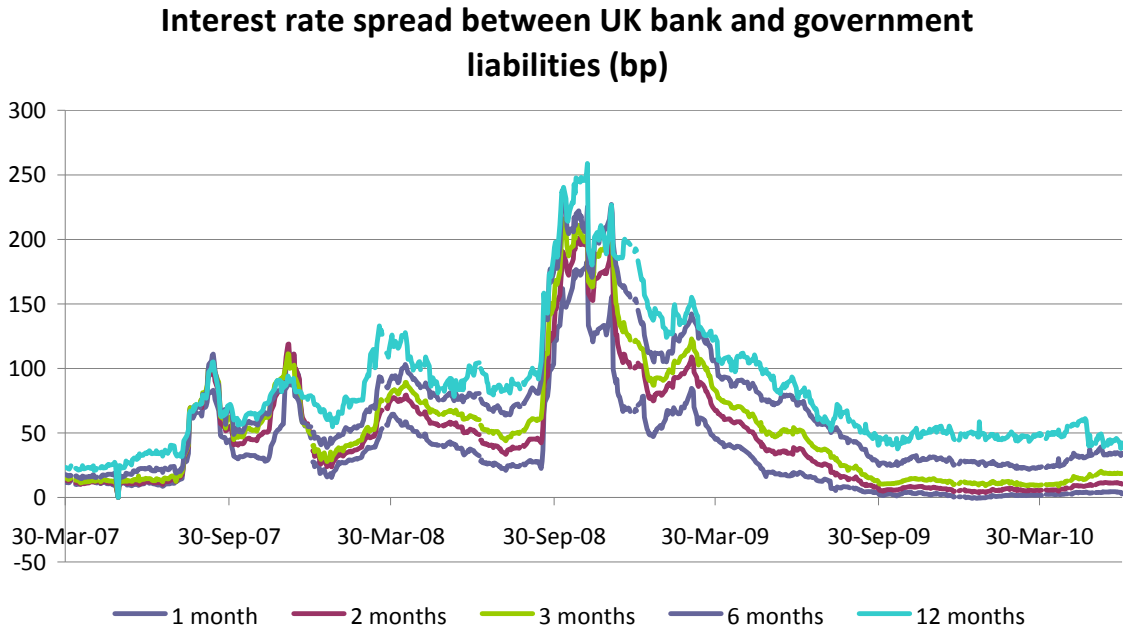
3.1 Flight to liquidity and safety

A flight to liquidity and safety began in 2007 when growing doubts about the security of mortgage-backed securities caused the 'shadow banking system' to begin to contract. The 'shadow banking system' consisted of financial companies which were not banks which performed maturity transformation by holding inventories of longer-term assets financed by shorter-term liabilities such as asset-backed commercial paper. Many shadow banks had

back-up liquidity guarantees from commercial banks, so that the growing doubts about the assets of the shadow banks, as well as about the assets of commercial banks themselves, led inevitably in turn to doubts about the soundness of commercial banks[4]. The flight intensified and turned into a crisis after the failure of Lehman Brothers on 15th September 2008.

The flight to liquidity and safety was manifested in many ways. For example, yield differentials between unsecured UK bank liabilities and UK government liabilities widened sharply after August 2007 (see graph 3.1).

Graph 3.1



Source: Bank of England.

Not all government liabilities were considered as safe, and yield differences between the securities issued by different governments widened. At the extreme, the government of Iceland was forced to impose exchange controls in 2008, while the governments of Greece and Ireland sought emergency support from international financial institutions in 2010. Commercial banks whose headquarters were in Iceland and Ireland were suspected of having negative net worth of such a size as to threaten the sustainability of their governments' finances, on the assumption that the governments would guarantee the deposits and perhaps some other liabilities of the banks. This undermined the credit standing of the governments (and the banks) of Iceland and Ireland. Other governments, such as in Spain, Portugal and the United Kingdom, tightened fiscal policy out of anxiety that their credit standing would otherwise deteriorate.

The liabilities of central banks in countries with stable public finances were also regarded as liquid and safe, and the demand for them surged. Central banks, having learned the lessons

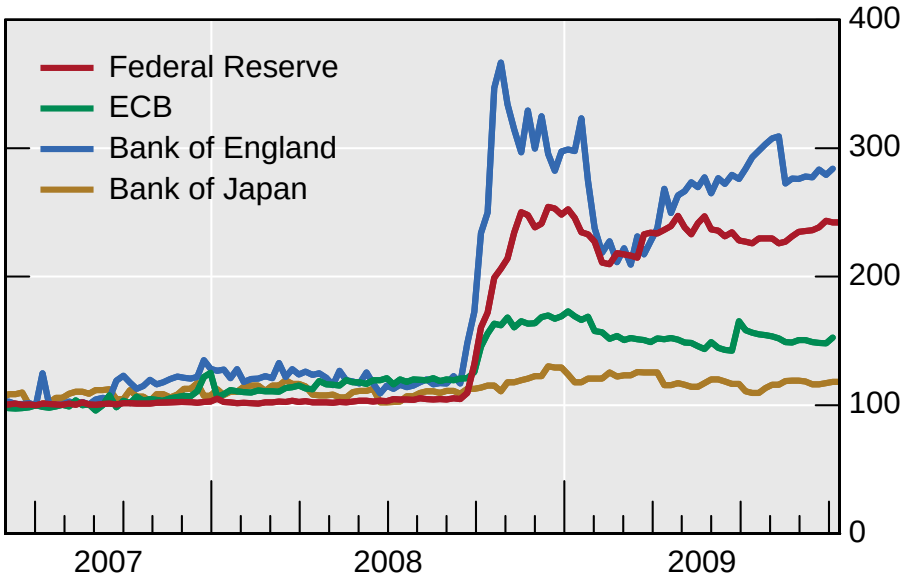
[4] See for example Pozsar, Adrian, Ashcraft and Boesky (2010).

of the Great Depression, generally recognised this surge for what it was and supplied deposits and other liabilities in large quantities, using the proceeds to acquire additional assets. In doing so they fulfilled the role of 'lender of last resort' in defence of financial stability. The balance sheets of some central banks, including those of the United States, the euro area and the United Kingdom, ballooned in size, as graph 3.2 shows.

Graph 3.2

Central bank balance sheet size, 2007-2009

(in national currencies, mid-2007 = 100)



Sources: Datastream, national data.

The international flows of funds after the failure of Lehman Brothers may also have been partly the result of a flight to quality. At that time, the yield differentials between commercial bank and government liabilities widened still further (graph 3.1), which reflected even more acute credit concerns. Banks in the United States may have become more uneasy about the creditworthiness of foreign banks and declined to roll over maturing deposits placed with them. However, as table 3.2 below shows, most of the massive increase of $575 billion between 3rd September and 31st December 2008 in amounts due from commercial banks in the United States to their foreign offices was on account of foreign banks, not US-chartered banks; moreover, there was no particular reason why the failure of Lehman Brothers (and the rescue of AIG, which occurred at much the same time) should have increased US banks' unease about foreign banks. We therefore doubt whether US banks' doubts about foreign banks were the main cause of the post-Lehman inflow to the United States.

3.2 Collateral squeeze

As discussed in this section, it is likely that the heavy inflow of funds to the United States after the Lehman Brothers failure can be partly explained as one of the side-effects of a collateral squeeze which took place in the United States at that time. We describe first how a collateral squeeze can develop and what its effects on the balance sheets of banks and shadow banks can be.

3.2.1 How a collateral squeeze works

A collateral squeeze affects leveraged companies which use their assets as collateral for their borrowings. For present purposes we describe such companies as 'shadow banks'. This definition of shadow banks therefore includes many broker-dealers and hedge funds, but it excludes most money market mutual funds, which are strictly speaking not leveraged, because investors buy shares which have no guarantee of capital value[5]. Table 3.1 shows the essential features of the balance sheet of a shadow bank as defined by us.

Table 3.1

The balance sheet of a shadow bank

Assets	Liabilities
Liquid assets (L)	Capital (K)
Securities (S)	Unsecured liabilities (U)
	Collateralised liabilities (C)

We assume that the shadow bank holds securities (S), which it uses to collateralise borrowings, and a precautionary reserve (L) of liquid assets which are in the form of cash and securities which are unencumbered but which could be used in an emergency to obtain cash quickly, eg by selling them to the central bank, or using them as collateral for borrowing from the central bank. When using its securities (S) to collateralise its borrowing, the shadow bank has to pledge a surplus margin of securities in excess of the value of the loan. This is known as a haircut. For the purposes of exposition, we assume that the fractional haircut is h. The amount of securities that the company has to pledge as collateral for its liabilities is therefore (1 + h) C. Since the shadow bank's securities holdings are S in total, it follows that:

$S \geq (1 + h)\, C$, ie (1)

$S \leq (1 + h)\, (K + U - L)/\, h$ (2)

One kind of collateral squeeze can be represented as an increase in h, ie an increase in the surplus margin of collateral that the shadow bank has to pledge to secure a loan. If h were to increase to say h*, there would be no necessary consequences for the balance sheet if its leverage is not too great, ie if

$S \leq (1 + h^*)\, (K + U - L)/\, h^*$ (3)

In that situation, the shadow bank would have enough unpledged securities to be able simply to provide the additional required collateral out of its assets.

If however the shadow bank has insufficient unpledged securities to accommodate the increase in h, then it must reduce its holdings of securities to S*, increase capital to K* , increase unsecured liabilities to U*, or reduce its precautionary liquid assets to L*, where

$S^* \leq (1 + h^*)\, (K^* + U^* - L^*)/\, h^*$. (4)

[5] Nevertheless, the Fed went to great lengths in 2008 to prevent money market mutual funds from 'breaking the buck', by establishing the Asset-backed Commercial Paper Money Market Mutual Fund Liquidity Facility and the Money Market Investor Funding Facility. The Fed commented that: 'Without additional liquidity in the money markets, forced sales of ABCP could have depressed the price of ABCP and other short-term instruments, resulting in a cycle of losses to MMMFs and even higher levels of redemptions and a weakening of investor confidence in MMMFs and the financial markets' (see http://www.federalreserve.gov/newsevents/reform_amlf.htm).

In practice, it is likely to try to do all four: reduce securities holdings, try to increase capital, try to increase unsecured liabilities, and use liquid assets.

For the purpose of exposition, we assume first that the shadow bank is unable to increase capital or unsecured liabilities, and that it decides not to use its liquid assets (or that it has none), and that the entire adjustment is therefore accomplished by sales of securities. In that case, the volume of sales must be at least

$$S - S^* = ((1/h) - (1/h^*))(K + U - L) \quad (5)$$

If h increases from, say 0.1 to 0.2 – in other words, if the firm's trading counterparties require it to pledge 1.2 units of assets to secure 1 unit of borrowing, rather than 1.1 – then the firm might have to reduce its securities holdings by up to half.

Another kind of collateral squeeze can be represented as a fall in U – ie a reduction in the amount of unsecured funding available to the shadow bank. This might happen for example if trading counterparties which had previously been willing to tolerate unsecured exposures to the shadow bank suddenly begin to demand collateral, or cut the exposures.

Again for the purposes of exposition, we assume that the entire adjustment is accomplished by the sale of securities. If U falls to U', then S will have to fall to S', where

$$S' - S = ((1 + h)/h)(U' - U) \quad (6)$$

If h is, say, 0.1, then the required fall in securities holdings is eleven times as large as the fall in unsecured funding. Thus both an increase in haircuts and a fall in unsecured funding can threaten to force a shadow bank to make extremely large asset sales.

Shadow banks hold liquid assets precisely to protect them against the risk of being forced to sell large amounts of assets in a short time. However, if the firm has used its liquid assets to meet additional collateral demands, it is likely to want to rebuild them as protection against future contingencies (unless it is confident that the risk has passed). Therefore liquid assets enable the firm to spread its asset sales over time, but not to avoid them altogether.

If the collateral squeeze is a general market phenomenon, rather than specific to one firm or a few firms, then all shadow banks which finance themselves in this way will be subject to the same pressure. It is therefore unlikely that the buyers of securities sold by shadow banks will be other shadow banks. They are much more likely to be unleveraged 'real-money investors', who will pay for the securities they buy from shadow banks by drawing down commercial bank deposits. The funds withdrawn by real money investors from banks will be transferred to shadow banks in payment for securities. The shadow banks will use the proceeds to repay collateralised loans to the commercial banks. Thus the assets and liabilities of the commercial banks fall in parallel. The deleveraging of the shadow banking system is matched by deleveraging of the commercial banking system.

The problems of the shadow banks are likely to be greatly aggravated by falls in securities prices caused by the additional supply. These price falls will cause equal reductions in S and K, making it harder for shadow banks to meet collateral requirements and causing a positive feedback loop between securities prices and supply of securities.

The positive feedback loop generates a downward spiral of securities prices, which may fall to levels which look extremely cheap when valued by reference to 'fundamentals'. As prices fall, shadow banks have an increasingly powerful incentive to interrupt the positive feedback loop by increasing capital or unsecured liabilities (K or U), or by using liquid assets (reducing L), and real money investors have an increasingly powerful incentive to interrupt it buy buying securities for cash.

The deleveraging of the shadow banking system began in the summer of 2007, but it became much more intense after the Lehman failure in September 2008. The Lehman Brothers failure shocked the market by showing that a large, systemically-important broker-dealer might be allowed to fail. After that, not only did collateral margins (h) increase, but the

market trading counterparties of the remaining large broker-dealers, mainly hedge funds to which the broker-dealers provided prime brokerage services, became more anxious about their stability and became much less tolerant of unsecured exposures to them. In the terms of table 3.1, U fell sharply (and K was falling at the same time as a result of trading losses). This greatly magnified the pressure to find new sources of capital and unsecured liabilities.

3.2.2 Commercial bank balance sheets after the Lehman Brothers failure

Between 3 September and 31 December 2008, the net debt of commercial banks located in the United States to their foreign offices increased by $575 billion, of which $165 billion was accounted for by US-chartered banks and the remainder, $410 billion, by foreign-related banks. This strongly suggests that the flow of dollars to the United States reported in table 2.1 was largely or entirely concentrated in flows to banks located in the United States from their foreign affiliates. Table 3.2 shows how other items in the commercial banks' balance sheets changed over the same period.

Table 3.2

U.S. commercial banks: changes in selected balance sheet items from 3 September 2008 to end-December 2008

(US dollar billions)

	Domestically-chartered banks	**Foreign-related institutions**	**All commercial banks**
Total assets	+1,093 (+11.2%)	+225 (+17.3%)	+1,319 (+11.9%)
Cash assets	+515 (+187.6%)	+236 (+432.7%)	+751 (+228.3%)
Deposits	+653 (+11.2%)	–258 (–21.1%)	+415 (+6.0%)
'Borrowings from others'	+161	+73	+235
'Net due to related foreign offices'	+165	+410	+575
Change in ratio of cash assets to total assets (percentage points)	+ 4.5	+14.9	+ 5.7
Change in deposits with Federal Reserve Banks			+ 850

Source: Federal Reserve tables H8, H4.1.

The increase in bank assets, other than cash, is not hard to explain. Commercial banks had provided liquidity guarantees to issuers of commercial paper, particularly shadow banks issuing asset-backed commercial paper, and as the asset-backed commercial paper market dried up, the guarantees were called. The increase arising from this source appears to have outweighed the decrease that will have arisen from debt repayments by shadow banks. On the liabilities side, it seems at first sight remarkable that the deposits of US-chartered commercial banks increased at all during this turbulent period. We attribute the phenomenon to two factors. The first is the relatively generous terms of federal deposit insurance (100% of deposits up to $250,000 were insured, the limit having been temporarily increased from $100,000 in the Emergency Economic Stabilization Act of 2008, signed by President Bush on 3 October), together with the fact that the Prompt Corrective Action procedure mandated under the Federal Deposit Insurance Corporation Improvement Act of 1991 for resolving distressed banks creates confidence that bank assets will be liquidated sufficiently promptly for depositors to be repaid. The second is that there was a flight, which had begun in 2007, from other asset types which had come to be regarded as risky, such as certain kinds of

commercial paper, notably asset-backed commercial paper (ABCP), and from money market mutual funds after 16 September 2008, when the Reserve fund announced that two of its funds were worth less than 100 cents in the dollar (see Baba, McCauley and Ramaswamy 2009)[6]. This was the collapse of the shadow banking system (see Pozsar et al. 2010). The funds coming out of the commercial paper market, money market mutual funds and other markets similarly affected had to be placed somewhere, and Treasury securities were in fixed supply. Investors who did not roll over their holdings of commercial paper on maturity left the money in the bank. There was nowhere else for them to go, except perhaps to banknotes or real assets, and the outlook for bank deposits was not bad enough for that (though the price of gold rose very sharply). The increase in bank deposits caused by the flight from money market mutual funds and the shadow banking system appears to have outweighed the reduction arising from purchases of securities by real money investors from shadow banks.

Thus the contraction of the shadow banking system led to changes in bank balance sheets but it did not in itself have any effect on aggregate commercial bank liquidity. The acquisition of additional assets by commercial banks as the shadow banking system contracted did not affect their aggregate cash flow, because the contraction of the shadow banking system also provided them with additional deposit funding; in other words it involved no pressure at all on the liquidity of the banking system in aggregate. The enforced deleveraging of some shadow banks will have led to a fall in the bank deposits of real-money investors, as described in section 3.2.1 above, but the funds withdrawn by real money investors will have been used by the shadow banks to repay commercial bank loans, so that the effect on the commercial banks' aggregate cash flow will again have been zero. Individual banks, however, cannot have been sure that the amounts of money that they had to find to finance additional assets on their balance sheets would all come back to them in additional deposits, or that lost deposits would all come back to them in the form of loan repayments. In the turmoil, they must have become much more uncertain about their future cash flows. The increase of $751 billion in cash assets recorded in table 3.2 can therefore be interpreted as additional precautionary demand for liquid assets.

3.2.3 Secured funding and the liquidity management of large broker-dealers

The failure of Lehman Brothers shocked the market because it had been widely thought that no systemically important financial institution would be allowed to fail. After Lehman Brothers had failed, market participants did not know how large were other financial companies' exposures to Lehman, eg through outstanding over-the-counter transactions, and they became much more anxious about credit exposures to their own trading counterparties. They became much less tolerant of unsecured exposures and demanded additional amounts of collateral against existing exposures, eg on repos or derivative positions. Gorton and Metrick (2009) provide data obtained from dealers showing how 'haircuts', ie margins of surplus collateral demanded from sellers of repo in bilateral transactions (ie borrowers of cash under bilateral repurchase agreements) increased very sharply, especially after Lehman Brothers failed. The IMF (2010) reports these data in fuller form. Copeland, Martin and Walker (2010) report that in the tri-party repo market, haircuts did not increase much, and suggest reasons for the difference in behaviour between the bilateral and tri-party markets. They comment that some lenders of cash in the tri-party repo market were mainly concerned in their risk management about the identity and credit standing of the counterparty, while others were

[6] Of course, some of the sales of ABCP were made by money market mutual funds that had experienced heavy redemptions.

mainly concerned about the nature of the collateral.[7] This suggests that haircuts would have depended not only on the nature of the collateral offered but also on who was offering it, ie on the credit standing of the counterparty. They also suggest that some of the lenders in the bilateral repo market were prime brokers lending cash to their hedge fund clients, who may have had no other source of funds. Some of the prime brokers will have been broker-dealers which were themselves experiencing large outflows of liquidity, and they may have increased the collateral margins they demanded from their clients in order to ease their own liquidity situations. Whatever the attitude of the lenders of cash in the tri-party repo market, the FCIC (2011, page 361) say that, after Lehman Brothers failed, the two clearing banks in the tri-party market became concerned about their intra-day exposures to broker-dealers and demanded more collateral.

Whatever pressures the tri-party repo market put on the broker-dealers, of which by far the largest were Goldman Sachs and Morgan Stanley, the failure of Lehman Brothers affected them profoundly, as it cast doubt on their ability to survive[8]. The fortunes of Goldman Sachs and Morgan Stanley in the immediate post-Lehman period are vividly related in the report of the United States Financial Crisis Inquiry Commission (FCIC 2011, chapter 20).

An impression of the nature and scale of the resulting collateral squeeze on broker-dealers can be obtained from the 10-K and 10-Q reports that Morgan Stanley submitted to the Securities Exchange Commission. A condensed version of Morgan Stanley's balance sheet, as at its 10-K and 10-Q reporting dates, is shown in table 3.3. Between September and November 2008, the period in which Lehman Brothers failed, Morgan Stanley experienced a massive withdrawal of unsecured funding. The main element in this was an outflow of $203 billion on account of 'payables', which we surmise included reductions in collateral provided by trading counterparties to Morgan Stanley, and notably by the hedge funds to which Morgan Stanley provided prime brokerage services[9]. Prime brokerage clients also exercised their contractual rights to borrow from Morgan Stanley. The FCIC reports that cash and securities withdrawn from non-bank prime brokers was transferred to prime brokers which were in bank holding companies, and to custodian banks (see FCIC, page 360).

Of course, Morgan Stanley, like any prudent financial company, had liquidity reserves which it could draw on in an emergency. It maintained a Contingency Funding Plan (CFP), which it described as follows in its 10-Q report for end-August 2008 (page 93):

> The Company's CFP model is designed to be dynamic and scenarios incorporate a wide range of potential cash outflows during a liquidity stress event, including, but not limited to, the following: (i) repayment of all unsecured debt maturing within one year and no incremental unsecured debt issuance; (ii) maturity roll-off of outstanding letters of credit with no further issuance and replacement with cash collateral; (iii) return of unsecured securities borrowed and any cash raised against these securities; (iv) additional collateral that would be required by counterparties in the event of a two-notch long-term credit ratings downgrade; (v) higher

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[7] Copeland, Martin and Walker (2010) suggest that lenders in the tri-party repo market therefore adjusted quantities, rather than haircuts: "This unresponsiveness of haircuts could reflect cash investors' strategy of considering counterparty risk first and collateral risk second. Hence, rather than raise haircuts, cash investors may have simply refused to lend to Lehman Brothers".

[8] Both companies became bank holding companies on 23rd September 2008, which enabled them to improve their access to Federal Reserve financing and thereby improve their market credibility.

[9] Singh and Aitken (2009) suggest that the withdrawals by hedge funds were motivated by fears of rehypothecation, that is, the fear that their assets would be pledged by the prime broker as collateral for the prime broker's own borrowing, and that they would be hard or impossible to disentangle if the prime broker became insolvent.

haircuts on or lower availability of secured funding; (vi) client cash withdrawals; (vii) drawdowns on unfunded commitments provided to third parties; and (viii) discretionary unsecured debt buybacks.

It held liquidity reserves, which it described as follows (end-August 10-Q report, page 93):

> These liquidity reserves are held in the form of cash deposits with banks and pools of unencumbered securities. The parent company liquidity reserve is managed globally and consists of overnight cash deposits and unencumbered U.S. and European government bonds and other high-quality collateral. All of the unencumbered securities are central bank eligible.

Table 3.3

Condensed balance sheet of Morgan Stanley, 2008

(US dollar billions)

	End–Nov 2007	End–May 2008	End–Aug 2008	29 Sept 2008[1]	End–Nov 2008	End–Dec 2008
Assets						
Liquidity reserves	118	169	179	55[2]	130	147
Other assets	927	862	808		529	530
(of which pledged to Fed as collateral for PDCF and TSLF loans)		*20*	*8*	*225*	*36*	*15*
Total assets	1,045	1,031	987		659	677
Liabilities						
Capital	31	34	36		52	49
Deposits and uncollateralised securitized liabilities	256	270	253		217	241
Payables	216	304	325		121	129
Other liabilities, including collateralised borrowing	542	423	373		270	258
Total liabilities	1,045	1,031	987		659	677
(Borrowings from PDCF and TSLF)		*3*	*2*	*100*	*20*	*11*

Notes: [1] Date of peak usage of the PDCF and TSLF; see text for more details; [2] End of September. Source FCIC (2011), page 363.

Sources: 10-K and 10-Q reports, information released by Federal Reserve about use of credit and liquidity facilities (see http://www.federalreserve.gov/newsevents/reform_transaction.htm).

In the same report (page 93), Morgan Stanley disclosed that

> During the month of September 2008, the credit markets experienced significant disruption. In response to the market disruption, the Company

> implemented certain CFP actions to further support its liquidity position. These actions included, but were not limited to: (i) hypothecation of previously unencumbered collateral; (ii) selective reduction in certain funding and balance sheet intensive businesses; (iii) selective asset reduction through sales; and (iv) pledging collateral to federal government-sponsored lending programs. The Company's total liquidity reserve levels subsequent to August 31, 2008 declined, but remain at levels well in excess of those observed on average for 2007.

Morgan Stanley's total unsecured funding fell by $239 billion in September - November 2008. The company drew down $49 billion of liquid assets, so that its liquid assets met about a fifth of the loss of unsecured funding. The company reduced its other assets by $279 billion, or 35%, in the three months, so that its total assets decreased by $328 billion[10]. It also raised new capital from investors. The company used its liquid assets to buy time, while making large reductions in total assets. The reduction in total assets in September - November was about 1 ½ times the reduction in capital and unsecured borrowing – much less than the maximum multipliers indicated by the analysis in section 3.2.1. This suggests that Morgan Stanley had surplus collateral at the beginning of the crisis, in addition to its liquidity reserve, which it was able to deploy with the help of the facilities provided by the Fed.

Table 3.4

Morgan Stanley's identified net collateral position

($ billion)

End of	May 2008	Aug 2008	29 September 2008[(1)]	Nov 2008	Dec 2008	Mar 2009
Collateral received	424	421		192	211	213
Collateral pledged	183	157		117	107	89
of which pledged to Fed (PDCF and TSLF)	*20*	*8*	*225*	*36*	*15*	*0*
Net collateral position	+241	+264		+75	+104	+124

Notes: The data are calculated from the published data as follows: Collateral received equals securities purchased under agreements to resell plus securities borrowed; Collateral pledged equals securities sold under agreements to repurchase plus securities lent; [(1)] Date of peak usage of PDCF and TSLF.

Source: 10-K and 10-Q reports, information released by Federal Reserve about use of credit and liquidity facilities (see http://www.federalreserve.gov/newsevents/reform_transaction.htm).

Despite the use of liquidity reserves by Morgan Stanley and, no doubt, other firms, the drying-up of unsecured funding, combined with increasing collateral demands from trading counterparties, led to a collateral squeeze[11]. Information from the 10-K and 10-Q reports

[10] The reported decreases in asset holdings in September - November will include the effects of falls in the prices of assets held at the end of August, as well as of transactions during the three months.

[11] American International Group (AIG) was also subject to additional collateral demands in the summer of 2008. AIG was not able to meet the additional demands and was rescued on 16th September by a loan from the Federal Reserve Bank of New York. The 10-Q report submitted to the SEC by AIG in November 2008 contains an interesting account of how collateral demands put pressure on the company's liquidity, and how the company's attempts to find a market solution to the problems failed (see AIG 2008, pages 49 - 51).

about the Morgan Stanley's collateral position is summarised in table 3.4. These data show the balance of the firm's identified collateralised financing transactions. They show that up to the end of August 2008, before Lehman Brothers failed, the firm held a large surplus of collateral received over collateral provided in repo and securities lending transactions[12]. At the end of August 2008, the surplus was $264 billion. After the Lehman Brothers failure the surplus fell heavily and it was down by $189 billion to $75 billion at the end of November 2008.

The large array of emergency financial support facilities supplied by the Federal Reserve provided considerable relief, even to broker dealers. The facilities that were most relevant to the collateral squeeze were:

a. The Primary Dealer Credit Facility (PDCF), which was an overnight loan facility for primary dealers in U.S. government securities, intended to support the tri-party repo market at a time when it was under severe strain, so that broker-dealers were experiencing difficulties in financing their securities inventories. PDCF credit extended by the Federal Reserve was fully collateralized. Initially, eligible collateral was restricted to investment grade securities. In September 2008, the set of eligible collateral was expanded to match closely all of the types of instruments that could be pledged in the tri-party repurchase agreement systems of the two major clearing banks. The total amount borrowed through the PDCF peaked at $155.8 billion on 29th September 2008.

b. The Term Securities Lending Facility (TSLF) was established in March 2008 as a means of addressing the pressures faced by primary dealers in their access to term funding and collateral. Primary dealers often obtain funding by pledging securities as collateral. When the markets for the collateral became illiquid, primary dealers had increased difficulty obtaining funding. Under this program, the Federal Reserve loaned relatively liquid Treasury securities for a fee to primary dealers for one month in exchange for eligible collateral consisting of other, less liquid securities. Loans were allocated through auctions. For "Schedule 1" auctions, the eligible collateral comprised Treasury securities, agency securities, and agency mortgage-backed securities. For "Schedule 2" auctions, the eligible collateral included Schedule 1 collateral plus highly rated securities. The TSLF enabled broker-dealers to convert low-quality collateral into high-quality collateral, which they could repo for cash. The total value of Treasury securities borrowed under the TSLF peaked at $270.0 billion from 26th September to 1st October 2008.

c. The commercial paper funding facility (CPFF). Under the program, the Federal Reserve Bank of New York provided three-month loans to the CPFF LLC, a specially created limited liability company (LLC) that used the funds to purchase commercial paper directly from eligible issuers. The commercial paper that was eligible for purchase was highly rated, U.S. dollar-denominated, unsecured and asset-backed commercial paper with a three-month maturity. To manage its risk, the Federal Reserve required issuers whose commercial paper was purchased by the CPFF LLC to pay fees to use the facility. The CPFF was used by broker dealers, among other firms, and provided them with extremely valuable access to unsecured funds.

[12] They do not show the balance of collateral received and collateral provided on secured lending transactions; the 10-Q reports disclose collateral provided but not collateral received.

Morgan Stanley borrowed from all these facilities. Its borrowings from the PDCF and TSLF taken together peaked at $100.5 billion on 29th September[13]. By the end of November, the date of its 10-Q reports, these borrowings had fallen to $20.1 billion. The fact that the firm used these facilities in large amounts suggests that it was unable to finance their securities inventories in the market; in other words that it did not have sufficient unencumbered assets which, in the prevailing environment, were perceived to be of sufficiently high quality that they could be used to secure market borrowing. And the fact that the firm's use of the facilities had fallen by four fifths between 29th September and 30th November suggests that the liquidity pressures on the firm had eased considerably by the time of its end-November 10-Q report. In addition to its use of the PDCF and TSLF, Morgan Stanley also borrowed from the Fed by issuing commercial paper which the Fed purchased under the CPFF; the amount outstanding peaked at $ 4.3 billion from 4th December 2008 to 25th January 2009.

3.2.4 Central bank reserve management

In the middle of 2008, global foreign exchange reserves were $ 7.4 trillion. They were, and are, generally managed by central banks separately from domestic market operations. Typically, the pursuit of returns by central banks is subject to a low tolerance for the risk of losses and lack of liquidity. In this respect, the operations of central banks are very similar to those of many commercial asset managers with conservative investment mandates. However, quite extensive information is available about the reserve management behaviour of central banks, thanks to the data released under the IMF Special Data Dissemination Standard, to the BIS international banking statistics and to US sources.

Pihlmann and van der Hoorn (2009) show that, after a period in which they appeared willing to take increasing amounts of risk in pursuit of additional returns, reserve managers withdrew $150 billion of unsecured deposits from banks between August 2007 and August 2008 (before Lehman Brothers failed), and a further $150 billion between September and December 2008 (of course, not all of the deposit withdrawals will have been from banks in the United States). McCauley and Rigaudy (2011) show that central banks also retreated from US federal agency debentures and securities lending, and describe how they redeployed the funds withdrawn from commercial banks, eg in government debt.

On plausible assumptions, the unsecured deposits that central bank reserve managers withdrew from commercial banks will have been replaced by collateralised loans extended to the commercial banks concerned by their home central banks. Thus the net effect of the withdrawal of unsecured deposits will have been a drain of collateral assets from commercial banks to central banks.

On the other hand, central banks in 2008, with no gold standard constraint, could liquefy illiquid assets in their own jurisdictions on a much greater scale than in 1931 (see Moessner and Allen 2011). In addition, inter-central bank co-operation worked far better: the provision of large-scale swap lines by the Federal Reserve relieved many of the financial stresses in countries outside the United States that had followed Lehman Brothers' failure.

3.2.5 The collateral squeeze and the inflow of funds from abroad

What was happening in financial markets after Lehman Brothers failed? Market makers in financial assets were being required to find additional collateral to secure their financing, while, in the bilateral repo market at least, the required margins of surplus collateral

[13] The amounts quoted include borrowings from the Fed by the London office of Morgan Stanley. The collateral pledged by Morgan Stanley on 29th September was valued at $224.5 billion.

increased and it became impossible to use some assets as collateral for loans[14]. As section 3.2.1 shows, selling assets was a necessary reaction, but an asset sale generates cash at the expense of an asset which might otherwise have been usable as collateral. Likewise secured borrowing involves exchanging an asset for cash. The PDCF and TSLF enabled broker-dealers to exchange assets that were no longer usable as collateral in the market for cash (or Treasury securities that were exchangeable for cash).

In a collateral squeeze, unsecured borrowing (or drawing down of unsecured deposits) however is especially valuable, since it generates cash without any immediate loss of collateral. Unsecured borrowing was difficult during the 2008 crisis, except for financial companies which had foreign affiliates which they could induce to place funds with them in the form of new deposits or loans, or to repay existing debts owed to the US operation, as part of intra-group funds transfers. Against this background, the increase of $575 billion in commercial banks' 'net debt to foreign offices' between 3 September and 31 December 2008 shown in table 3.2 is understandable. Foreign bank affiliates (branches and agencies of foreign banks) in the United States were under greater pressure than US-domiciled banks. They had lost much of the funding they had previously received from money market mutual funds[15]. Foreign bank branches (the most common type of foreign banking institution operating in the United States) were not allowed to take deposits of less than $100,000 from U.S. citizens and residents, and were thus disqualified from receiving some of the funds that were fleeing from money market mutual funds. Moreover, deposits in foreign bank branches established after 19th December 1991 were not covered by U.S. deposit insurance. Foreign bank affiliates' deposits fell by $258 billion between 3rd September and 31st December 2008. Their 'borrowings from others' – presumably mainly from the Fed – increased by $73 billion[16], and they raised $410 billion from their foreign offices, compared with the $165 billion that U.S. – chartered banks raised from their foreign offices during the same period (see table 3.2).

In fact, most of the external inflow to the United States took place in October and November. Commercial banks' net debt to foreign offices increased by just $74 billion between 3rd September and 1st October, but it had increased by a further $457 billion by 3rd December. The inflow was facilitated by swap lines provided by the Fed to foreign central banks, which enabled the foreign offices of commercial banks located in the United States to remit dollar funds to the United States[17]. It seems therefore that the inflow of funds from abroad played a large role in easing the collateral squeeze in US financial markets during October and November, and in financing the large repayments of borrowings from the PDCF.

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[14] See Gorton and Metrick (2009), IMF (2010).

[15] The run on money market mutual funds and its effect on foreign banks in the US are documented by Baba, McCauley and Ramaswamy (2009). Fender and Gyntelberg (2008, p9) estimate that investors withdrew $184 billion from money market mutual funds between 10th and 24th September 2008. Another indication of the scale of the run is that drawings on the facility set up by the Fed to finance purchases of commercial paper from MMMFs, which began operations on 22nd September 2008, reached $150.7 billion on 2nd October.

[16] Why did foreign banks not borrow more from the Fed? Perhaps they were concerned about being stigmatised as weak banks if the fact of their large borrowing became public; perhaps in some cases they did not have the right kind of collateral; perhaps raising funds from foreign affiliates was perceived as less costly than borrowing from the Fed, though the last seems unlikely in the light of the disruption that the withdrawal of dollar funds caused in foreign money markets.

[17] See Allen and Moessner (2010). See also CGFS (2010a) on cross-border funding pressures and proposed measures to address them, and CGFS (2010b). The more complex determinants of liquidity risk in many currencies are discussed in Domanski and Turner (2011), pages 4-10.

3.3 Unwinding of carry trades

Carry trades are operations which involve borrowing in a currency in which interest rates are relatively low in order to finance the purchase of assets denominated in a currency in which interest rates are higher. The carry trader earns the difference between the interest (or other) returns on the purchased asset and the interest due on the borrowing. Foreign exchange risk is inherent in carry trading and the carry trader will gain if the currency of borrowing depreciates relative to the currency of investment, and lose if the opposite is the case. The risk can be mitigated by hedging – eg purchasing out of the money options to buy the currency of borrowing in exchange for the currency of investment - but the cost of hedging normally reduces the profitability of the trade.

The long period after 1997 when interest rates were kept very low in Japan in order to help stimulate the economy provided ample opportunity for carry traders to borrow yen very cheaply and invest in high-yielding currencies. The total amount of yen carry trades has been estimated at around $1 trillion[18].

The attractiveness of yen carry trades diminished with the onset of the financial crisis. The Bank of Japan commented that

> as volatility in the FX markets rose rapidly in summer 2007 and investors' risk-averse behavior became evident, they rushed to unwind their yen-carry positions and higher-yielding currencies consequently depreciated rapidly.[19]

Moreover, the large reductions in short-term interest rates outside Japan in the second half of 2008 will have reduced the expected return from yen carry trades.

Japanese banks' net external yen-denominated assets continued to increase in the second half of 2007 and the first half of 2008, but there was a large flow of yen-denominated funds into Japanese banks in the second half of 2008 (see table 3.5), which is most naturally interpreted as a reversal of yen carry trades.

The unwinding of yen carry trades was reflected mainly in a fall in the assets and liabilities of foreign banks located in Japan; domestically-owned banks were barely affected. Table 3.5 illustrates this. The contraction of foreign banks in Japan was consistent with the general post-crisis tendency for banks to concentrate their activities on their domestic markets and to make cuts disproportionately in their international activities; conceivably, the fall in the assets of foreign banks in Japan was partly supply-driven. The dollar equivalent of the fall in the banks' net external assets between September 2008 and the end of 2009 was about $185 billion, which suggests that only a moderate proportion of the total of outstanding carry trades was reversed.

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[18] See Cecchetti, Fender and McGuire (2010).

[19] See Bank of Japan (2009), page 65.

Table 3.5

Selected assets and liabilities of banks located in Japan

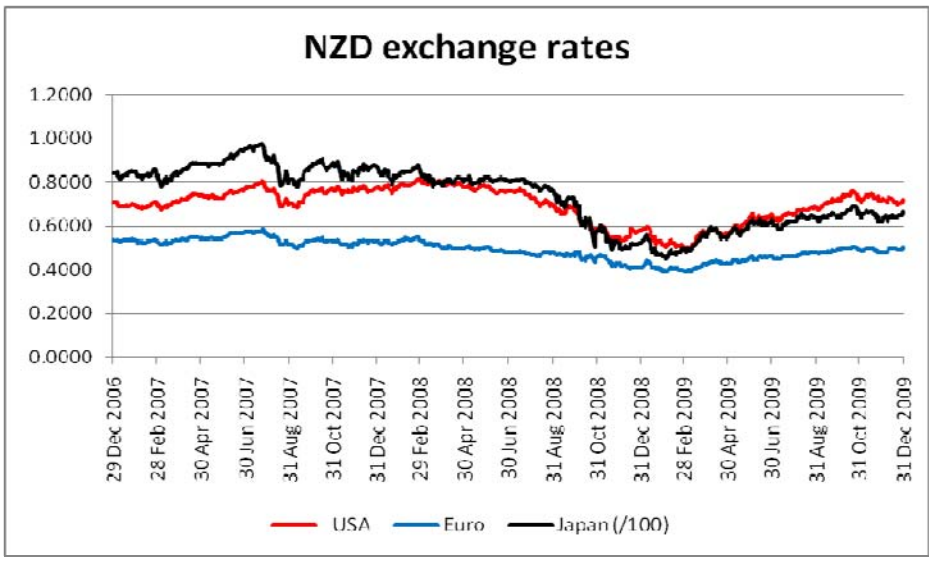
Changes from end-July 2008 to end-December 2009 (JPY billion)

	Domestically-licensed banks	Foreign banks	All banks
Total assets	+ 21,262 (+2.7%)	– 16,642 (–34.3%)	+ 4,620 (+0.6%)
Net external yen-denominated assets			– 18,918

Source: Bank of Japan.

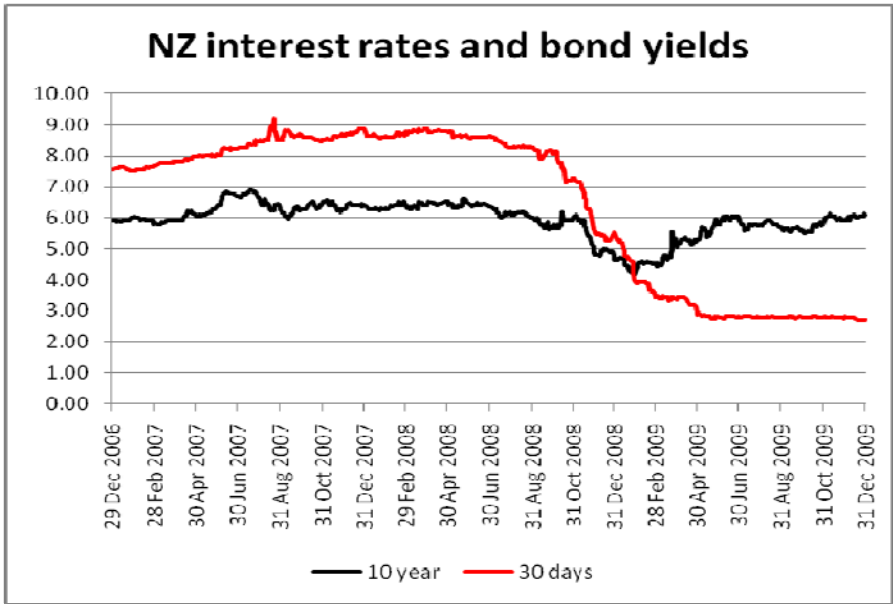
There is evidence of the effects of the unwinding of yen carry trades on the countries in which the proceeds were invested. New Zealand is a case in point. Graph 3.3 shows how the New Zealand dollar depreciated sharply after Lehman Brothers failed, and graph 3.4 shows how 10-year New Zealand dollar bond yields remained little changed, after a brief dip, despite short-term interest rates falling from around 9% to around 3%. The New Zealand balance of payments data record a fall of NZ$ 14.3 billion, or 17.6%, in foreign holdings of New Zealand debt securities in the second half of 2008, and New Zealand's current account balance of payments deficit narrowed from 8.7% of GDP in 2008 to 2.9% in 2009.

Graph 3.3



Source: Reserve Bank of New Zealand.

Graph 3.4

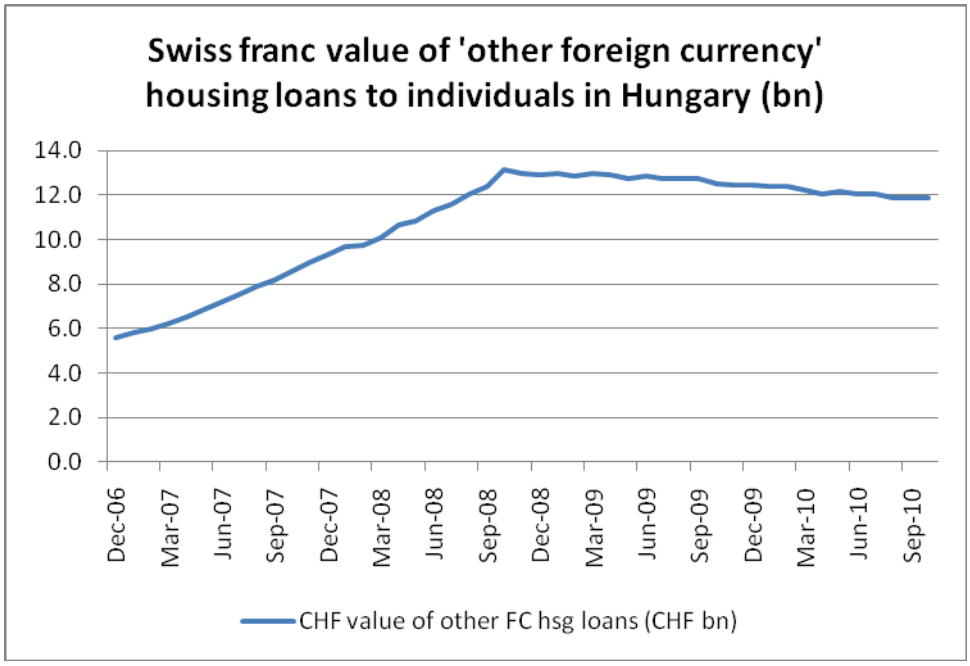


Source: Reserve Bank of New Zealand.

Carry trades were also undertaken on a large scale in Swiss francs, notably in Hungary and Poland where Swiss franc-denominated mortgages became very popular. In Hungary, in the middle of 2008, 51.3% of mortgages extended to individuals were denominated in foreign currencies, with hardly any denominated in euros; while in Poland, at the same time, 58.1% of housing loans were denominated in foreign currencies. The Hungarian and Polish statistics do not separately identify mortgages denominated in Swiss francs from mortgages denominated in other foreign currencies, but it seems reasonable as an approximation to assume that all foreign currency mortgages were denominated in Swiss francs (except, in Hungary, for the small quantity of mortgages which the statistics identify as euro-denominated). Graphs 3.5 and 3.6 show that, in Hungary, the Swiss franc value of non-euro foreign currency mortgages began to fall after October 2008, while in Poland, the growth rate of the Swiss franc value of foreign currency mortgages fell abruptly. The banks that made these mortgage loans had financed them mainly with short-term wholesale market borrowing and when they were unable to roll over the borrowings they were forced to swap their domestic currencies, or sell them outright, for Swiss francs. The pressures thus created led to the drying up of FX swap markets and the Hungarian and Polish currencies depreciated sharply in the spot foreign exchange market. The pressures were to some extent relieved when the Swiss National Bank provided facilities for the central banks of Hungary and Poland to swap euros from their reserves for Swiss francs[20].

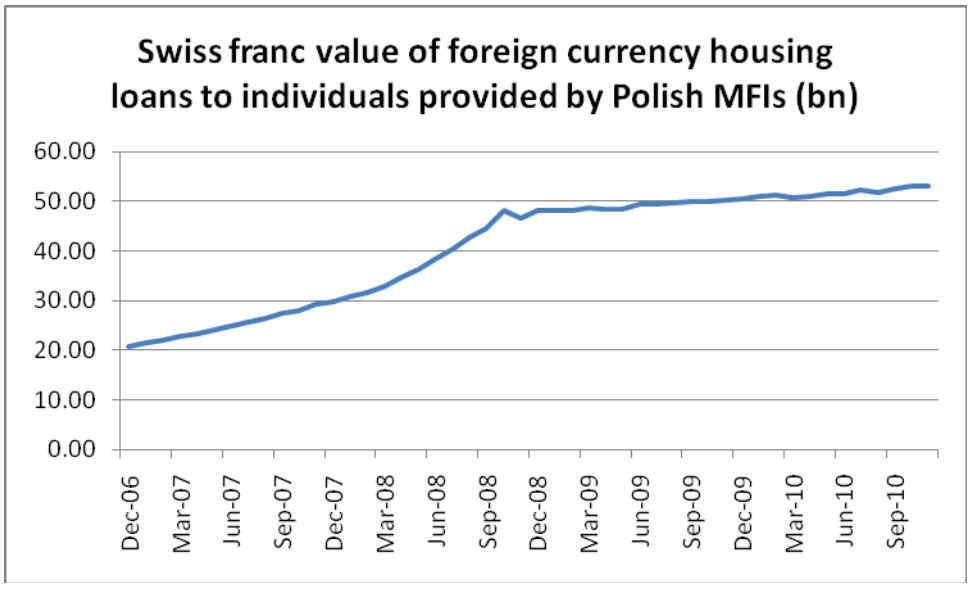
[20] See Allen and Moessner (2010), section 11.

Graph 3.5



Sources: National Bank of Hungary, authors' calculations.

Graph 3.6

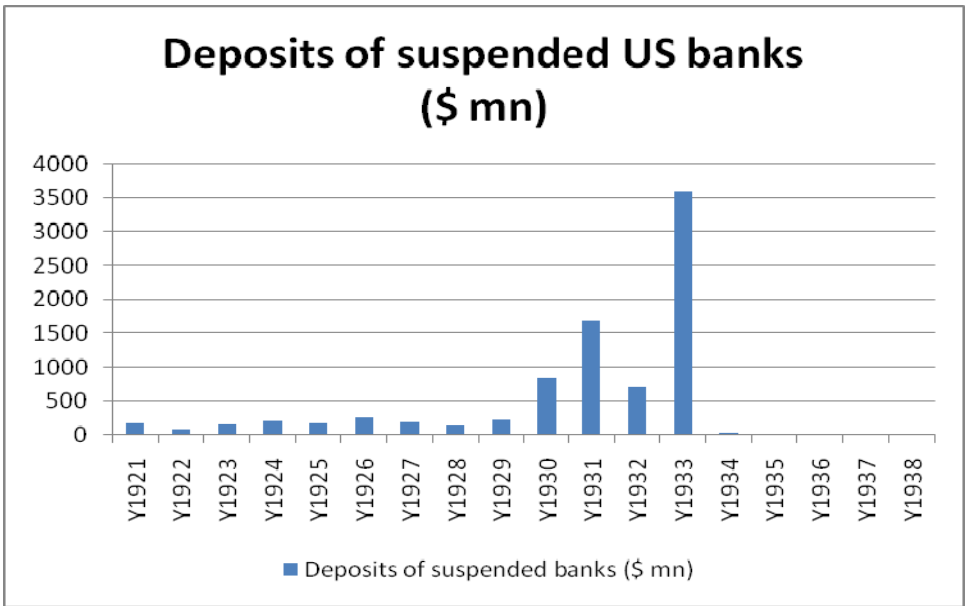


Sources: National Bank of Poland, authors' calculations.

4. The propagation of the 1931 crisis.

In this section, we discuss the propagation of the 1931 crisis, for purposes of comparison with 2008. The macro-economic background to the crisis was dismal. World industrial production had peaked in June 1929, and the Wall Street crash that began in October was accompanied by large falls in equity prices all over the world[21]. Bank failures had already begun to increase before 1931. For example, in the United States, bank failures became much more serious in 1930 (see graph 4.1 and Calomiris 2009, 2010).

Graph 4.1



4.1 International flows of funds in 1931

During the spring and summer of 1931, there was an epidemic of severe banking or exchange rate crises in Europe, and some European countries suffered heavy outflows of gold from their reserves while trying vainly to support their banking systems and remain faithful to the gold standard simultaneously. It is now conventional wisdom that the disastrous events of 1931 were crucial in turning the recession following the stock market crash of 1929 into the Great Depression of the 1930s[22].

The banking crisis began in May 1931 with the disclosure of disastrous losses at Creditanstalt in Vienna[23]. The ensuing crisis in Austria was followed immediately by a crisis in Hungary and shortly afterwards by one in Germany. Pressures on sterling, which had been chronic ever since the UK had returned to the gold standard in 1925, became acute during the summer of 1931 and the UK left the gold standard in September.

It is not obvious why the crisis was propagated from Austria to Germany. James (1992) comments that 'in the most famous case, the Austrian crisis around the Creditanstalt in May

[21] See Almunia, Bénétrix, Eichengreen, O'Rourke and Rua (2009).

[22] See eg Friedman and Schwartz (1963), Bernanke and James (1991), Ahamed (2009), Ritschl (2009).

[23] Williams (1963) denotes the period that began in May 1931 as the 'final phase' of the crisis and describes how the crisis developed until then. For an account of the Austrian crisis, see Cottrell (1995).

1931 is supposed to have provoked the German bank collapse of June-July, although the extent of German financial involvement in Austria was very limited, and it would be impossible to argue that the Austrian developments directly weakened German institutions.'[24] James suggests that the key issue in the early 1930s was market anxiety about budget deficits, which were thought to threaten a likely departure from gold. Eichengreen (1995) thinks that 'lacking timely information on the state of German finances, investors took the Austrian crisis as a warning.'[25] We do not wish to take issue with either of them.

The banking crises in central Europe added decisively to the pressure on sterling in 1931. For one thing, London was the world's main international financial centre, and people and companies needing liquidity on account of the crises in central Europe would naturally have drawn it from London. In particular, London merchant banks had provided extensive acceptance credits to central European borrowers, especially in Germany[26]. After the crises, the borrowers could not pay the bills on time, and the acceptors were therefore liable to the holders of the bills. Standstill agreements were reached under which the creditors agreed not to call in the debts, and the existing credits were frozen on their original terms but interest payments were guaranteed[27]. The German agreement provided that there was to be no discrimination among the creditors, but that the German authorities would discriminate in favour of remittances due under the agreement[28]. German debtors were required to provide eligible bills for acceptance. As Roberts (1995, p. 164) aptly says, 'Under this agreement German bills remained in the [London] market and were repeatedly renewed on expiry, the sort of practice which had hitherto caused apoplexy in the Discount Office [of the Bank of England].'

The central European crisis and the standstill agreements put great strain on the liquidity of the London accepting houses, since they were responsible for the prompt payment of the debts which the central European debtors could not meet. The Bank of England's position was that standstill bills, once renewed, would not be eligible for rediscount, and that no loans would be made to accepting houses with large frozen positions (see Sayers 1976 p 505), though the Bank encouraged the clearing banks to provide support to the accepting houses[29]. The Bank's attitude is not surprising, since the total debts in London covered by the standstill agreement were £66 million, compared to the Bank of England's gold reserves of £132 million at the end of July 1931. Nevertheless, Sayers also reports that 'the Bank [of England] leaned over backwards to ensure marketability' of standstill bills, and that 'in the first half of 1932 nearly half the bills discounted at the Bank [of England] were of German origin'[30]. These bills will presumably have been bought by the Bank on its own initiative in normal open-market operations, rather than at the initiative of the holders. It is impossible to trace through time the amounts of such bills that the Bank purchased.[31] But whatever these

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[24] Page 596.

[25] Page 271.

[26] Readers unfamiliar with acceptance credits are recommended to consult the account in Accominotti (2009, section 2).

[27] See Forbes (1987, p 575).

[28] See Sayers (1976, pp 506 – 507).

[29] See Diaper (1986 p 69) and Roberts (1992 pp 252 – 253). It appears that the Bank of England did in the event provide financial support to certain accepting houses: see Sayers (1976, p 531). The position that the Bank took in 1931 was very different from the one it took in comparable circumstances in 1914: see Sayers (1976, p 77-78).

[30] Sayers (1976, p 509 footnote 1).

[31] Changes in the 'other securities' recorded in the Bank of England's weekly return are not a reliable guide, since they were the net result of several influences, not just liquidity provision to a particular group of banks.

amounts may have been, the residual liquidity problems of the merchant banks represented a kind of contingent liability of the Bank of England, and the adequacy of the Bank's own liquidity was in any case already a source of serious doubt about the sustainability of sterling's gold parity[32]. The central European banking crisis seriously aggravated the existing lack of liquidity of the London money market.

The alternative to the standstill agreements would have been a default by the debtors, which 'threatened to bankrupt several of the merchant banks, probably some of the discount houses, and possibly to provoke a crisis in the banking system' (Roberts 1992 p 253). The artificial maintenance of the fiction that standstill bills were high-quality liquid assets in London was the price of avoiding that outcome. Complete bank-by-bank information about exposures to standstill bills is not yet publicly available, though Diaper (1986, p 68) says that Kleinworts and Schroders were particularly hard hit[33]. Using such bank-by-bank data as are publicly available, Accominotti (2009) shows that the banks which were most exposed to standstill bills also experienced large deposit outflows during 1931, and thus faced a double threat to their liquidity. Nearly all of the accepting houses' deposits were of foreign origin, according to Truptil (1936, p 314), and it is possible that those banks whose acceptances were largely central European also had a high proportion of central European deposits, which would naturally have been withdrawn during the crisis to meet the depositors' liquidity needs. Kleinworts and Schroders both survived the crisis, but at great cost to their partners, as Diaper (1986) and Roberts (1992) relate.

The British clearing banks, of course, had much larger liquid liabilities than the accepting houses[34], but the vast majority of their liabilities were presumably of domestic origin and not very vulnerable to flight. Their demand and time deposits fell by £58 million between June and October 1931, but as Billings and Capie (2010) recount, they were able to withstand the shocks of 1931 without any special support, and to provide support themselves to accepting houses and other banks in distress[35]. We agree with Billings and Capie that there was no financial crisis in Britain in 1931[36]. In our judgment that can be attributed to the fact that the ability and willingness of the monetary authorities to defend the gold parity fell far short of the liquid assets of the clearing banks. According to the British Government statement issued on 20th September 1931, when the gold standard was suspended, 'since the end of July funds amounting to more than £200 millions have been withdrawn from the London market'[37]. The cash and liquid assets of the London clearing banks amounted to £586 million in June 1931, however[38].

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[32] The Macmillan report, published on 13th July, had disclosed that the UK's short-term external liabilities were much larger than its short-term external assets. Its estimate of short-term external liabilities as at 31st March 1931 was £407 million in deposits, bills and advances, plus £153 million in acceptances (Committee on Finance and Industry Report 1931, appendix I table 11). This estimate has now been superseded (it was too low). The Bank of England's gold reserves averaged £142 million in March 1931 (appendix II).

[33] Bank-by-bank information exists in the Bank of England's archives, but it is subject to a 100-year delay before disclosure (the delay is longer than the usual 30 years because the information relates to the affairs of private parties). Therefore it will be available in the year 2031.

[34] Demand and time deposits in the ten London clearing banks were £950 million and £792 million, respectively, in June 1931. Source: Board of Governors of the Federal Reserve System (1976, section 15, table 168).

[35] See Billings and Capie (2010, table1) for details.

[36] For the definition of financial instability on which this judgment is based, see Allen and Wood (2006).

[37] See Sayers (1976) appendix 23.

[38] Source: Board of Governors of the Federal Reserve System (1976, table 168). The figure of £586 million includes cash reserves, money at call and short notice, and bills discounted.

Table 4.1

Changes in gold and foreign exchange reserves in 1931

Country	Change in gold reserves (valued in US$ millions at 1931 parity).	Change in foreign exchange reserves (valued in US $ millions)	Total change in gold and foreign exchange reserves ($ millions)
Canada	–50	+4	–46
USA	–174[(1)]	0	–174
Argentina	–159	0	–159
India	+34	–5	+29
Japan	–178	0	–178
USSR	+79		+79
Germany	–293	–211	–504
Austria	–3	–93	–96
Hungary	–11	–8	–19
Belgium	+163	–135	+28
Spain	–37	+2	–35
France	+584	–184	+400
Netherlands	+186	–65	+121
UK	–132	0	–132
Switzerland	+315	–65	+250
Total (incl other countries)	+340		

Note: Countries which experienced a change of $30 million or more in their gold reserves are included in the table, along with certain countries which experienced banking crises. [(1)] Includes holdings of US Treasury as well as Federal Reserve.

Source: League of Nations Statistical Yearbook 1936 – 37, available at http://www.library.northwestern.edu/govinfo/collections/league/

As a result of the turmoil in financial markets, there were large international flows of gold and foreign exchange in 1931 (see table 4.1). Total gold reserves actually rose somewhat, but they were redistributed among countries and some countries lost large amounts of gold. The redistribution occurred as the natural consequence under the gold standard of international flows of funds, which in the turbulent conditions of 1931 were dominated by financial flows rather than current account flows. As table 4.1 shows, there were large inflows of gold into France, Switzerland and the Netherlands, and outflows from Germany, Japan, the USA, Argentina and the UK[39].

The central banks of Belgium, the Netherlands, Switzerland and above all France experienced heavy inflows of gold during 1931. In Belgium, this seems to have reflected

[39] The data in table 2.1 are from the League of Nations Statistical Yearbook 1936 -37. They are not in all cases consistent with the data in section 2.2, which are mainly from national sources. We have not explained all the differences, but they are not large enough to affect our interpretation of the data.

mainly sales of foreign exchange reserves for gold; the net change in foreign exchange and gold reserves was only $28 million. The inflows into France, the Netherlands and Switzerland totalled $771 million (increase in gold reserves net of reduction in foreign exchange reserves).

There were heavy outflows of gold and foreign exchange from Germany, Austria and Hungary, where there were banking crises, and from the UK, where a banking crisis was avoided, but probably only because the country left the gold standard (in September 1931) rather than face the prospect of continued liquidity outflows and their deflationary consequences for the economy[40]. The scale of these countries' financial problems was larger than the figures in table 4.1 suggest, because they all received official loans which partly offset their gold and foreign exchange losses. The United States also lost gold, as table 4.1 shows, but this was entirely the result of official loans from the gold-rich United States to countries in distress, which increased by $306 million during 1931 (authors' calculation).

International gold flows in 1931 were extremely large by the standards of the time: the sum of the absolute values of the changes in gold reserves of the 56 countries reported in the League of Nations Statistical Yearbooks was $2.6 billion that year, compared with $1.1 billion in 1929 and $1.4 billion in 1930. The scale of the flows reflected the banking crises in Europe and the well-founded fear that not all countries would be able to continue on the gold standard.

4.2 Flight to liquidity and safety

In 1931, the dominant concerns of international investors were liquidity and safety. This meant avoiding currencies which might leave the gold standard and be either devalued or subjected to standstill agreements, exchange controls or other administrative obstructions to scheduled payments, and avoiding exposures to commercial banks whose soundness was in doubt[41]. It is interesting to consider the counterparts to the flows of gold in the countries that were most affected by the crisis.

Table 4.2 provides such information in respect of the three main gold-losing countries, namely Germany, Austria and the United Kingdom. In Germany and Austria, the central bank's loss of gold and foreign exchange reserves was more than compensated by an increase in its domestic assets, largely if not entirely accounted for by emergency assistance provided to distressed domestic commercial banks. In the United Kingdom, the central bank's balance sheet (with the Issue and Banking Departments consolidated) contracted slightly during 1931 and the increase in domestic assets was slightly smaller than the fall in gold and foreign exchange.

Central bank liabilities (notes and deposits) increased moderately in Austria and the UK, but they fell sharply in Germany, where the banknote circulation fell by 7.8%. It can safely be assumed that central banks supplied banknotes on demand, and that the fall in the note circulation was driven by demand, not supply. Real GDP in Germany fell by 7.6% in 1931[42], and retail prices fell by 8.5%[43], and it is plausible that the fall in incomes caused the fall in demand for banknotes. However, it was less than a decade since Germany had experienced

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[40] James (2001, pp 70 -74) argues plausibly that bank liquidity was an important influence on official decision-making in the UK.

[41] At that time commercial banks disclosed much less about their financial condition than they do these days, so that there was plenty of scope for such doubt.

[42] Source: Maddison (2010).

[43] Source: League of Nations Statistical Yearbook 1932-33, table 125.

hyperinflation, and it is also possible that the fall in demand for banknotes reflected at least partly a loss of confidence in the Reichsmark and in Germany's ability to remain on the gold standard.

Table 4.2

Changes in central and commercial bank balance sheets in gold-losing countries in 1931

(US dollar million, except where shown)

	Change in						
	Gold	**Foreign exchange**	**Domestic assets**	**Note issue**	**Deposits in central bank**	***Deposits in commercial banks***	***Commercial bank assets***
Germany	–293	–77	361	–88	–61	*–1,242*	*–1,238*
Austria	–3	–93	106	13	5	*N/A*	*N/A*
UK (GBP mn)	–27	–9	31	3	–1	*–171*	*–183*

Sources: Central bank data: Board of Governors of the Federal Reserve System (1976); Commercial bank data: Deutsche Bundesbank (1976), Sheppard (1971).

All of the gold-receiving countries listed in table 4.3 ran down their foreign exchange reserves in 1931, but in each case total reserves of gold and foreign exchange rose by a large amount. In each case also there were large increases in both the banknote issue and in deposits with the central bank. The percentage increases in the banknote issue in France, the Netherlands and Switzerland were 12.2, 21.4 and 51.5 respectively, far more than could be explained by changes in domestic economic conditions[44]. It seems highly likely that French, Dutch and Swiss banknotes were among the destinations of the flight to liquidity and safety. It is also quite possible that the same can be said of deposits in the three central banks. The Banque de France dominated the French banking scene in that era: its note circulation alone was much larger than the total of commercial bank deposits. It did a great deal of what would now be regarded as commercial banking business and it seems highly likely that funds seeking a safe home were attracted into deposits there[45].

[44] For example, the retail price index of 34 products sold in Paris fell by 12.8% during 1931 (source Bulletin de Statistique Generale, accessible on NBER historical statistics website). Williams (1963, p.101) says that a series of bank failures in France in 1930 stimulated the demand for banknotes, but data published by the League of Nations show that the note circulation rose by FRF 9.3 billion in 1931, whereas bank deposits fell by just FRF 1.5 billion.

[45] For a description of the Banque de France and its activities, see Mouré (1991), chapter 4.

Table 4.3

Changes in central and commercial bank balance sheets in gold-receiving countries in 1931

(US dollar million)

	Change in						
	Gold	**Foreign exchange**	**Domestic assets**	**Note issue**	**Deposits in central bank**	***Deposits in commercial banks***	***Commercial bank assets***
France	599	–199	101	364	147	*–61*	*53*
Netherlands	184	–70	15	76	54	*–228*	*–415*
Switzerland	315	–48	–23	106	139	*–60*	*–205*

Sources: France: Federal Reserve Board Banking and Monetary Statistics 1914 – 1941; Netherlands: Nederlandse financiële instellingen in de twintigste eeuw: Balansreeksen en naamlijst van handelsbanken. De Nederlandsche Bank Statistische Cahiers Nr 3, 2000; Switzerland: Swiss National Bank http://www.snb.ch/en/iabout/stat/statpub/histz/id/statpub_histz_actual.

4.3 Central bank reserve management

There were also widespread reductions in foreign exchange reserves in 1931 (see table 4.1), which continued in 1932. The Genoa Conference of 1922 had recommended economising on gold in order to enable the world monetary system to adapt to the higher price levels that followed the inflation of the Great War while retaining the essential features of the gold standard[46]. One technique was for foreign exchange reserves to be used to supplement gold as backing for national currencies. Indeed, foreign exchange reserves had the attraction for the holder that, unlike gold reserves, they were interest-bearing. In addition, in many countries gold coins, which had circulated freely before being withdrawn at the outbreak of war in 1914, were not returned to general circulation, so that the available gold could be concentrated on central bank reserves, as an additional means of economising on gold. However, when it became clear that national currencies might depart from the gold standard, foreign exchange reserves were hastily liquidated, as is evident from table 4.1 and graph 4.2. By the end of 1932, foreign exchange holdings of central banks had fallen to 25% of the amount before the outbreak of the crisis in spring 1931. The BIS explained that countries reduced their foreign exchange reserves by two main methods. First, the central banks of countries which had short-term international debts used foreign exchange reserves to meet foreign payments. The BIS estimates this use to have amounted to around CHF 2.5 billion. Second, central banks converted foreign exchange into gold. The BIS estimates that these conversions amounted to around CHF 5 billion (see Bank for International Settlements 1933)[47].

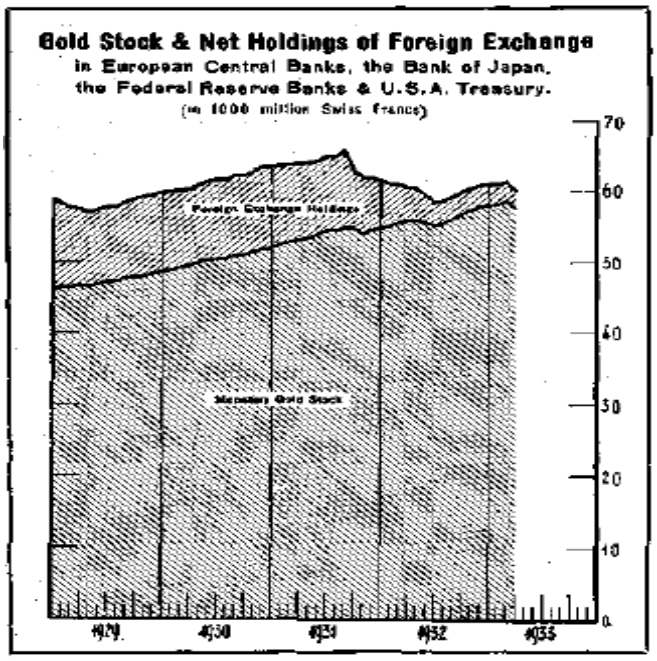
Just as the addition of foreign exchange to gold as a medium for the holding of national reserves had enabled a larger amount of credit and bank deposits to be extended on the foundation of a limited global supply of gold during the 1920s, so the conversion of foreign

[46] See Brown (1940), chapter 20, and Eichengreen (1995), pages 157 – 162.

[47] In addition, the value in gold and gold-linked currencies (including the Swiss franc) of foreign exchange reserves held in sterling and other currencies that left the gold standard during the period will have fallen (by the end of 1932, sterling had depreciated by 32.5% against its earlier gold parity). However, the foreign exchange holdings shown in graph 3.1, which is reproduced from the BIS Annual Report for 1932-33, may have been valued at their pre-1931 gold parity exchange rates rather than at current exchange rates.

exchange reserves back into gold caused a contraction in credit and bank deposits in the 1930s[48]. Central banks themselves took part in the flight to liquidity and safety.

Graph 4.2



Source: 3rd BIS Annual Report 1932/33.

5. A comparison of the propagation of the two crises

Because more data were collected in 2008 than in 1931, it is possible to trace more of the ways in which the more recent crisis was propagated. Nevertheless, it is possible to identify some common features, the most important being the flight to liquidity and safety, which was a leading characteristic of both crises. In both crises, there was a sudden wave of suspicion about the safety of assets which had hitherto been regarded as secure, and institutions which were thought to be over-exposed to such newly-doubtful assets were subject to the risk of liquidity crises if they had short-maturity liabilities fixed in money value. In both crises, deposit outflows were not the only important sources of liquidity pressure on banks: in 1931, the central European acceptances of the London merchant banks were a serious problem, as, in 2008, were the liquidity commitments that commercial banks had provided to shadow banks. And in both crises, the managers of central banks' international reserves participated in the flight to liquidity and safety in the same way as other market participants.

In both crises, the behaviour of creditors towards debtors, and vice versa, and the valuation of assets by creditors, were all very important. For example the decision of the creditors of the central European countries who were affected by the 1931 crisis to reach standstill agreements, rather than declaring loans in default, made a difference to the valuations that could be placed on the debts, and therefore to the immediate outlook for financial and economic stability in both central Europe and in the creditor countries; defaults would

[48] For further discussion, see Moessner and Allen (2011).

probably have precipitated bank failures in the latter. And in 2008, the creditworthiness of many financial companies was undermined by uncertainties about their net worth in the light of the drying-up of markets for many assets and the absence of price information from third parties[49].

However, there was a very important difference between the two crises, in the range and nature of assets that were regarded as 'safe havens' - ie which were regarded as liquid and safe. We showed in Moessner and Allen (2011) that central banks provided much more liquidity after the 2008 crisis than they had done in 1931, and argued that they had been inhibited in 1931 by the constraints of the gold standard. The gold standard set a benchmark for liquidity and safety that could be met only by assets of a certain kind, namely assets which either were gold or which could be confidently expected to be convertible into gold at the parity rate. Commercial banks had experienced financial stress in many countries, there was no deposit insurance, and commercial bank liabilities were in many cases not regarded as safe. Budget deficits were regarded as incompatible with continued adherence to the gold standard. When doubts arose about particular classes of assets, such as claims on commercial banks, there was a scramble for assets in the elite group. The group included the liabilities (notes and deposits) of central banks which were regarded as being securely attached to the gold standard, but those central banks felt unable to expand their balance sheets much, partly for fear of undermining their ability to remain on the gold standard. They were unable to implement Bagehot's remedy for a banking crisis, of lending freely against good collateral at a high interest rate[50]. As a result, monetary policy was very tight in gold standard countries, despite the depression, and countries abandoned the gold standard when its effects became intolerable, notably the United Kingdom in 1931 and the United States in 1933. As countries left the gold standard and their currencies depreciated, the pressures on those that remained increased. In fact, no country was still on the gold standard after 1936. The supply of liquid and safe assets was not only inelastic, but it also contracted over time, and the gold standard, being therefore incompatible with satisfactory management of the crisis, collapsed.

In 2008, a range of assets was regarded as liquid and safe, even though the relative prices of assets within the group could change. The group included deposits in a wide range of central banks, including those of the countries with the largest banking systems, and a wide range of government securities. Market participants were much more tolerant of budget deficits than they had been in the 1930s. Most governments accepted contingent liability for the safety of at least some bank deposits, and in some cases expanded deposit insurance even though the recession induced by the financial crisis had weakened their current budget balances. Crucially, it was possible to implement Bagehot's remedy and to expand the supply of liquid and safe assets massively without undermining their credibility among market participants. Thus central banks were able in effect to take on the function of money market intermediaries, as wholesale deposits migrated onto their balance sheets, and as they on-lent the funds to relieve shortages elsewhere in the market. Large budget deficits (which would have been anathema in 1931) emerged as automatic fiscal stabilisers came into operation and as some countries additionally undertook discretionary fiscal easing, and the

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[49] Shin (2010, chapter 1) discusses the importance of valuation practices for financial stability and considers the merits of marking to market. He notes that 'transaction prices may not be readily available' and that 'even those prices that are available may not correspond to the hypothetical fundamental prices that would prevail in frictionless perfect markets'. However the reason why markets become illiquid is usually that there are serious doubts about what 'fundamental prices' are. In that case, the only alternative to marking to market is to express an opinion about a matter of extreme uncertainty. And expressing such an opinion is the only option when there is no market price. This explains why audited accounts did not reassure their users about bank solvency during the recent financial crisis.

[50] See Bagehot (1892, pp 198 – 201).

contingent liabilities that most governments accepted for the security of at least some bank liabilities became more threatening. Nevertheless there was no serious loss of confidence in the safety of most governments' debts[51].

Thus the international monetary system, comprising both official institutions and the set of prevailing market beliefs, was much less fragile and much more resilient in 2008 than it had been in 1931. As a result, the near-term consequences of the recent crisis have been much less severe. It is too early to tell what the longer-term consequences might be.

6. Conclusion

We have suggested a number of ways in which the financial crisis of 2008 was propagated internationally. We argue that the collateral squeeze in the United States, which became intense after the failure of Lehman Brothers created doubts about the stability of other financial companies in the United States, was an important propagator. The provision of large-scale swap lines by the Federal Reserve relieved many of the financial stresses in other countries that had followed Lehman Brothers' failure. The unwinding of carry trades, particularly yen carry trades, is also likely to have transmitted market volatility to the countries that had been the destination of the carry trades when they were first put in place. It seems likely that, at the time of writing, there is still a large quantity of yen carry trades to be unwound.

In both crises, deposit outflows were not the only important sources of liquidity pressure on banks: in 1931, the central European acceptances of the London merchant banks were a serious problem, as, in 2008, were the liquidity commitments that commercial banks had provided to shadow banks. And in both crises, the behaviour of creditors towards debtors and the valuation of assets by creditors, were all very important. Flight to liquidity and safety was an important common feature of the crises of 1931 and 2008. In both episodes, the management of central banks' international reserves appears to have had pro-cyclical effects. However, there was a crucial difference, in that the supply of assets that were regarded as liquid and safe in 1931 was inelastic and became narrower with the passage of time, whereas in 2008, it could be, and was, expanded quickly in such as way as to contain the effects of the crisis. The understanding that the role of governments and central banks in a crisis is to enable such assets to be supplied was perhaps the most important lesson of 1931, and the experience of 2008 showed that it had been learned.

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[51] There were exceptions though, such as Iceland (whose bank liabilities were colossal in relation to the size of the economy and the government's resources), and some smaller euro area countries.

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