

US dollar money market funds and non-US banks¹

The Lehman Brothers failure stressed global interbank and foreign exchange markets because it led to a run on money market funds, the largest suppliers of dollar funding to non-US banks. Policy stopped the run and replaced private with public funding.

JEL classification: E58, F34, G28, G29.

That a loss of confidence in dollar money market funds amplified the financial instability arising from the Lehman Brothers failure in September 2008 is well appreciated. What is less well understood, however, is why the run on these funds coincided with the deterioration in global interbank markets. Similarly unclear is the relationship between policies to stabilise US money markets and those to distribute dollars through cooperating central banks.

How great was the need of non-US banks for dollars and how much did they rely on US dollar money market funds? How did a safe haven become the critical link between Lehman's failure and the seizing-up of interbank markets? Was the run on money market funds indiscriminate? How did policies to calm the US money market fit with policies to provide dollars to non-US banks?

In sum, the run on US dollar money market funds after the Lehman failure stressed global interbank markets because the funds bulked so large as suppliers of US dollars to non-US banks. Public policies stopped the run and replaced the reduced private supply of dollars with public funding.

The rest of this special feature first reviews European banks' need for US dollars. Then it quantifies the role of dollar money market funds as dollar providers. The following two sections trace how money funds played this role up to August 2008 and then how the Lehman failure undid it. The penultimate section reviews policies that responded to the run and associated fund flows.

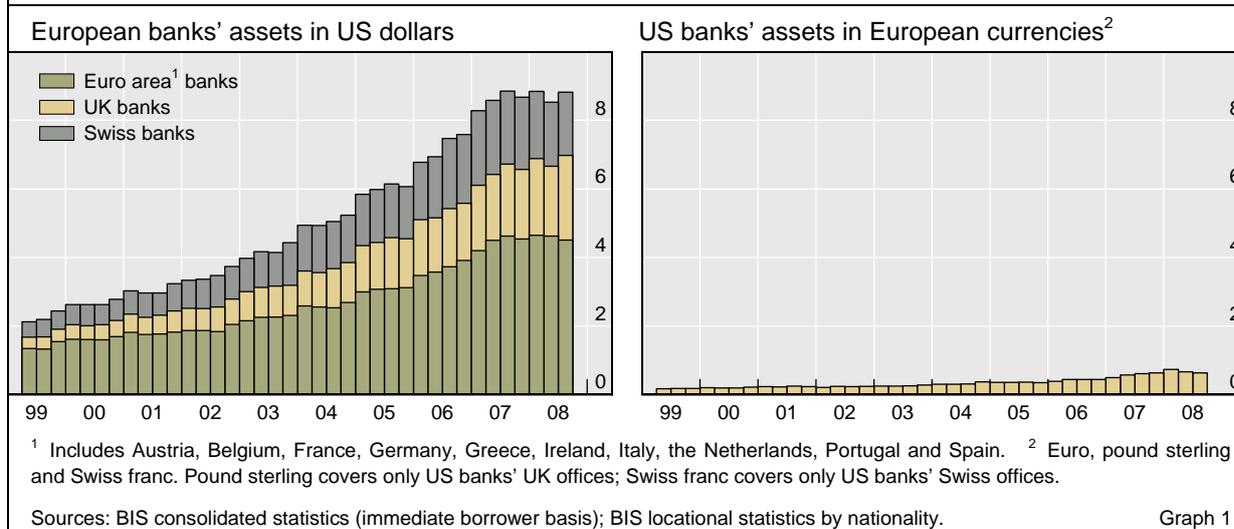
European banks' need for US dollar funding

Non-US banks' overall need for US dollar funding provides a useful perspective on their reliance on money market funds. European banks increased their

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The transatlantic asymmetry in international banking

In trillions of US dollars



dollar assets sharply in this decade (Graph 1, left-hand panel). Since this growth outran that of their retail dollar deposits, they bid for dollars from non-banks and banks (see McGuire and von Peter in this issue). US banks' need for European currencies is much smaller (Graph 1, right-hand panel) because US banks have leveraged their domestic operations with foreign assets much less. European banks' foreign assets in all currencies topped \$30 trillion in early 2008, 10 times the figure for US banks. (Netting out intra-euro area assets does not alter the order-of-magnitude difference.)

As a result, the effect was not symmetric when, in the second half of 2007, the creditworthiness of major banks on both sides of the Atlantic deteriorated and interbank markets dried up. As European banks relied more on the foreign exchange swap market to obtain dollars against European currencies, they did *not* meet US banks with a complementary need for European currencies. Under these circumstances, this asymmetry led to skewed foreign exchange swap prices that hiked the cost of raising dollars well above an already elevated Libor dollar rate (Baba et al (2008), Baba and Packer (2008)).

Interbank market strains made it critical for non-US banks to retain access to other sources of dollar funding, especially the largest, US dollar money market funds.² Originally, these funds invested in US names. Competition to offer investors higher yields, however, led them to buy the paper of non-US-headquartered firms to harvest the "Yankee premium" (Stigum and Crescenzi (2007, Chapter 20)). Most funds that invest in private paper, so-called "prime"

European banks' need for dollars not matched by US banks' need for European currencies ...

² This feature concerns US dollar money market funds domiciled in the United States and Europe. It uses the term "US money market funds" to refer to mutual funds in the United States regulated under Rule 2a-7 of the Securities and Exchange Commission. These should be distinguished from "alternative" or "enhanced" cash funds. As noted in the box, most of the US dollar money market funds in Europe are managed under principles similar to those of the SEC adopted by the Institutional Money Market Fund Association.

funds, now invest heavily in non-US names.³ (So-called “government” funds specialise in Treasury and agency paper – see box.)

Records of the mid-2008 holdings of the 15 largest prime funds (Table 1), accounting for over 40% of prime funds’ assets, show that the funds placed half of their portfolios with non-US banks. Thus, such US money market funds’ investment in non-US banks reached an estimated \$1 trillion in mid-2008 out of total assets of over \$2 trillion. To this can be added one half of the assets of European US dollar funds represented by the Institutional Money Market Fund Association, about \$180 billion out of \$360 billion in early September 2008.

Overall, European banks appear to have relied on money market funds for about an eighth of their \$8 trillion in dollar funding. By contrast, central banks, which invest 10–15% of US dollar reserves in banks (McCauley (2007)), provided only \$500 billion to European banks at the peak of their holdings in the third quarter of 2007. Given these patterns, any run on dollar money market funds was bound to make trouble for European banks.

... leaving
European banks
dependent on US
dollar money
market funds

Share of US prime money funds’ assets held in non-US/European banks						
As a percentage of each asset class, mid-2008; percentage for non-US banks ¹ before slash, European banks after						
Fund	CDs and time deposits	Commercial paper	Corporate notes ²	Repos	Total	Memo: Net assets, in \$ billions ³
Fidelity Cash Reserves ^c	91 / 73	28 / 27	54 / 34	70 / 70	63 / 51	128
JPMorgan Prime Money Market ^{c, d}	98 / 94	35 / 31	57 / 39	73 / 73	67 / 62	120
Vanguard Prime Money Market ^c	94 / 69	39 / 25	0 / 0	68 / 68	33 / 24	106
BlackRock Liquidity Temp ^b	95 / 91	4 / 4	37 / 17	13 / 13	51 / 47	68
Reserve Primary ^{c, e}	98 / 88	24 / 18	54 / 51	18 / 18	43 / 37	65
Schwab Value Advantage ^a	91 / 64	24 / 19	58 / 48	67 / 67	54 / 40	61
GS FS Prime Obligations ^{a, f}	0 / 0	0 / 0	0 / 0	2 / 2	0 / 0	56
Dreyfus Inst Cash Advantage ^b	85 / 71	32 / 25	33 / 24	0 / 0	62 / 51	49
Fidelity Inst Money Market ^a	100 / 91	44 / 44	51 / 36	45 / 45	61 / 54	47
Morgan Stanley Inst Liq Prime ^b	4 / 4	19 / 19	0 / 0	91 / 91	37 / 37	34
Dreyfus Cash Management ^b	92 / 75	46 / 30	31 / 31	0 / 0	70 / 56	33
AIM STIT Liquid Assets ^c	95 / 69	25 / 20	27 / 16	84 / 84	57 / 45	32
Barclays Inst Money Market ^{a, g}	67 / 57	10 / 6	30 / 21	21 / 21	24 / 19	31
Merrill Lynch Premier Inst Portfolio ^{b, h}	92 / 80	32 / 25	46 / 36	45 / 45	60 / 51	26
Fidelity Inst Money Market: Prime ^a	100 / 90	33 / 33	51 / 34	15 / 15	56 / 47	21
Total	92 / 78	26 / 22	47 / 33	51 / 51	50 / 42	878
Memo: Share of asset class in assets	34	26	13	11	100 ⁴	

a: report as of 30 June 2008; b: report as of 31 July 2008; c: report as of 31 August 2008; d: Lehman exposure of 0.2%; e: Lehman exposure of 1.2%; f: Lehman exposure of 0.3%; g: Lehman exposure of 2.7% (all repo); h: Lehman exposure of 0.6%.

¹ Bank classified by ownership; non-US includes US operations. ² Includes bank notes, master notes, short-term notes, medium-term notes, and variable and floating rate obligations. ³ As of reporting date; funds selected by size at 31 August 2008. ⁴ Shares add up to 85% owing to the exclusion of Treasury obligations, municipal securities, government agencies and promissory notes.

Sources: Portfolio holding reports; BIS calculations. Table 1

³ Disproportionate investment in foreign commercial paper by money funds was already evident in the 1980s (McCauley and Hargreaves (1987, pp 26–7)). By the early 1990s, the Yankee premium had declined to a handful of basis points (McCauley and Seth (1992)).

Money market funds

Money market funds (MMFs) are collective investment schemes that invest in short-term high credit quality debt instruments and provide considerable funding in the overnight and term money markets. In the United States, MMFs are referred to as mutual funds whereas in other countries they are called investment funds. MMFs were introduced in the 1970s in the United States as an alternative to bank deposits to circumvent regulatory caps on bank interest rates. At end-2008, MMFs managed more than \$5 trillion in assets globally. The United States has the largest market for MMFs, with assets under management at end-2008 amounting to \$3.8 trillion, of which \$2.5 trillion accounted for by institutional investor funds and the remainder retail funds. In Europe, assets under management amounted to \$1.3 trillion and more than half of this was denominated in US dollars. The dollar-denominated funds are often managed from offices located in the United States.

US MMFs are categorised on the basis of their investment objectives and the type of investors in the fund. For example, prime MMFs invest predominantly in non-government paper as opposed to government funds. If government MMFs are restricted to investing only in US Treasuries, they are referred to as Treasury funds. Depending on whether the funds are marketed to institutional or retail investors, these MMFs may be further classified into institutional prime funds or retail prime funds. Some MMFs invest in tax-exempt US municipal securities, which provide the basis for another categorisation of MMFs as taxable and tax-free funds.

MMFs operate under different regulatory regimes in the United States and Europe. The Securities and Exchange Commission regulates the credit quality, issuer concentration and maturity of assets that US MMFs can hold in their portfolios under Rule 2a-7. Under this rule, MMFs are not permitted to hold more than 5% of investments in second tier (A2-P2) paper, or to hold more than a 5% exposure to any single issuer (other than the government and agencies). Weighted average maturity of the portfolio is also restricted to 90 days or fewer. MMFs in Europe, which are dominated by institutional investor funds, are authorised under the Undertakings for Collective Investments in Transferable Securities (UCITS) Directive. The UCITS Directive allows a fund to be sold throughout the European Union subject to regulation by its home country regulator. Dollar funds domiciled in Europe generally adopt voluntarily the code of practice published by the Institutional Money Market Funds Association (IMMFA) for their investment guidelines. These guidelines are in spirit very similar to the investment restrictions under Rule 2a-7, and the weighted average maturity of portfolio holdings is even capped at a more restrictive 60 days. This is a noteworthy case of an offshore financial market adopting an onshore regulation. Many MMFs are rated by credit rating agencies, which may in turn impose additional investment restrictions.

All US and a majority of European MMFs are structured to maintain a stable net asset value (NAV) of \$1 (or \$10), and portfolio holdings are accounted for under amortised cost to compute NAV. Funds charge fees between 25 and 50 basis points of the NAV, and monthly dividends are paid to shareholders that reflect the average accrual income on the fund investments net of fee. As investments in MMFs can be withdrawn on the same day, these funds need to maintain a strong liquidity position to meet potential investor redemptions. Unlike bank deposits, however, investments in MMFs do not carry an official guarantee, nor are they insured or guaranteed by the fund's sponsor.⁶

While amortised cost provides the basis for computation of dividend payments, fund sponsors are required by regulation to also compute a shadow price for the portfolio holdings. Shadow price is the current NAV per share of the fund calculated using available market prices. Applicable regulations require that the shadow price does not materially deviate from \$1. Under Rule 2a-7, this deviation is limited to 50 basis points. For Dublin-domiciled funds regulated by the Irish Financial Services Authority, the deviation limit is 30 basis points. In circumstances where the shadow price falls below this limit, fund managers are required to take corrective action. An inability to do this would result in the fund "breaking the buck", that is, valuing shares at less than \$1.

The reason why MMFs did not "break the buck" in 30 years, with one exception in 1994, is that fund sponsors have provided financial support when the market value of a share threatened to fall substantially below \$1. While there is no legal obligation to provide support, fund sponsors have done so to preserve their business franchise. Available evidence on parental support suggests that around 145 funds received sponsor support up until July 2007. Since then, about one third of the top 100 US MMFs have received financial support from management companies through various means (Crane Data Archives (2008)). Such support has also been extended recently by US

sponsors to European-domiciled funds, which were subject to runs in September 2008. Recognising the importance of the ability and willingness of a fund sponsor to support its fund, credit agencies factor these into their fund rating decisions (Moody's (2008)). Fitch (2009) gives new emphasis to its evaluation of support and its interaction with concentration and liquidity.

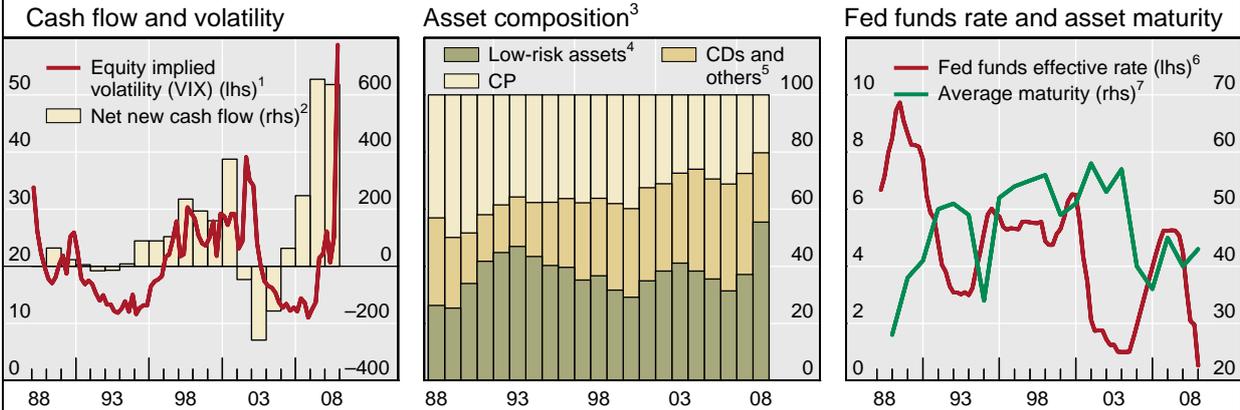
Support can take various forms. The fund sponsor can purchase the security that has experienced a credit event from the fund at par or can provide the fund with an A1-P1 letter of credit or guarantee covering the par amount of the security. A blanket guarantee of the NAV could lead to the consolidation of the MMF into the sponsor's balance sheet, but support for individual securities has thus far been interpreted as not requiring such consolidation (SEC (2008)).

Considering that MMFs invest in short-term and high credit quality securities and are structured to provide principal protection, inflows into these funds usually rise during periods of heightened investor risk aversion (Graph A, left-hand panel). During the current financial market crisis, MMFs have been important beneficiaries, with assets under management rising by more than 20% in 2008. In fact, end-2008 holdings in MMFs exceeded those in equity mutual funds in the United States for the first time in the last 15 years. As net inflows into MMFs have grown rapidly since 2007, competition between funds to gain market share has increased. This competition has been further intensified by the growth in money fund portals, which offer institutional investors and corporate treasuries not only a wider range of funds to invest in, but also greater flexibility in switching among them.

As investors in short-term debt, MMFs are important providers of liquidity to financial intermediaries through purchases of certificates of deposit (CDs) and commercial paper (CP) issued by banks, and through repo transactions. For example, MMFs held nearly 40% of the outstanding volume of CP in the first half of 2008. Consequently, when MMFs shift away from these assets into safer ones, funding liquidity for financial institutions can be affected. The shifts in the asset composition and maturity, however, tend to be influenced by credit market conditions, market liquidity and level of interest rates. Interpreting falling interest rates as periods of weaker credit market conditions, aggregate portfolio holdings of MMFs have shifted to low-risk assets in such periods (Graph A, centre and right-hand panels). To maintain yield in a falling interest rate environment, the shift to safer assets is usually accompanied by maturity extension.

© Following the Lehman bankruptcy, the US Treasury unveiled a temporary guarantee programme for investments held in MMFs.

US money market funds



¹ The Chicago Board Option Exchange Volatility Index (VIX) is a measure of market expectations of near-term volatility, as conveyed by the S&P 500 stock index option prices; quarterly averages. ² In billions of US dollars; taxable and tax-exempt funds; end-of-year observation. ³ As a percentage of total net assets of taxable funds; end-of-year observation. ⁴ Treasury bills, other Treasury securities, government agency issues and repurchase agreements. ⁵ CDs, eurodollar CDs, bank notes, corporate notes and other assets. ⁶ Quarterly averages, in per cent. ⁷ Average maturity in days of taxable funds; end-of-year observation.

Sources: Bloomberg; Investment Company Institute.

Graph A

US money market funds from August 2007 to August 2008

US money market funds appear to have increased their outright investment in non-US banks in the August 2007–August 2008 period. Their stepped-up funding of non-US banks reflected the cross-currents set in motion by investors' and fund managers' response to heightened risk in various corners of the money market. Amid concerns over risk, however, competition for assets under management through relatively high yields continued.

Assets at US money market funds grew strongly (Graph 2, left-hand panel) as investors withdrew funds from less safe short-term investments. Such investments included alternative “cash” funds, auction-rate preferred instruments and extendible asset-backed commercial paper (ABCP), sold as short-term instruments but revealed as less liquid in strained markets.

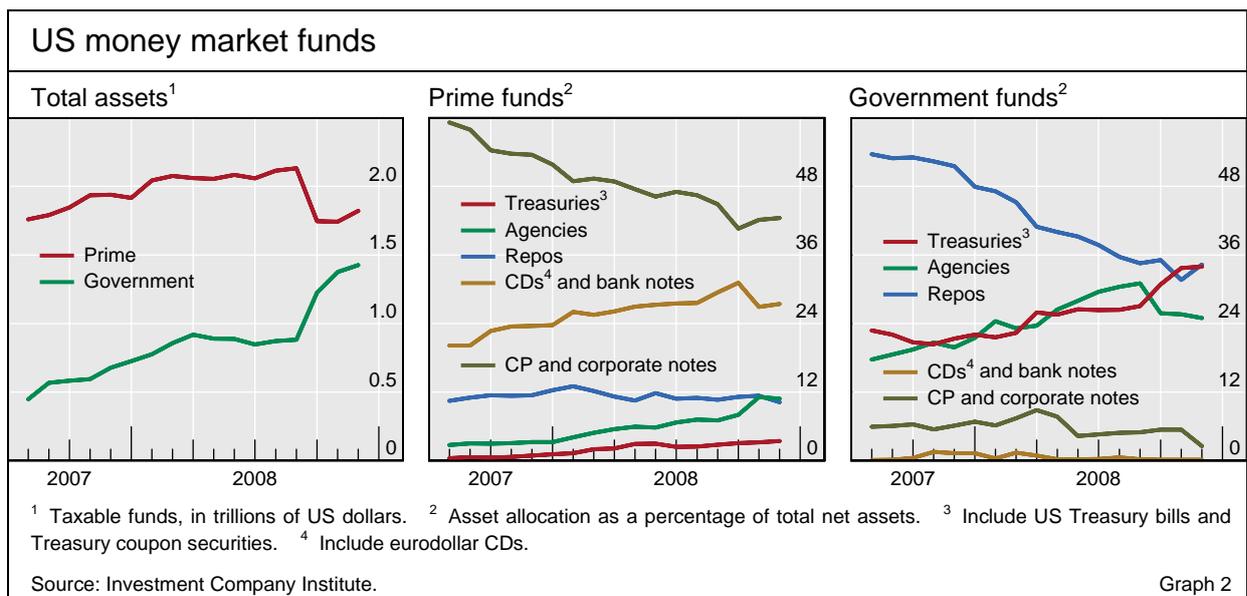
From late 2007 to April 2008, investors strongly favoured government funds, invested in agency and Treasury paper, over prime funds. This followed recognition in August 2007 that prime funds held ABCP of vehicles that held securities backed by shaky mortgages and other debts (Fender and Hördahl (2007)). By October, some prime fund managers found it necessary to promise investors that they would make good any losses on such paper (Table 2), especially ABCP issued by vehicles without a bank sponsor. This support, however, did not prevent inflows from favouring government funds (Graph 2).⁴

Non-US banks did benefit as prime fund managers took their cue from investors and adopted a less risky investment mix. Prime funds shifted their portfolios away from problematic commercial paper (CP) towards certificates of deposit (CDs) – seen as intermediate in risk between CP and government paper – and agency and Treasury issues (Graph 2, centre panel). This shift from CP to CDs suggests that prime funds enlarged their role as providers of unsecured dollar funding to non-US banks, given the much larger share of non-

Up to August 2008, US money market funds increase dollar funding of non-US banks ...

... despite investors' shift from “prime” funds to government funds ...

... as “prime” fund managers shift from commercial paper to safer certificates of deposit ...



⁴ Dudley (2007) highlights a two-week portfolio shift of \$30–40 billion from prime funds to Treasury funds in August 2007 as a source of pressure on the ABCP market.

Asset growth of the largest money market fund managers in the year to August 2008

Bank-owned ¹				Others			
Manager	Asset growth ²	Assets ³	Support?	Manager	Asset growth ²	Assets ³	Support?
Dreyfus (BoNY Mellon)	75.9	199.1	Sep 08	Reserve	113.0	84.0	
HSBC	57.4	32.8	Jan, Jun 08	Goldman	54.1	183.6	
UBS	53.5	56.7		BlackRock	50.2	259.8	
SSgA (State Street)	36.4	43.6		Fidelity	32.9	425.7	
TDAM (Toronto Dominion)	36.2	22.6	Dec 07	Federated	29.7	231.1	
JPMorgan	31.7	267.9		AIM	30.0	70.9	
First American (US Bancorp)	27.2	59.8	Nov 07	Morgan Stanley	29.2	112.6	Sep–Nov 08
Wells Fargo	21.8	103.9	Feb 08	Schwab	22.8	194.5	
Barclays	21.2	21.4	2008	Western	21.3	110.6	Jun, Sep, Dec 08
DWS (Deutsche)	20.7	64.9		Vanguard	12.3	191.5	
Northern (Northern Trust)	19.3	63.4	Feb, Jul 08	Lehman	0.3	21.0	Apr 08
Evergreen (Wachovia)	15.6	56.1	Sep 08				
Ridgeworth (SunTrust)	6.5	23.5	Oct 07, Jan, Sep 08				
Columbia (BofA)	-0.3	146.8	Nov 07, Oct 08				

¹ The chi-squared statistic to test the null hypothesis of independence of bank ownership and support (for the 24 cases excluding Reserve) is 4.0, allowing a rejection at the 0.05 level. ² In per cent over the 12 months to 31 August 2008. ³ In billions of US dollars, 31 August 2008.

Sources: Barclays 2008 interim and full-year reports; Crane Data; Morgan Stanley 2007 10-K, p 55; SEC; Standard & Poor's (2008).
Table 2

US banks as issuers of CDs than of CP held by those funds (Table 1).⁵

While both investors and managers broadly shifted away from risk, US money market funds continued to compete keenly under pressure from shareholders for yield. Financial investors, including securities lenders, led the growth of money fund assets as they shifted from CP, and many sought higher yields. As in previous periods of easing policy interest rates (see box), money market funds competed by extending the maturity of their portfolios.

... amid yield competition for funds

Competition produced strikingly different growth rates of assets under management for fund families (Table 2) and thus changes in market share. Support announcements in 2007 and early 2008 acted as a drag on the growth of some fund families, with concern over risk management outweighing the reassurance of support. Bank-owned fund managers were over-represented among support providers. But the credit loss that would pose the greatest challenge to the industry would strike a fast growing independent fund family.

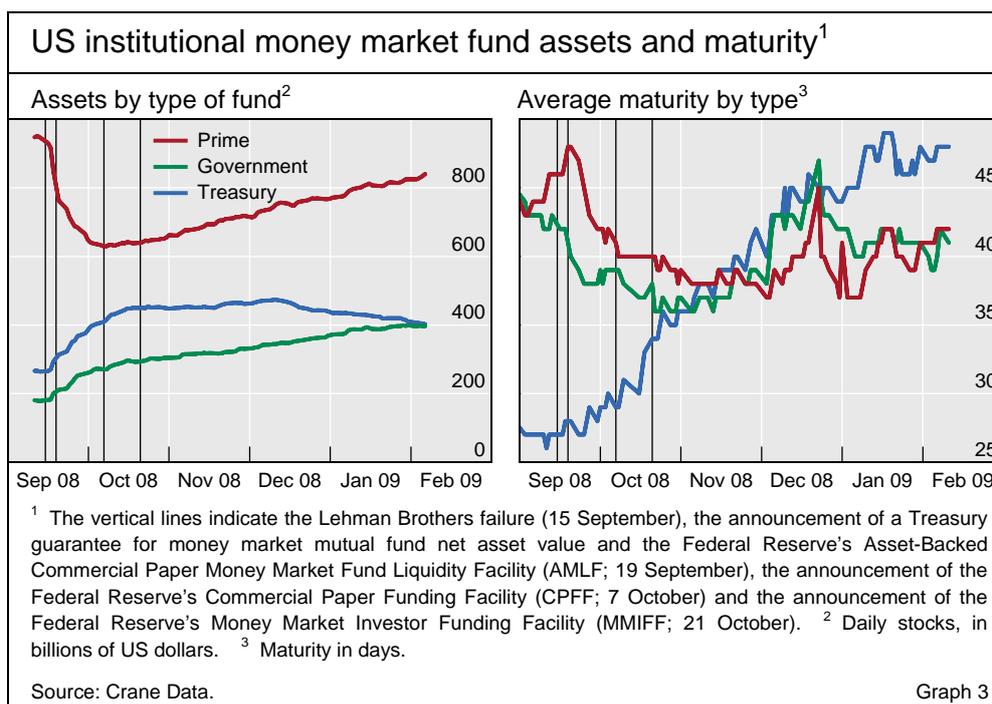
⁵ Government money market funds also responded to heightened counterparty risk by reducing their repos (Graph 2, right-hand panel), before and after Bear Stearns' collapse. To what extent this reduction squeezed secured lending to non-US banks by such funds is not known.

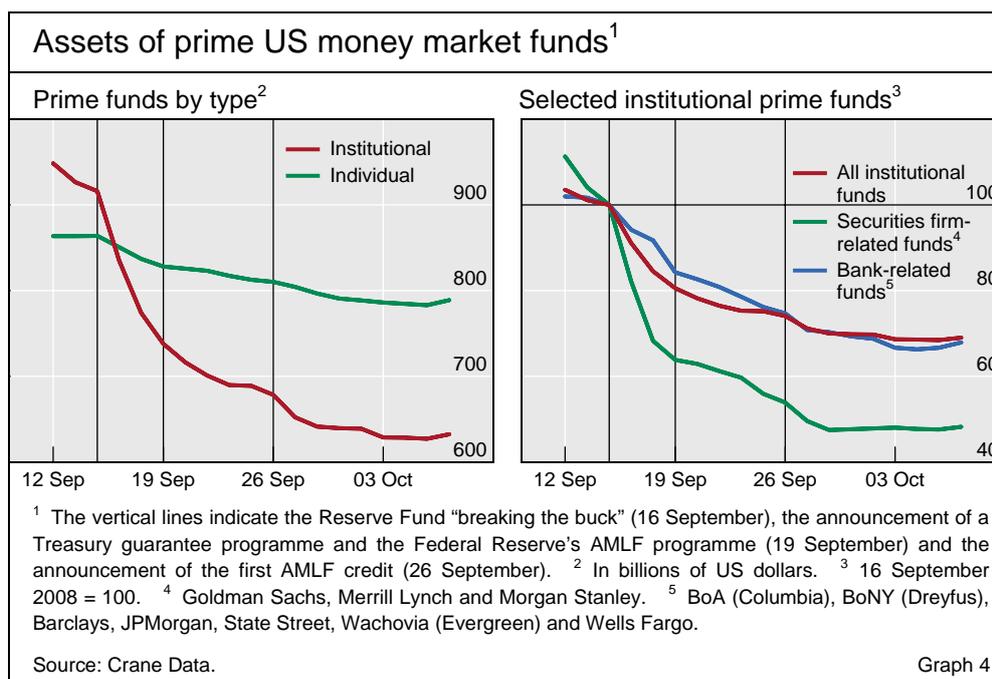
The run on money market funds

On 16 September, the day after Lehman's failure, the fastest growing fund family over the previous several years, Reserve, announced that shares in its flagship fund were worth 97 cents and those in its Caribbean fund 91 cents. The flagship Primary Fund, the industry's oldest and still independently managed by its founder, had gained market share by buying higher-yielding paper, including Lehman notes (Stecklow and Gullapalli (2008)). A deep-pocketed parent, such as Bank of New York Mellon, made good the Lehman losses in money funds managed by Dreyfus (the second fastest growing fund family in Table 2). Reserve, however, had shallow pockets and "broke the buck", an event without precedent for a major fund. This set off broad-based but selective shareholder redemptions, like a bank run (Fender et al (2008)).

Data by fund show three aspects of this run. First, punishment: the buck breaker did "suffer massive withdrawals", as expected (Stigum and Crescenzi (2007)). The Primary Fund had \$25 billion of redemption orders on 15 September (Commonwealth (2009)) and by 19 September another \$35 billion, for a total of \$60 billion out of \$62 billion. Although reporting an unbroken buck, Reserve's \$10 billion US Government Fund received \$6 billion in sell orders. Second, contagion and flight to safety: other prime funds also suffered redemptions; meanwhile, government funds received inflows (Graph 3, left-hand panel, which distinguishes Treasury-only funds from agency-holding government funds). Third, the who's who: if institutional investors ran, then individual investors walked. On the Wednesday and Thursday following Tuesday's breaking of the buck, institutional investors liquidated \$142 billion in 102 prime institutional funds, 16% of their holdings (Graph 4, left-hand panel). On the same days, they purchased \$54 billion in government funds, a similar percentage increase. Individuals sold a more modest \$27 billion from prime funds (3%), and bought a net \$34 billion in government funds.

A selective run:
some funds hit ...





... with focus on funds with managers not seen as source of support

The largest redemptions occurred at institutional prime funds managed by the remaining securities firms and small independent managers, which investors doubted could support their funds. Two-day redemptions at the largest institutional prime fund managed by the three largest securities firms were 20%, 36% and 38% of assets, well above the 16% average. By contrast, the largest such funds managed by affiliates of seven large banks met two-day calls of 2%, 5%, 5%, 7%, 10%, 10% and 17% of assets (Graph 4, right-hand panel). On 21 September, Goldman Sachs and Morgan Stanley announced plans to become bank holding companies; Bank of America had announced its purchase of Merrill Lynch on 15 September. American Beacon, an independent money fund spun off by American Airlines, faced two-day redemptions of 46% of its assets and resorted to in-kind redemption.

Run leads to less demand for commercial paper and certificates of deposit

The immediate effect of investors’ shifts of funds can be seen in the differing portfolios of prime and government funds (Graph 2). The flight to safety represented new demand for Treasuries, agency securities and repos as well as less demand for CP and bank CDs. Prime funds’ holdings of repos at 11% of portfolio (Table 1) could not meet even the first two days’ redemptions at many funds. Liquidating repos forced up average maturities (Graph 3, right-hand panel) and led funds to reinvest only at the very short term.

Investors also shifted from prime money market funds into bank deposits. If US banks received the deposits while European banks repurchased their CP or CDs, then the latter needed to bid in the already strained interbank market.⁶

In sum, the run on money market funds threatened a run first on the CP market and then on the CD market and thereby on non-US banks. A run on the money market funds destabilised already strained global bank funding markets.

⁶ The Federal Reserve’s H.8 release showed that demand deposits jumped \$37.4 billion (6.5%) and deposits jumped \$238 billion (4.1% seasonally adjusted) in the week to 17 September. In Table 13A, US dollar “other instruments”, mostly CDs, fell 18% in the fourth quarter of 2008.

Policy responses

Policy responses to the run on the money market funds had two complementary but different purposes. They sought to stop the withdrawal of funds from money market funds by restoring confidence in their liquidity and solvency. And they sought to accommodate or offset the withdrawals by providing public funds so as to reduce asset sales at distress prices. With this distinction in mind, we consider the measures taken in September and October: the Treasury's money market fund guarantee and the Federal Reserve's ABCP money market fund liquidity facility (AMLF), expanded central bank swaps and the CP funding facility (CPFF).⁷

Treasury guarantee and the Federal Reserve's AMLF

On Friday 19 September, the US President described a wide-ranging package of measures to support the financial system. In addition to proposed legislation to authorise official purchases of financial assets, there was a Treasury guarantee for money market funds' net asset value: "For every dollar invested in an insured fund, you will be able to take a dollar out." Earlier that day, the Federal Reserve had announced the AMLF to help MMFs meet demands for redemptions by investors and to foster liquidity in the money markets.

Drawing on the above distinction, the Treasury guarantee sought to stop the run by taking on risk from money market fund shareholders. The AMLF sought to stop the run by granting MMFs indirect access to Federal Reserve funding and to finance it by exchanging cash for theretofore illiquid assets.

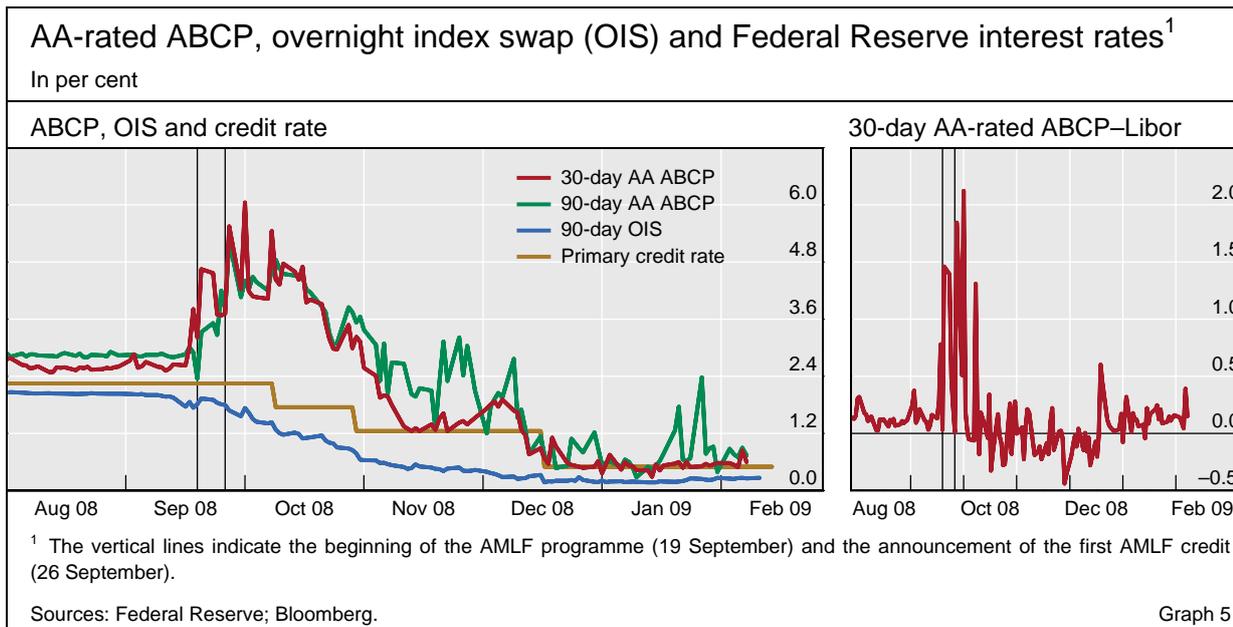
The Treasury guarantee gained definition over the weekend and opened for business a week later on 28 September. MMFs could sign up for net asset value insurance on shares outstanding as of 19 September for three months (subsequently extended to 30 April 2009). The cost would be either 1 or 1½ basis points for three months, depending on the gap between the market value of holdings (the "shadow price") and the \$1 (1.5/2.2 basis points for the extension up to end-April). This offer was compelling: the opportunity cost of holding 5% of the portfolio in Treasury bills rather than bank CDs exceeded the insurance cost. And only those who bought insurance in the first instance were invited to participate in the extension. Industry participation reached over 98%, with just a handful of Treasury-only money funds not opting in.

The Federal Reserve began making AMLF loans as early as Monday 22 September (Rosengren (2008)) through the adaptation of its operating procedures. Banks that bought ABCP with a top rating from two rating

US Treasury guarantees the net asset value of US money market funds ...

... Federal Reserve funds ABCP ...

⁷ Two additional policies may have helped to stabilise MMFs. On 10 October, the Securities and Exchange Commission allowed money market funds for 90 days to use amortised cost to measure the market value of holdings of high-quality securities of less than 60 days' maturity for the purpose of determining whether they had "broken the buck" (Plaze (2008)). Since such "shadow pricing" is not reported to shareholders, it is unknown how many trustees used this option, which expired on 12 January 2009. Industry sources suggest that the permitted accounting was not critical to other funds' not breaking the buck, perhaps because rating agencies monitored mark to market valuations. On 21 October, the Federal Reserve announced a facility to lend to special vehicles to which money market funds would sell CP. At the time of writing, this facility has not been used. These measures are not further discussed.



agencies⁸ from MMFs at amortised cost could obtain “non-recourse” Federal Reserve funding at the Fed’s primary credit rate for the paper’s life. In other words, funds could sell paper at the purchase price, adjusted for interest, and banks could lock in a spread and transfer any credit risk to the Federal Reserve (which would have no call on the seller in case of default). Since the primary credit rate then stood well below ABCP yields (Graph 5), the custodian bank was by design a willing buyer.⁹ By selling ABCP, the money market fund could raise funds without suffering a loss and possibly breaking the buck. Assured of such a market, funds had an incentive to buy and to hold ABCP.

... and the run stops

In the days following these measures, the institutional run on prime funds abated, as indeed it had already on Thursday 18 September, the day before the announcement, amid discussions of a guarantee.¹⁰ By the end of the month the institutional run had slowed to a crawl, and the retail “walk” halted in early October. And no other fund broke the buck.

Since the two measures were announced simultaneously, market participants continue to debate their respective effects. Clearly, the mere initial announcement of both these measures did not halt the run on the institutional prime funds in its tracks. At \$36 billion, US redemptions on Friday 19 September were as large as the day before. They slowed further on the following Monday, but dropped to \$1 billion only on Thursday 25 September.

⁸ Or a top rating from one agency if there was only one. See Estrella (2000) for issues arising from such use of single or multiple ratings.

⁹ This was all the more the case in that the non-recourse nature of the loan from the Federal Reserve allowed the bank’s holding to be assigned a zero weight for regulatory capital purposes (*Federal Register*, vol 73, no 188, 26 September 2008, p 55706). In economic substance, the Federal Reserve was subject to downgrade and default risk and received the difference between the primary credit and the federal funds rates, then 25 basis points.

¹⁰ The ICI (2008) timeline for 18 September reads: “Consults with Treasury on proposal by Secretary Henry M. Paulson for a money market fund guarantee program.”

Those who emphasise the effect of Federal Reserve funding point to the timing of the announcement of the first AMLF usage (Graph 5). As noted, the Federal Reserve began to make AMLF loans on Monday 22 September, but this was only confirmed and quantified (\$22 billion average for the week and \$73 billion outstanding on Wednesday) on Thursday 25 September. In the six working days between 16 September and this announcement, prime funds tracked by Crane (other than Reserve) had met redemptions of \$272 billion.

It may be misplaced to ask which of the two policies stopped the run. Despite their benefiting from neither the Treasury guarantee nor any AMLF funding, European-domiciled dollar MMFs generally experienced runs not much worse than those on similar US prime institutional funds with the same manager. Variation in the run by fund family, more than by domicile, highlights the role of perceptions of the need, and capacity, for support. A wide range of policies bolstering financial firms left them more able to offer support.

Money market funds not only benefited from immediate AMLF funding but also rather quickly responded to its incentives to buy ABCP once the run ended. AMLF credit peaked on 1 October at \$152 billion, no more than 21% of the ABCP market, and perhaps 30–40% of MMFs' ABCP. Notwithstanding this sale, prime funds' proportion of CP holdings stabilised in the fourth quarter after a drop in September (Graph 2). Of the top 15 prime funds, four separately identify ABCP and in two cases report that ABCP holdings actually rose to end-October from end-July, despite overall portfolio shrinkage. In all four cases, ABCP rose over the three months including September as a share of assets (by 8–14 percentage points) and as a share of CP holdings. However representative these funds were, Federal Reserve data show that private ABCP holdings bottomed out very rapidly on 8 October. For their part, 30-day ABCP yields peaked in absolute terms and relative to Libor around the end of September (Graph 5). By early 2009, AMLF credit was only 2% of ABCP.

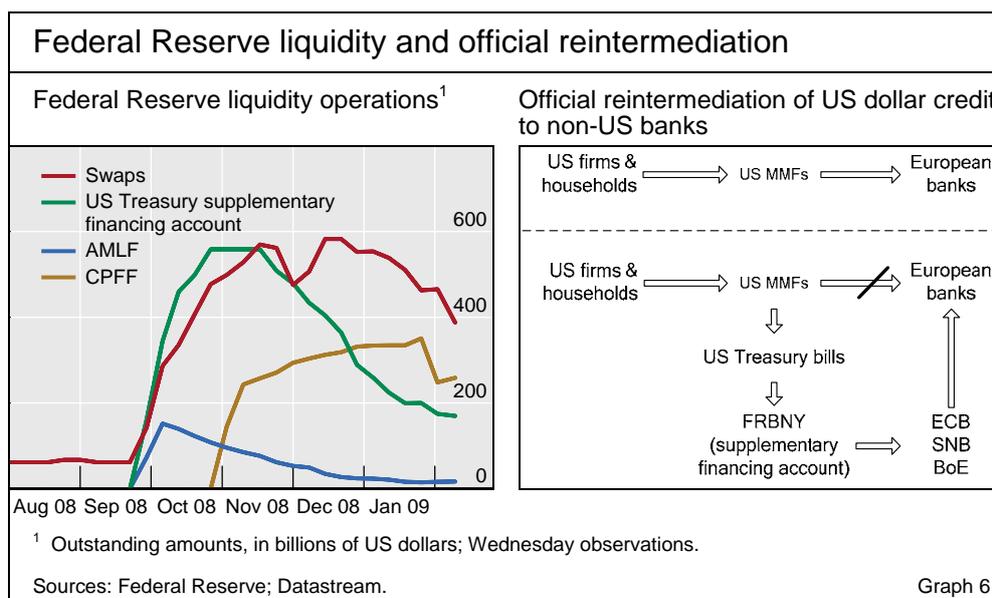
Run on US dollar money market funds in Europe offers a clue

AMLF allows money market funds to sell, and later spurs holding of, ABCP

The expansion of the central bank swap lines

The run on money market funds made it almost inevitable that they cut back on their funding of non-US banks. An update of Table 1 based on end-September to end-November portfolios shows that the funds still held half of their assets in non-US banks in aggregate, with assets down by 14%.

In response to these and other pressures on non-US banks' dollar funding, central banks ramped up their transatlantic dollar funding of non-US banks. On 18 September, the Federal Reserve agreed to increase its existing swap lines with the ECB and the Swiss National Bank (SNB) to \$110 billion and \$27 billion, respectively. It also agreed new swap lines with the Bank of Japan (\$60 billion), Bank of England (\$40 billion) and Bank of Canada (\$10 billion). On 29 September, the above swap lines were at least doubled. On 13 October came an unprecedented announcement: "sizes of the reciprocal currency arrangements (swap lines) between the Federal Reserve and the BoE, the ECB, and the SNB will be increased to accommodate whatever quantity of US dollar funding is demanded [at fixed rates]".



Central banks provide US dollars to European banks and offset cutbacks by money market funds

Whereas the Treasury guarantee provided an incentive not to withdraw funds, the expansion of the swap lines between the Federal Reserve and European central banks, inter alia, offset withdrawals that resulted in less credit to European banks from US money market funds (Graph 6). Even as money funds and others shifted to safer assets, the Treasury “overfunded” its immediate cash needs and placed the proceeds in the Federal Reserve. These funds were the counterpart of the expansion of Federal Reserve funding to European central banks which in turn funded their banks. In quantity terms, the accommodation was more than complete in the last two weeks of September. Redemptions of prime funds amounted to \$350 billion in the 11 business days 16 September to 1 October. Given the allocation in Table 1, this implied an eventual loss of funding for non-US banks of \$175 billion. In the two weeks ending on 1 October, the Federal Reserve’s swaps rose by \$225 billion.¹¹

The Federal Reserve’s Commercial Paper Funding Facility (CPFF)

On 7 October, the Federal Reserve announced a facility to restore liquidity to the CP market¹² and to encourage issuance of longer-term paper. Money market funds received no direct support from this facility and could not sell paper into it. As holders of 40% of US CP, however, they benefited from an assurance that eligible issuers could roll over maturing CP at a certain spread.

Until 30 April 2009 (just extended to 31 October), issuers could sell three-month CP directly to the Federal Reserve up to a level set by the shortfall of their paper currently outstanding from the maximum outstanding from January to August 2008. Similar to the AMLF, paper was to be top-rated. The price was

¹¹ Non-US banks may have also obtained Federal Reserve Term Auction credit, particularly through the Second District (New York). There, funding rose by \$17 billion on 1 October and by \$45 billion on 15 October.

¹² The Federal Reserve responded to a rapid decline in outstanding CP after the failure of Penn Central in 1970 by welcoming banks that lent to CP issuers at the discount window (Timlen (1977)). At the time, the banking system was healthy.

set at the three-month OIS, basically tracking the expected average federal funds rate over the period, plus 200 basis points for unsecured CP.¹³

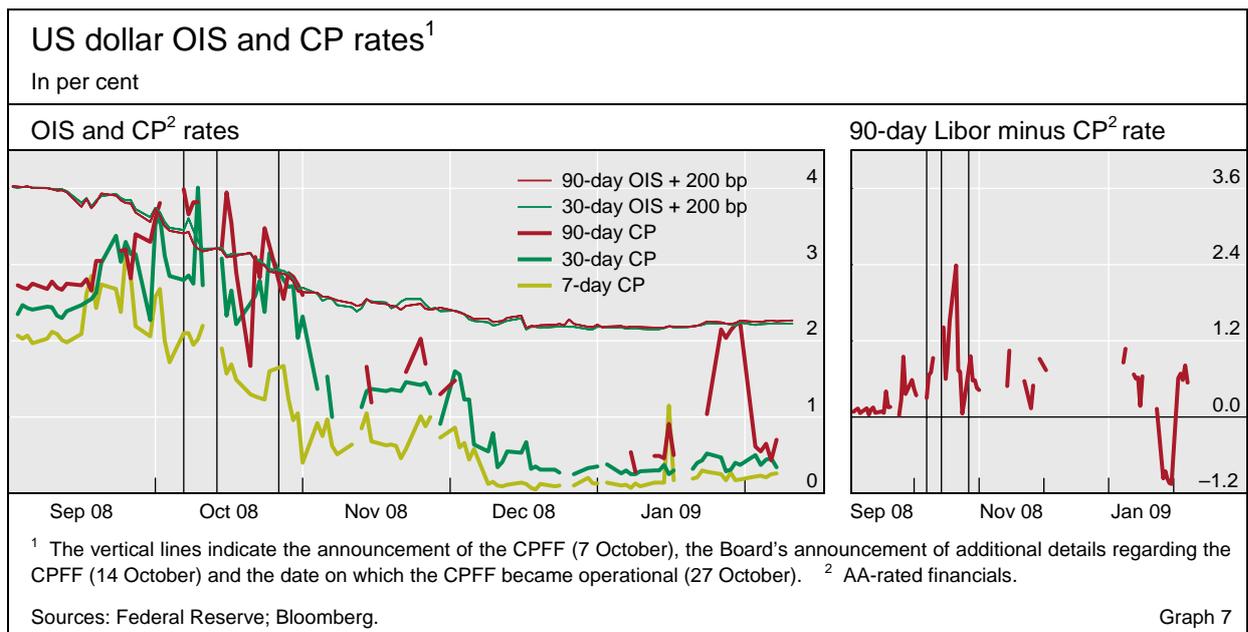
Official purchases financed repayments of maturing CP that the holder opted not to roll over, including CP of non-US banks held by money funds. While this facility thus financed a portfolio reallocation, it also gave MMFs incentives to hold CP. General Electric announced its willingness to repurchase its paper, given GE's stated eligibility for \$98 billion in Federal Reserve funding. A ready market for the *issuer* could thus encourage money market fund *investors* to purchase longer-term issues. As noted, MMFs showed no discontinuous reduction in CP holdings in late 2008. And prime funds stopped reducing their portfolio maturity in November (Graph 3, right-hand panel).

Money market funds benefit from CP issuers' access to Federal Reserve funding

In terms of pricing, the facility provided a backstop that benefited any CP buyer constrained by market prices. Term paper spreads over OIS exceeded the 200 basis point facility spread at times between the facility's announcement and its first purchases. Once purchases began, three-month yields – admittedly a market so thin that no yields were collected on many days in this period – fell under the facility's ceiling (Graph 7, left-hand panel). The denser observations on one-month yields reinforce the impression that the facility capped yields.

The gap between three-month Libor and financial CP yields (Graph 7, right-hand panel) also suggests that Federal Reserve purchases held down CP yields. Libor rose to 4.5% in October, well above the peak in CP rates. Indeed, this spread widened well beyond any experience since the Federal Reserve reduced reserve requirements on large domestic CDs and net eurodollar borrowing to zero in December 1990. In sum, the CP facility both financed repayments to MMFs and reduced their risk in continuing to hold CP.

At the first opportunity, CPFF credit has shrunk, as money market funds, inter alia, have bought CP at lower yields. Overall, seasonally adjusted CP held



¹³ The yield would be 100 basis points less if the borrower could post acceptable collateral or obtain an acceptable guarantee. For ABCP, the yield was set at OIS plus 300 basis points.

outside the Federal Reserve recovered from a post-Lehman low of \$1.269 trillion on 12 November by \$56 billion by end-January 2009. Late January's \$100 billion decline in CPFF credit showed, however, that issuers had found credit elsewhere as well, including by sale of bonds, some with official guarantees.

Conclusions and prospects

Money flowed into money market funds in 2007–08 in search of a safe haven. But these funds were ill-designed to serve as such in times of extreme market strains, given a business model of not “breaking the buck” while competing on yield. Non-US banks' funding benefited from these inflows initially but subsequently suffered when losses on Lehman securities set off a run. Global interbank and foreign exchange markets felt the strain. Policies succeeded in stopping the run, thereby stabilising money market funds' assets and their holdings of non-US banks' paper. Policies also more than replaced the funding to non-US banks previously provided by money market funds.

The future of the money market fund industry is not clear. Those in the industry tend to take the view that too much should not be made of one fund that tried to shoot the moon. According to them, events have shown that money market funds can survive much stress if they get the credit analysis right.

Some former policymakers and current market participants, however, have called for money market funds that offer transaction services, withdrawal on demand and a stable net asset value to be organised and supervised as banks with access to last resort lending (Group of 30 (2009)). Further, they would require any short-term funds that were not thus organised and supervised to have a floating net asset value.

US securities firms' becoming bank holding companies points in this direction. They could seek deposits and follow the lead of Merrill Lynch, which, well before its funding risks became evident or it was acquired by Bank of America, shifted retail “cash management accounts” from a money market fund to its own bank. In contrast, banks have moved strategically to manage money market funds, but their heavy support to them over the last two years raises questions.

Such proposals and developments leave open the future allocation of the current \$3.4 trillion portfolio of US taxable money market mutual funds. In particular, their ultimate importance as providers of dollars to non-US banks remains to be seen. For now, flows from low-yielding Treasury funds to prime funds could provide a near-term boost to non-US banks' funding in US dollars.

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