The Quiet Run of 2011: Money Market Funds and the European Debt Crisis *

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Abstract

We show that money market funds transmitted distress across firms during the European sovereign debt crisis. Using a novel data set of US money market fund holdings, we show that funds with large exposures to Eurozone banks suffered significant outflows between June and August 2011. These outflows have significant short-run spillover effects on other firms: non-Eurobank issuers that typically rely on these funds raise less financing in this period. The results are not driven by issuer riskiness or direct exposure to Europe: for the same issuer, money market funds with greater exposure to Eurozone banks decrease their holdings more than other funds. Our results illustrate that instabilities associated with money market funds persist despite recent changes to the regulations governing them.(*JEL* G01, G18, G21, G28, G32)

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1 Introduction

In the aftermath of the financial crisis, risk taking by financial intermediaries has been heavily scrutinized by academics, regulators, practitioners, and the general public. One important reason for this scrutiny is that financial firms may be subject to runs if the concerns develop about the quality of their assets (Gorton and Metrick, 2011; Gorton, 2010). And as pointed out by Bernanke (1983), runs can result in a contraction of the supply of credit to firms and consumers with potentially serious consequences for the macroeconomy.

Despite its importance, there is little empirical evidence directly demonstrating how risk taking by financial intermediaries can set the stage for runs and therefore lead to eventual reductions in the supply of credit to creditworthy firms. In this paper, we provide such evidence, studying the role US money market mutual funds play as intermediaries in short-term credit markets. Using a novel data set of the security-level holdings of money market funds, we document the interaction of risk taking, runs, and credit supply in the context of the European sovereign debt crisis. Specifically, we show that risk taking by money market funds, in the form of investments in risky Eurozone banks, drives large investor redemptions in the summer of 2011, significantly reducing the ability of other firms to raise short-term financing.

With over $1.5 trillion in assets, prime money market funds are an important source of short-term financing for financial and nonfinancial firms,[1] as well as an important cash management tool for nonfinancial firms.[2] Instabilities associated with money market funds played a central role in the financial crisis of 2008. At a smaller, less chaotic scale, similar instabilities surfaced in the summer of 2011 as fears about European sovereign debt problems mounted. According to the Investment Company Institute (ICI), assets managed by prime

[1] According to the Flow of Funds data, in 2010 money market funds held 37% of all open market paper, making them the single largest holder.

[2] According to the Investment Company Institute, in 2010 nonfinancial businesses held 25% of their cash and short-term investments in money market funds (Investment Company Institute, 2011).

money market funds fell more than $170 billion (10%) between June and August 2011 due to concerns that these funds were heavily exposed to European sovereign debt through their lending to European banks. This "slow-motion run" (Economist, 2011) represents the largest three-month decline in prime money market fund assets outside of the chaos surrounding the Lehman default. Despite recent reforms intended to make them safer, a report by the Financial Stability Oversight Council labelled money market funds as an important conduit through which the "amplification of a [European sovereign debt] shock" could take place (Financial Stability Oversight Council, 2011).

This paper empirically identifies a novel channel through which runs on financial intermediaries may have consequences for the real economy. We demonstrate how runs can create collateral damage: they can result in a sudden and indiscriminate loss of funding for a large number of firms. Due to institutional and market frictions, issuers maintain relationships with specific money market funds and cannot always seamlessly substitute between different funds as suppliers of financing. Thus, concerns about the creditworthiness of one firm or a set of firms can lead investors in a particular money market fund to run, resulting in short-term funding difficulties for the other firms financed by that fund.

Our analysis proceeds in three steps. We first show that prior to June 2011 money market funds had strong incentives to take on risk in order to increase their offered yields. Facing a flat yield curve and regulatory constraints on portfolio maturity, funds took on risk primarily by holding large positions in Eurozone banks—in May 2011, more than a quarter of all prime money market fund assets were invested in Eurozone banks. Our results point to franchise value and operating leverage as important determinants of risk taking.

We then examine the consequences of this risk taking. We show that money market funds with larger exposures to Eurozone banks suffered larger investor redemptions between June and August 2011. The magnitude of the effect is large: a 10% higher exposure to Eurozone banks is associated with a 1.4% larger monthly outflow. Moreover, the effect is not driven by a general investor pullback from all risky funds. Investors treat exposure to Eurozone

banks as particularly toxic: the effect of exposure to Eurozone banks remains strong when we control for fund yields. The effect is particularly strong for institutional funds and for funds exposed to the riskiest banks.

Finally, we show that investor withdrawals from money market funds have impaired the functioning of the money markets for other firms. In particular, other (non-Eurozone bank) firms funded by money market funds with large exposures to Eurozone banks had more trouble raising financing. Again, the magnitudes are large, particularly for nonfinancial firms. A firm financed by money market funds with 10% greater exposure to Eurozone banks raises 20–30% less total financing from all money market funds in the period June–August 2011. Again, this result is not driven by a broad withdrawal of funding from riskier issuers. Our results are robust to controlling for the yields offered by issuers. Furthermore, in specifications with issuer fixed effects, money market funds with larger exposures to Eurozone banks are more likely to withdraw financing. Thus, our results cannot be explained by unobservable issuer characteristics, including riskiness or direct exposure to Europe.

Our paper is related to both the literature on risk taking by investment funds, including Sirri and Tufano (1998), Chevalier and Ellison (1997, 1999),[3] and the literature on bank runs and credit supply, including Bernanke (1983), Calomiris and Gorton (1991), Calomiris and Mason (2003), and Khwaja and Mian (2008). Our key contribution is to study the consequences of money market fund risk taking for issuers, showing that money market funds transmit distress from risky firms to less risky ones.

Relative to the banking literature, we show that runs can have negative spillover effects even if they are driven by information about fundamentals, not just strategic complementarities as in Diamond and Dybvig (1983). Borrower heterogeneity is key. Even when based on information about fund exposures to particular risky issuers, investor redemptions can still

[3] More recently Kacperzyk and Schnabl (2010, 2011), McCabe (2010), and Mishkin (2011) have focused on money market funds because of their role in the financial crisis. Another group of papers, including Adrian, Kimbrough, and Marchioni (2011), Babo, McCauley, and Ramaswamy (2009), and Duygan-Bump, Parkinson, Rosengren, Suarez, and Willen (2010) focuses on interventions to stabilize the money markets in Fall 2008.

create collateral damage, reducing the ability of other creditworthy issuers to raise short-term financing. This is true even though the firms we study are larger than bank-dependent firms and likely have access to alternative sources of financing except during periods of severe financial stress.

We provide direct evidence demonstrating that the key friction driving these spillovers is that relationships are important in the commercial paper market. In contrast to the sharp distinction between relationship-based and arm's length financing in the literature (e.g., Rajan (1992) and Petersen and Rajan (1994)), we show that relationships matter in market-based financing: even for large, highly rated firms, arm's length finance is never fully arm's length. Thus, the cross-firm spillover effects we document are likely to also exist in the traditional banking sector, though they would be difficult to document in the absence of comprehensive loan-level data.

The remainder of this paper is organized as follows. Section 2 gives a brief description of the market turmoil associated with the European sovereign debt crisis. After describing the data in Section 3, we present the results on fund exposure to Eurozone banks and investor withdrawals in Section 4 and on the spillover effects of investor withdrawals in Section 5. Section 6 discusses the results and their implications, and Section 7 concludes.

2 Background

We focus on events in the money markets in the summer of 2011 driven by fears of European sovereign debt defaults.[4] These fears began to surface in late 2009, when Greece revealed that its debt had been substantially understated due to accounting problems. Concerns quickly arose that Greece and other peripheral countries in the Eurozone, including Portugal and Ireland, might default.

Concerns about sovereign debt in turn created anxiety about a number of Eurozone banks

[4] See Bloomberg's European Crisis Timeline for more information: http://www.bloomberg.com/news/2011-11-07/europe-timeline-maastricht-to-papandreou.html

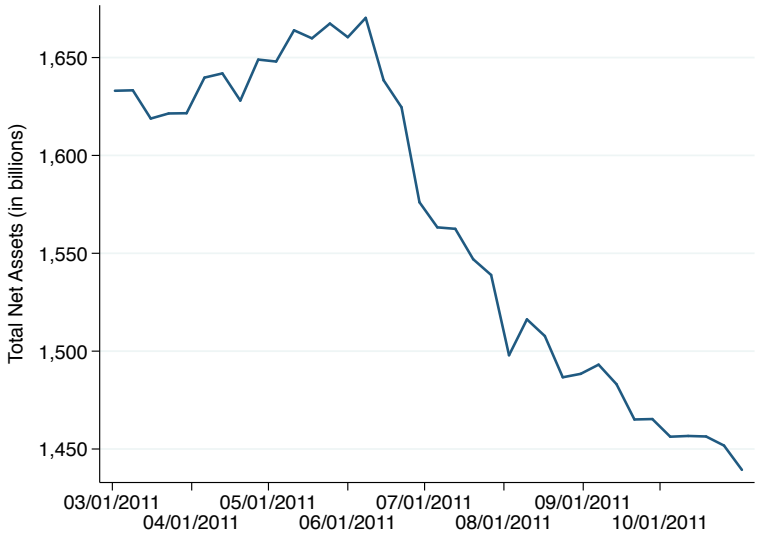
because of their direct holdings of potentially risky sovereign debt, as well as their indirect exposures to peripheral Eurozone economies. In May 2010, faced with growing turmoil in financial markets and funding difficulties for several Eurozone sovereigns, the European Union announced a stabilization package consisting of three parts. First, the European Central Bank began purchasing sovereign debt on the secondary market in order to stabilize prices. Second, EU governments collectively contributed €440 billion to create the European Financial Stability Facility (EFSF). Third, a package of loans was extended to Greece to help cover its short-term financing needs.

Although these measures alleviated Greece's immediate funding needs, they did not address the underlying unsustainability of its debt burden. Furthermore, subsequent events suggested that sovereign debt problems would not be limited to Greece. Ireland accepted an EFSF-funded bailout package in November 2010. Portugal accepted a similar package in May 2011. This sequence of bailouts led to concerns that Spain and Italy, countries whose debt vastly exceeded the size of the EFSF, might also be in danger of default.

As large haircuts or outright default on Greek debt became more and more likely, concerns about the solvency of Eurozone banks with large holdings of sovereign debt resurfaced in June 2011. On June 15, Moody's placed the large French banks BNP Paribas, Credit Agricole, and Societe Generale on review for possible downgrade citing their exposures to Greece. To alleviate concerns about bank solvency, in July 2011, the European Banking Authority conducted stress tests of the 90 largest European banks. However, the results of the stress tests were widely regarded as too optimistic because they did not consider the possibility of losses on sovereign debt.

Figure 1 shows that as concerns about European banks resurfaced, investors began withdrawing cash from prime money market funds. The assets managed by these funds reached \$1.66 trillion on June 1 and declined by over \$170 billion (10%) to \$1.49 trillion on August 31, 2011. This was a large shock—the fall in aggregate assets is the largest three-month de-

Figure 1
Total Net Assets of Prime Money Market Funds
Weekly data from the Investment Company Institute.



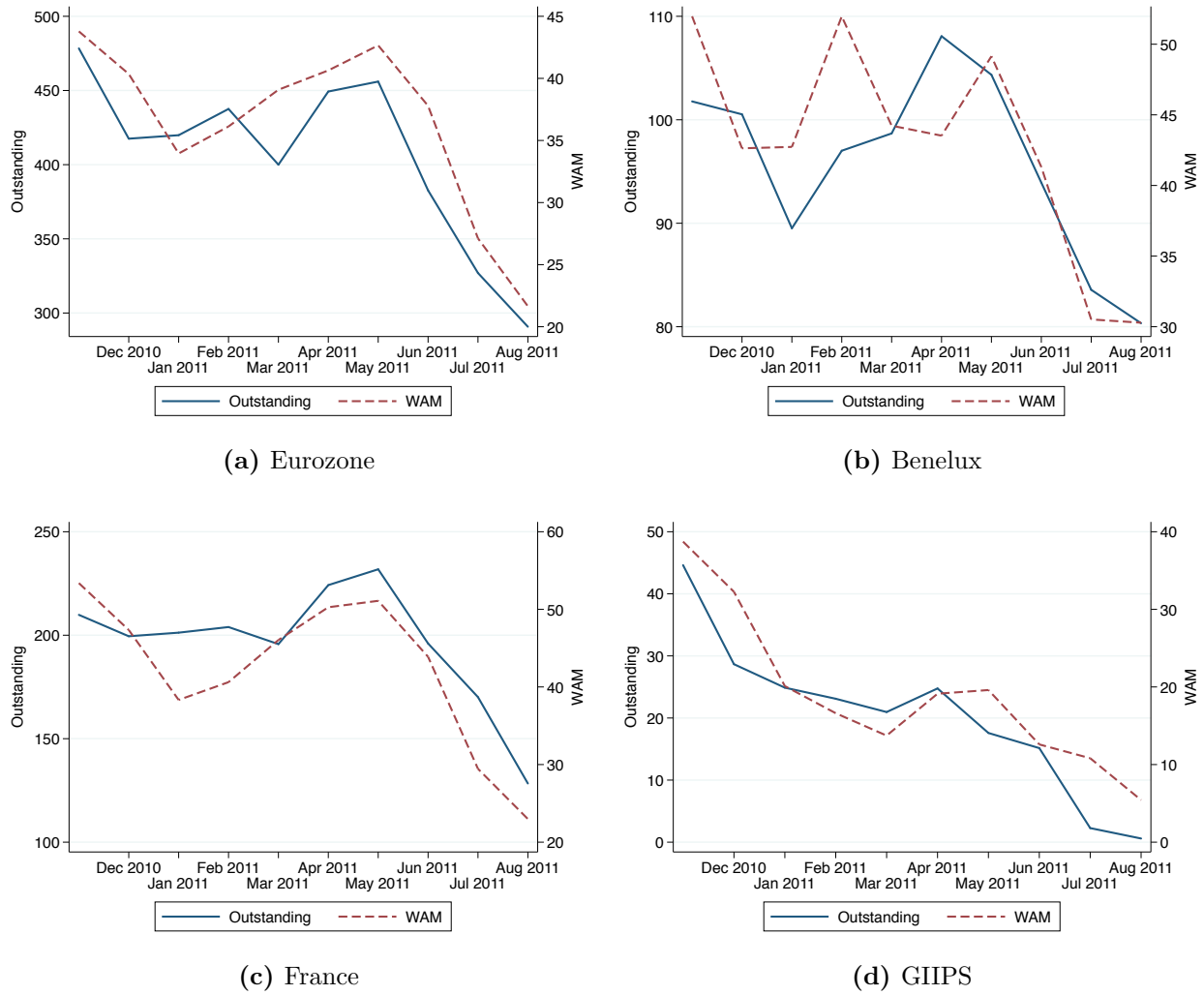
cline except for the depths of the financial crisis in Fall 2008.[5] Moreover, not all funds were equally affected—those with large exposures to Eurozone banks suffered very large outflows. For example, Fidelity Prime Money Market Portfolio, which in May 2011 invested 28% of its assets in Eurozone banks, had outflows of $20 billion (30%), leading Fidelity to issue multiple statements arguing that its exposures to European banks represented "minimal credit risk." Similarly, Dreyfus Institutional Cash Advantage Fund, with 39% of its assets invested in Eurozone banks, suffered outflows of $22.4 billion, almost 50% of its assets.

Figure 2 shows that faced with large investor redemptions, US money market funds started to pull financing from a variety of Eurozone banks. As one money market fund manager reported, "it is just easier to say to clients 'we don't have any exposure to Europe' than to try to explain the differences" (Economist, 2011). Money market fund exposure to all Eurozone banks declined 37% from $453 billion to $287 billion between May and August 2011. The overall Eurozone numbers hide interesting geographical variation. Money market funds almost completely eliminated their exposure to banks in Greece, Italy, Ireland, Portugal,

[5] Based on ICI data covering the 1984–2011 period.

Figure 2
Amount Outstanding and WAM of Eurozone Banks

Amount outstanding, in billions, is the aggregate amount held by U.S. prime money market mutual funds. WAM is weighted-average maturity.



(a) Eurozone

(b) Benelux

(c) France

(d) GIIPS

and Spain (GIIPS), and reduced their exposure to French banks, whose ratings were on review by Moody's due to their exposures to Greece, by almost 45%. In contrast, funds reduced their exposures to banks in Belgium, the Netherlands, and Luxembourg (Benelux) by a comparatively mild 26%.

In addition, to the extent that they were willing to continue extending financing to any of these banks, money market funds insisted on shorter maturities. Figure 2 also shows the weighted average maturity (WAM) of Eurozone bank securities held by US money market

funds. Between May and August 2011, the weighted average maturity fell 49% from 43 to 22 days for Eurozone banks overall, 55% from 51 to 23 days for French banks, and 39% from 49 to 30 days for Benelux banks.[6]

3 Data

We construct a novel data set of the security-level holdings of all US money market mutual funds. Since November 2010, money market funds have been required to use SEC form N-MFP to report their portfolio holdings as of the last business day of each month. Funds are required to file within 5 business days after the end of the month, but the forms become publicly available 60 days later. Our data set covers the November 2010–August 2011 period, but most of our analyses focus on the March–August 2011 period.

We focus on prime funds[7] and exclude feeder funds that invest in other funds.[8] The resulting data set covers 260 unique funds, which at the peak managed almost $1.9 trillion in assets.[9] The average fund manages about $7 billion, but the distribution of fund size is quite skewed, with the top 10 funds managing around $700 billion in assets during this period.

[6] These results are not mechanically driven by the fact that Eurozone banks stop issuing in the post period and their outstanding securities mature. We find similar (untabulated) results if we focus on new issuance.

[7] Funds report their category in item 10 of form N-MFP. In a few cases, the reported category varies over time. We manually examine all funds that ever report their category as prime. In all cases, within-fund variation appears to be due to reporting errors, which we correct, making fund classifications constant during our sample period.

[8] We also exclude two funds that hold cash only during the whole sample period and seven prime muni funds, which we define as prime funds that consistently invest more than 75% of their assets in municipal securities. Some of these funds explicitly state that their investment objectives include "sustainability and social responsibility factors." Our results are robust to including these funds.

[9] Aggregate assets of prime money market funds are larger in N-MFP data (1,875 billion as of May 31, 2011) than they are in ICI data (1,660 billion as of June 1, 2011). Most of the difference appears to be due to N-MFP data including money market funds that are used internally by fund complexes to invest cash balances of other funds. For example, Vanguard Market Liquidity Fund is a cash management vehicle for other Vanguard funds and is not available to other investors. Similarly, the DFA Short-Term Investment Fund is used internally by Dimensional Fund Advisors to invest the cash collateral received from securities lending. Our results are robust to excluding twelve funds that we identify as "in-house" funds.

Our first step is to collapse the raw portfolio holdings data to the fund-issuer-month level. Form N-MFP provides us with issuer name, security CUSIP, if available, and issuer CIK if security CUSIP is not available. Our algorithm uses a number of other data sets—the CUSIP master file, S&P Ratings IQuery, FISD, the SEC's list of all CIKs matched with entity names, and data sets of Fitch, Moody's and S&P credit ratings publicly available per Rule 17g-2—to link each security to the ultimate parent of the issuer. For example, our algorithm attributes all of the following to BNP Paribas: CDs issued by its Chicago, New York, and San Francisco branches (which have their own issuer CUSIPs), commercial paper issued by BNP Paribas Finance, and repurchase agreements entered into by BNP Paribas Securities.

Because municipal issuers frequently use bond insurance and letters of credit, it is often difficult to determine the money market fund's ultimate credit exposure for these issuers. Furthermore, municipal issuers are generally small,[10] are missing from the CUSIP master file most of the time, and have the most variation across funds in the spelling of a given issuer's name. For these reasons, we exclude municipal issuers from our analysis, though our results are robust to their inclusion.

Table 1 reports fund-, issuer-, and fund-issuer level summary statistics. Panel A reports fund-level statistics. Panel B reports summary statistics for the ABCP, non-EU financial, and nonfinancial issuers in our data.[11] We focus on these issuers when we analyze the spillover effects of the outflows suffered by money market funds. There are 75 ABCP, 98 non-EU financial, and 182 nonfinancial issuers in our sample. The median issuer has about $81 million outstanding, but the distribution is skewed, with mean and maximum outstandings of $2.2 billion and $57.7 billion respectively. The weighted average maturity ranges from 1 day to 386 days, with a mean of 49 days. Panel C reports fund-issuer level summary

[10] The median municipal issuer has just $35 million in outstanding securities held by prime money market funds.

[11] Weighted average maturity, yield, and *Issuer Euro share* have missing values whenever the outstanding amount is zero.

statistics for ABCP, non-EU financial, and nonfinancial issuers in our data. The median position is $3 million, and again the distribution is skewed with the mean position size being $73.3 million.

Table 1
Summary Statistics

This table reports summary statistics for prime money market funds and issuers in our data. The sample period is March–August 2011. Panel A reports fund-month level summary statistics. Feeder funds are excluded. Flows are scaled by lagged assets. Portfolio maturity is the weighted average portfolio maturity. Fund-level gross yield is the value reported on form N-MFP. Fund-level net yield is the weighted average of share class-level net yields. Institutional share is the share of fund's assets in institutional shares classes. Fund Euro share is the share of fund's assets invested in Eurozone banks that were part of July 2011 stress tests. Government share is the share of fund's assets invested in Treasury securities. Non-EU financial share is the share of fund's assets invested in financial firms outside the European Union. Panel B reports issuer-month level summary statistics for ABCP, non-EU financial, and nonfinancial issuers. Issuer-level yield is the weighted average of yields calculated across all positions in the issuer. Panel C reports fund-issuer-month level summary statistics for ABCP, non-EU financial, and nonfinancial issuers.

	N	Mean	Median	SD	Min	Max
Panel A: Funds						
Total Net Assets	1,523	7,074.85	1,189.50	16,164.06	0.00	132,348.37
Flows	1,518	−0.08	−0.16	7.29	−24.22	26.79
Portfolio maturity (days)	1,523	38.34	40.00	11.21	0.00	63.00
Gross yield (%)	1,523	0.21	0.22	0.09	0.00	0.49
Net yield (%)	1,523	0.04	0.01	0.07	0.00	1.00
Institutional share (%)	1,520	63.08	99.82	44.86	0.00	100.00
Fund Euro share (%)	1,520	15.29	13.84	11.65	0.00	71.90
ABCP share (%)	1,520	10.09	6.19	11.56	0.00	76.68
Government share (%)	1,520	5.17	2.84	7.23	0.00	84.38
Agency share (%)	1,520	10.82	7.01	13.81	0.00	100.00
Municipal share (%)	1,520	6.14	1.47	10.32	0.00	55.02
Non-EU financial share (%)	1,520	26.52	26.69	13.19	0.00	89.35
Nonfinancial share (%)	1,520	11.06	4.15	15.96	0.00	76.89
Panel B: Issuers						
Outstanding	2,130	2204.95	80.75	6849.24	0.00	57,673.16
Weighted average maturity	1,777	49.08	24.51	73.57	1.00	386.00
Yield (%)	1,676	0.25	0.25	0.12	0.01	0.82
Issuer Euro share (%)	1,777	15.17	15.77	8.37	0.00	46.57
Panel C: Positions						
Outstanding	64,243	73.11	3.00	282.62	0.00	8,004.48
Maturity	37,657	43.78	26.00	57.38	1.00	386.00
Yield (%)	36,616	0.24	0.24	0.12	0.00	1.38
Issuer Euro share (%)	61,829	16.93	17.54	6.63	0.00	46.57
Fund Euro share (%)	64,093	14.85	14.04	10.28	0.00	71.90

It is important to note that most of our analysis is done within the N-MFP data set and

thus does not cover other sources of short-term financing available to these firms, including revolving credit lines and non-money market fund holders of commercial paper. However, according to the Flow of Funds accounts, money market funds are the single largest holder of commercial paper. Therefore, it is unlikely that significant disruptions in the sector are completely offset by other investors. Moreover, in Section 6 we provide suggestive evidence that nonfinancial firms are not able to completely substitute to other sources of commercial paper financing.

We use our fund-issuer-month level data to construct a measure of fund f's exposure to Eurozone banks at time t, which we call *Fund Euro share*,

$$\textit{Fund Euro share}_{f,t} = \frac{\sum_{i \in Eurobanks} Outstanding_{i,f,t}}{\sum_i Outstanding_{i,f,t}}$$

where $Outstanding_{i,f,t}$ is the exposure of fund f to issuer i at time t. *Fund Euro share* is simply the fraction of the fund's assets that is invested in Eurozone banks. In our data, this measure ranges from 0 to 72%, with an average of 15% and a standard deviation of 12%.

In addition we construct a measure of issuer i's indirect exposure to Eurozone banks, which we call *Issuer Euro share*,

$$\textit{Issuer Euro share}_{i,t} = \frac{\sum_f Outstanding_{i,f,t} \times \textit{Fund Euro share}_{f,t}}{\sum_f Outstanding_{i,f,t}}$$

This is the weighted average of *Fund Euro share* across money market funds that provide financing to issuer i. It measures how exposed the funds that provide financing to issuer i are to Eurozone banks. In our data, this measure ranges from 0 to 47%, with an average of 15% and a standard deviation of 8%.

Finally, we augment our money market funds holdings data set with a) the results of European bank stress tests released in July 2011, and b) European bank CDS spreads. We use the stress tests to measure each bank's exposure to Greece, Ireland, Italy, Portugal, and Spain (GIIPS). Our hypothesis is that investors were more likely to withdraw from funds

holding securities of banks with greater exposure to the GIIPS. We also use 1-year CDS spreads of European banks to proxy for their exposure to the GIIPS (and their riskiness more generally).

4 Risk-Taking and Runs

4.1 MMMFs Face Strong Incentives to Take Risk in the Pre Period

Throughout the paper, we separate our analysis into two symmetric periods: June–August 2011 (the post period), the period of large-scale investor redemptions from prime money market funds, and March–May 2011 (the pre period), the three months leading up to these investor redemptions.

We first analyze the incentives money market funds faced to take on risk in the pre period. In Table 2, we show that there is a strong performance-flow relationship in the pre period. We scale fund flows in month t by lagged total net assets, TNA_{t-1}. To ensure that our results are not driven by outliers, for example due to fund mergers or liquidations, fund flows are winsorized at the 1st and 99th percentiles.

In column 1 we regress fund flows on *Fund Euro share* and month fixed effects. The coefficient on *Fund Euro share* during the pre period is positive and statistically significant, reflecting the fact that funds with higher *Fund Euro share* offered higher yields because Eurozone bank exposures commanded higher yields.[12] The economic magnitudes are meaningful. A one standard deviation increase in *Fund Euro share* is associated with an increase of about 51 basis points in monthly fund flows in the pre period. For comparison, mean fund flows in the pre period were −23 basis points on an equal-weighted basis and 82 basis points on a value-weighted basis.

[12] We verify that this is the case in untabulated results.

Table 2
Fund Flows during the Pre Period (March–May 2011)

The dependent variable is net flows scaled by lagged assets, $\frac{Flows_{f,t}}{TNA_{f,t-1}}$, winsorized at the 1st and 99th percentiles. Month fixed effects are included. Fund Euro share is the share of the fund's portfolio invested in Eurozone banks. Fund size is the log of fund TNA. Institutional share is the share of fund assets in institutional share classes. Robust standard errors are reported. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)
Fund Euro share$_{f,t-1}$	0.044**		0.021	0.048**	0.015
	(0.021)		(0.021)	(0.022)	(0.023)
Benelux share$_{f,t-1}$		0.010			
		(0.104)			
France share$_{f,t-1}$		0.112**			
		(0.047)			
GIIPS share$_{f,t-1}$		0.362**			
		(0.177)			
Rest of Eurozone share$_{f,t-1}$		−0.124*			
		(0.068)			
Net yield$_{f,t-1}$			18.594***		17.642***
			(4.115)		(4.347)
Gross yield$_{f,t-1}$				−2.010	
				(2.763)	
Size$_{f,t-1}$					0.001
					(0.001)
Constant	−0.010***	−0.009**	−0.015***	−0.005	−0.021**
	(0.004)	(0.004)	(0.003)	(0.007)	(0.008)
N	761	761	761	761	761
Adjusted R^2	0.006	0.019	0.041	0.005	0.041

Column 2 shows that exposures to banks within different Eurozone countries have different effects on flows. Exposures to GIIPS banks attract the most inflows, while exposures to French banks also attract strong inflows. Exposures to other banks in the Eurozone have either no effect or a negative effect. These results are consistent with the idea that funds are rewarded for taking on the riskiest exposures, which increase their yields the most.

We show this directly in column 3, by adding net yield as a regressor. Net yield comes in strongly positively and reduces the coefficient on *Fund Euro share*, suggesting that the positive effect of *Fund Euro share* in the pre period is due to the higher yields offered by Eurozone banks.

The magnitude of the coefficient on net yield is large. An increase in net yield of 10 basis points is associated with a 186 basis points increase in monthly fund flows. This performance-flow relationship is consistent with the findings of Sirri and Tufano (1998) in the equity mutual fund literature and Kacperzyk and Schnabl (2011) in the money market fund space. While the magnitude of the effect seems very large, it is important to consider the interest rate environment. The median net yield in the pre period is 1 basis point, the average is 4 basis points, and the standard deviation is 7 basis points. If a fund started at the median net yield and increased its yield 10 basis points, it would be in the 88th percentile. Nonetheless, the strength of the relationship shows how intensely money market fund investors desire yield.

Columns 4 and 5 are robustness checks. Column 4 shows that gross yield, the yield earned by fund assets has no effect on flows. Only net yield, the yield paid to investors (net of fund fees) attracts inflows. Column 5 shows that our results are robust to controlling for fund size (lagged log TNA).

Table 2 shows that funds face strong incentives to take on risk by investing in Eurozone banks. Which funds respond most strongly to these incentives? In Table 3, we examine the determinants of *Fund Euro share*. We run cross-sectional regressions of fund f's average *Fund Euro share* in the pre period on fund characteristics.

We first examine basic fund characteristics. Column 1 shows that larger funds tend to have higher *Fund Euro share*. This is consistent with larger funds being more sophisticated and more capable of analyzing foreign issuers. Column 2 shows that funds with higher *Fund Euro share* have higher gross yields, which is to be expected since Eurozone banks offer higher yields than other issuers in the pre period. Going from a *Fund Euro share* of 0 to 100% increases gross yields by 19 basis points. Column 3 shows the same result for net yields. Going from a *Fund Euro share* of 0 to 100% increases net yields by 12 basis points, suggesting that funds do not pass on all of the incremental yield from investing in Eurozone banks to their investors.

Table 3
Determinants of Fund Exposure to Eurozone Banks

The dependent variable is *Fund Euro share*$_{f,pre}$, the share of the fund's portfolio invested in Eurozone banks, averaged over the pre period, March–May 2011. Fund size is the log of fund TNA. Adviser's MMMF share is the fraction of money market funds in the fund adviser's total assets under management. Fee waivers is the ratio of waived fees to fund TNA. Institutional share is the share of fund assets in institutional share classes. Gross yield is the 7-day gross yield reported by the fund. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Size	0.020***	0.019***	0.018***	0.022***	0.019***	0.015***	0.024***	0.017***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Gross yield		25.184***						
		(7.817)						
Net yield			18.189*					
			(10.509)					
Portfolio maturity				−0.002**				
				(0.001)				
Institutional share					0.022			
					(0.015)			
Adviser's MMMF share						0.165***		0.097***
						(0.033)		(0.036)
Fee waivers							3.824*	−4.403
							(2.264)	(2.820)
Adviser's MMMF share × Fee waivers								22.555***
								(7.215)
Constant	0.024	−0.026	0.029	0.077*	0.013	0.019	−0.011	0.022
	(0.025)	(0.026)	(0.025)	(0.039)	(0.024)	(0.024)	(0.029)	(0.030)
N	258	258	258	258	258	247	254	243
Adjusted R^2	0.135	0.169	0.141	0.154	0.140	0.230	0.149	0.246

Column 4 shows that funds with higher *Fund Euro shares* have lower portfolio maturity, reflecting the fact that Eurobank exposures tend to have shorter maturities than other exposures.

We next turn to fund characteristics that have a more direct economic link to risk taking. We first examine whether funds that cater to institutional investors tend to invest more in Eurozone banks. One might expect this to be the case because institutional investors monitor their investments more closely and may therefore be more aggressive in seeking out the funds with the highest yields. Column 5 shows that institutional funds have higher *Fund Euro share*, though the effect is not statistically significant.

We next examine the idea that funds with significant franchise or reputational value at stake take less risk. If the failure of a money market fund impairs the franchise value of the other funds managed by the same asset manager, the manager will have an incentive to rein in risk taking by the money market fund. For instance, an asset manager with a large number of equity mutual funds may not want the stream of income generated by those funds to be jeopardized by risk taking within its money market fund. The larger the other funds are relative to the adviser's money market funds, the stronger these incentives will be. Column 6 shows that this is the case. *Fund Euro share* is higher when money market funds make up a larger fraction of the overall mutual fund assets managed by the fund's adviser.[13,14]

Next we turn to the effect of operating leverage on risk taking. During the pre period asset yields were so low that many money market funds were forced to waive some of their fees in order to maintain a non-negative net yield. If funds have some fixed costs, this effectively means that their operating leverage increased, which should encourage additional risk-taking. Column 7 shows that funds offering larger fee waivers (as a percentage of fund assets) have higher *Fund Euro share*s. A one standard deviation increase in waivers is associated with a 1.3% higher *Fund Euro share*. Column 8 shows that this effect is concentrated among funds managed by advisers with large fraction of total mutual fund assets under management invested in prime money market funds. This makes sense—an asset manager with little franchise value at stake and few other sources of income to help cover expenses will be more likely take on risk to help cover those expenses.

[13] We measure *Adviser's MMMF share* as follows. First, using our N-MFP data, we calculate the total TNA of all prime money market funds managed by an adviser. Second, using the CRSP mutual fund database, we calculate the total TNA of all mutual funds managed by the adviser. Finally, we calculate the ratio of the two numbers as of March 2011.

[14] To account for correlation across funds managed by the same adviser, we calculate standard errors clustered by adviser.

4.2 Investors Withdraw from Funds with Larger Eurozone Exposure

We now turn to the consequences in the post period of the money market fund risk-taking documented above. In Table 4 we examine the determinants of fund flows in the post period. In column 1 we regress fund flows on *Fund Euro share*. In contrast to the pre period, where *Fund Euro share* had a positive effect on flows, in the post period the effect of *Fund Euro share* is significantly negative and much larger in magnitude. A one standard deviation increase in lagged *Fund Euro share* is associated with a 165 basis points decrease in monthly fund flows. Mean fund flows in the post period were 8 basis points on an equal-weighted basis and −292 basis points on a value-weighted basis, so the effect of *Fund Euro share* is large.

Column 2 shows that our results are robust to controlling for net yield. In contrast to our results for the pre period, net yield does not drive out the effect of *Fund Euro share* in the post period. Funds with higher net yields experience larger outflows in the post period[15], but there is a strong independent effect of *Fund Euro share* in the post period. This suggests that money market fund investors were withdrawing both from funds with large exposures to Eurozone banks and from funds that generally invest in riskier assets. Column 3 shows that the effect of *Fund Euro share* is robust controlling for fund size (lagged log TNA). Larger funds tend to experience outflows in the post period, but the effect of *Fund Euro share* in the post period is still large and significant.

It may seem somewhat surprising that money market fund investors evaluate the exposures of their funds to Eurozone banks. After all, the relative safety of these funds should weaken investor incentives to monitor risk-taking (Kacperzyk and Schnabl 2009). However, as column 4 shows, our results are largely driven by funds that cater to institutional in-

[15] This result is consistent with McCabe (2010). Using gross yield as a measure of portfolio risk, he shows that following the collapse of Lehman Brothers, funds with higher gross yields experienced larger outflows and were more likely to be supported by their sponsors.

Table 4
Fund Flows during the Post Period (June–August 2011)

The dependent variable is net flows scaled by lagged assets, $\frac{Flows_{f,t}}{TNA_{f,t-1}}$, winsorized at the 1st and 99th percentiles. Month fixed effects are included. Fund Euro share is the share of the fund's portfolio invested in Eurozone banks. Fund size is the log of fund TNA. Institutional share is the share of fund assets in institutional share classes. Fund Euro share^{GIIPS} is the share of the fund's portfolio invested in Eurozone banks, weighted by each bank's exposure to the GIIPS (scaled by Tier 1 capital). Portfolio insurance is the cost in percentage points of insuring $1 of the fund's portfolio using CDS. Portfolio insurance ignores the correlation across issuers, and assumes zero CDS spreads on all issuers other than Eurozone financials. Robust standard errors are reported. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fund Euro share$_{f,t-1}$	-0.142^{***}	-0.131^{***}	-0.098^{***}	-0.052			-0.100
	(0.023)	(0.023)	(0.023)	(0.032)			(0.110)
Net yield$_{f,t-1}$		-13.435^{**}	-6.294				
		(6.063)	(5.993)				
Size$_{f,t-1}$			-0.007^{***}				
			(0.002)				
Institutional share$_{f,t-1}$				0.014			
				(0.009)			
Fund Euro share$_{f,t-1}$ × Institutional share$_{f,t-1}$				-0.134^{***}			
				(0.046)			
Fund Euro share$^{GIIPS}_{f,t-1}$					-0.126^{***}		0.043
					(0.021)		(0.094)
Portfolio insurance$_{f,t-1}$						-0.175^{***}	-0.119^{*}
						(0.027)	(0.062)
Constant	0.023^{***}	0.026^{***}	0.065^{***}	0.014^{**}	0.021^{***}	0.024^{***}	0.025^{***}
	(0.004)	(0.004)	(0.010)	(0.006)	(0.004)	(0.004)	(0.004)
N	755	755	755	755	755	755	755
Adjusted R^2	0.074	0.080	0.101	0.081	0.071	0.077	0.077

vestors. Such investors are more likely to have the incentives and capabilities necessary to closely monitor fund risk taking. For instance, they likely subscribe to reports by brokerage houses, money market data providers such as iMoneyNet and Crane Data, and the credit rating agencies, which were reporting on money market fund exposures to European banks at the time (e.g., "US Money Fund Exposure to European Banks Remains Significant," Fitch Ratings 2011).[16] In column 4, we interact *Fund Euro share* with the share of the fund's assets

[16] For example, in its 2010 annual report, Honeywell states: "We monitor the third-party depository insti-

in institutional share classes. In the post period, institutional funds with high *Fund Euro share* suffer large outflows, while the coefficient on *Fund Euro share* alone is still negative but no longer statistically significant.

In the remaining columns of Table 4, we examine whether investors treat all money market fund exposures to Eurozone banks the same or whether they withdraw more financing from funds with exposures to riskier banks. In column 5, we incorporate information from the bank stress tests conducted by the European Banking Authority in June 2011. Specifically, we weight each fund-level exposure to a Eurozone bank by that bank's exposure to the sovereign debt of the GIIPS. We measure a bank's exposure to the GIIPS as the bank's reported net direct exposure to the five countries as a fraction of the bank's Tier 1 capital. The results are again similar to those in our baseline regression in column 1.

In column 6, we use CDS spreads to construct a measure of the riskiness of a fund's exposure to Eurozone banks. This measure, which we call portfolio insurance, is the cost in percentage points of insuring \$1 of the fund's portfolio using CDS. Formally our measure is

$$Portfolio\ Insurance_{f,t} = \frac{\sum_{i \in Eurobanks} Outstanding_{i,f,t} \times CDS_{i,t}}{\sum_i Outstanding_{i,f,t}}$$

This portfolio insurance measure ignores the correlation of defaults across issuers, and assumes zero CDS spreads on all issuers other than Eurozone banks. The mean and standard deviation of our portfolio insurance measure are about 10 and 8 basis points.

Despite being a noisy measure, *Portfolio insurance* comes in strongly negatively. A one standard deviation increase in lagged *Portfolio Insurance* is associated with a decrease of about 179 basis points in fund flows during the post period.

Finally in column 6, we run a horse race of our different measures of money market fund exposures to Eurozone bank risk. The results show that the portfolio insurance measure drives out all other measures. This suggests that investors in money market mutual funds

tutions that hold our cash and cash equivalents on a daily basis."

do not treat all fund exposures to Eurozone banks the same. Investors are more likely to withdraw financing from funds with exposures to the riskiest banks. This is again consistent with the idea that institutional investors monitor the assets of the money market funds they are invested in.

5 Collateral Damage

We next show that, while it may be individually rational, the risk-taking behavior documented above can have significant spillover effects on other issuers and therefore on the real economy. Specifically, we find that money market funds effectively transmit distress from Eurozone banks to other firms, particularly nonfinancial firms, by temporarily disrupting their ability to raise financing in the money markets.

Before we turn to the results, it is worth discussing why we might expect to observe such spillovers. The key institutional friction is that individual money market funds are typically constrained to purchase securities from a fixed list of issuers that their boards have pre-approved.[17] In particular, SEC Rule 2a-7, which governs money market funds, states: "The money market fund shall limit its portfolio investments to those United States Dollar-Denominated securities that the fund's board of directors determines present minimal credit risks." Thus, if a money market fund that typically provides financing to a particular issuer becomes constrained due to outflows, there may not be many other funds that can immediately step in to provide financing to that issuer. As we saw above, money market funds with large exposures to Eurozone banks suffered significant outflows in the post period. Thus, we might expect the non-Eurozone bank issuers financed by those funds to experience temporary difficulties raising financing. Moreover, money market funds are subject to concentration limits: no more than 5% of a fund's assets may be invested in a particular issuer.

[17] In an effort to increase transparency and alleviate concerns about their exposures, some funds, such as Reich & Tang Natixis Liquid Prime Portfolio, have started publishing their approved issuer lists on their websites.

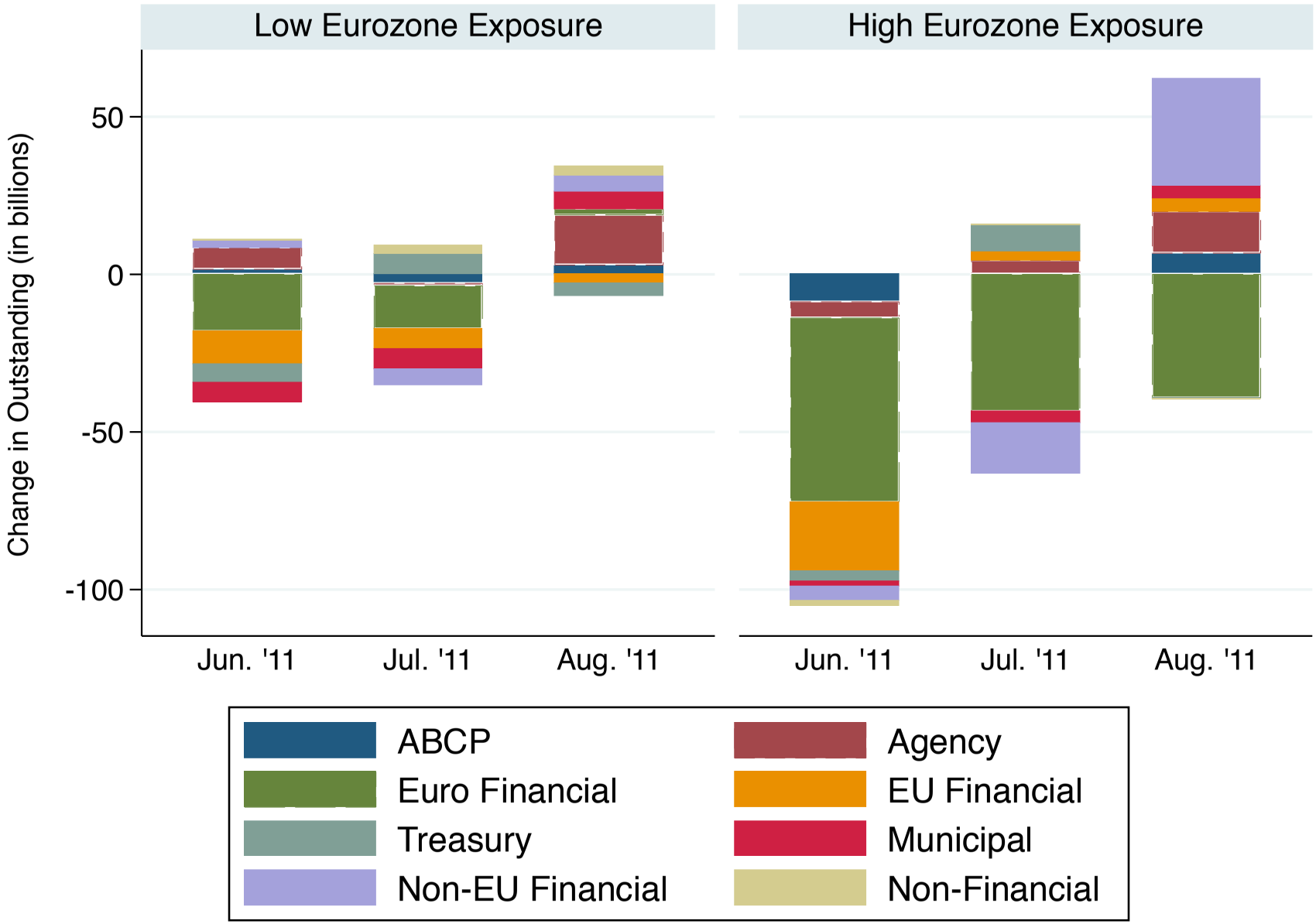
Thus, in the presence of slow-moving capital (Duffie, 2010), funds not suffering outflows may not be able to increase the amount of financing they provide to a pre-approved issuer.

In addition, relationships between issuers and specific money market funds—either direct or intermediated by dealers—may be important for mitigating short-run adverse selection problems, even in the absence of formal regulatory constraints. If a money market fund that typically provides financing to a particular issuer becomes constrained due to outflows, that issuer will have to seek financing from other funds, possibly offering higher yields as an enticement. However, as in Rajan (1992), other funds may fear that the issuer's inability to raise financing from its typical funders reflects inside information on the part of those funders. Thus, they may be unwilling to provide financing in the short run until they have done their own research.

Figure 3 summarizes the aggregate patterns in our data. We split money market funds by their exposure to Eurozone banks in May 2011, defining funds in the top quartile as high Eurozone exposure, and show the monthly changes in their aggregate holdings of different issuer types during June, July, and August 2011. Faced with large redemptions in June, high Eurozone exposure funds were forced to reduce their holdings across virtually all issuer types. This suggests that high Eurozone funds were a channel for the transmission of distress from Eurozone banks to other firms that raise financing in the money markets. Low Eurozone exposure funds only partially offset these reductions by increasing their exposures to non-financials and non-EU financials. In July, high Eurozone exposure funds are faced with smaller but still significant redemptions and continue to reduce their positions in both EU and non-EU financials, while low Eurozone exposure funds continue to increase their exposures to nonfinancials. Finally in August withdrawals begin to abate, and high Eurozone exposure funds begin to rebuild their exposure to non-EU financials.

Table 5 uses our issuer-level data to show more formal evidence that money market funds effectively transmit distress from Eurozone banks to other firms. We take a transparent approach, collapsing our monthly panel into a single issuer-level cross section. We exclude

Figure 3
Changes in Exposure to Different Issuer Types by Fund Eurozone Exposure
Funds are split into high versus low Eurozone exposure at the 75th percentile of exposure to Eurozone banks as of May 2011.



government, agency, supranational, and municipal issuers, as well as investment companies. We also exclude EU and Eurozone financial institutions that are not banks because these issuers may have significant direct exposures to Eurozone banks. All our results would be stronger if we included these issuers. It is important to note that this means that our estimates are likely to be a lower bound on the cross-firm spillover effects transmitted by money market funds. European financials are the issuers for whom spillovers are likely to be most important. We omit them for the sake of cleaner identification, but this comes at the cost of underestimating the magnitude of the spillovers. Our final sample consists of non-EU financials, nonfinancials, and asset-backed commercial paper (ABCP) issuers.

The dependent variable is the percentage change in average outstanding amount for each issuer between the pre (March–May 2011) and post (June–August 2011) periods. The independent variable is *Issuer Euro share*: the average exposure to Eurozone banks of the money market funds that finance the issuer in the pre period. Thus, we run the following regression

$$\Delta \overline{Outstanding_i} = \alpha + \beta \times Issuer\ Euro\ share_i + \varepsilon_i$$

In some specifications we include fixed effects for each issuer type (e.g., ABCP, non-EU financial, and nonfinancial), to ensure that our results are not driven by a general decline in financing for a particular issuer type.

Column 1 of Panel A shows that being financed by money market funds that have large Eurozone bank exposures has a strong effect on issuers that are not Eurozone banks. Issuers with a 10% higher *Issuer Euro share* (i.e., financed by money market funds with 10% higher exposure to Eurozone banks in the pre period) grow their financing 30–40% less in the post period.

In column 2 we add issuer type fixed effects and get similar results. In column 3, we control for the average yield offered by the issuer in the pre period. This helps to show that our results are not solely driven by a general aversion to risk among money market fund managers. In particular, one might worry that funds that invest in Eurozone banks generally

Table 5
Spillovers to Other Issuers

The dependent variable is $\Delta\overline{Outstanding_i}$, the relative change in the issuer's average outstanding amount between the pre and post periods. The change in outstanding is winsorized at the 1st and 99th percentile. Pre period is March–May 2011. Post period is June–August 2011. Issuer i's Euro share in month t is the share of issuer i held by fund f times the share of fund f's portfolio invested in Eurozone banks, summed over all funds holding issuer i in month t. The sample includes ABCP, non-EU financial, and nonfinancial issuers. Robust standard errors are reported. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

Panel A: Pooled Regressions						
	Equal-weighted			Value-weighted		
	(1)	(2)	(3)	(4)	(5)	(6)
Issuer Euro share$_i$	−4.050***	−3.410***	−3.077**	−0.775*	−1.912***	−1.824***
	(1.146)	(1.146)	(1.205)	(0.455)	(0.588)	(0.637)
Yield$_i$			−0.868			−0.238
			(0.725)			(0.464)
Constant	0.916***	0.809***	0.984***	0.160	0.419***	0.465***
	(0.246)	(0.237)	(0.273)	(0.104)	(0.134)	(0.156)
N	302	302	302	302	302	302
Adjusted R^2	0.068	0.070	0.072	0.015	0.050	0.049
Issuer type FE	No	Yes	Yes	No	Yes	Yes

Panel B: Results by Issuer Type						
	ABCP		Non-EU financial		Nonfinancial	
	EW	VW	EW	VW	EW	VW
Issuer Euro share$_i$	−1.768	−1.868	−0.853	−1.991**	−4.400***	−1.751**
	(2.615)	(1.221)	(0.762)	(0.901)	(1.576)	(0.841)
Constant	0.389	0.336	0.117	0.477**	1.056***	0.213
	(0.566)	(0.254)	(0.167)	(0.219)	(0.300)	(0.138)
N	72	72	86	86	158	158
Adjusted R^2	0.010	0.020	0.005	0.070	0.048	0.035

invest in other riskier issuers as well, and that the post period is associated with reduced exposure to all risky issuers. Column 3 shows that while the issuer's average yield in the pre period commands a negative but not statistically significant coefficient, the coefficient on *Issuer Euro share* is not changed.

Columns 4–6 repeat the exercise value-weighting issuers. That is, we weight firms by their total financing raised from money market funds in the pre period. The magnitudes here are somewhat smaller, but still economically and statistically significant. Issuers with a 10% higher *Issuer Euro share* grow their financing 8-19% less in the post period. Panel

B examines the results for each issuer type separately. Starting with ABCP issuers, we see large negative coefficients associated with being financed by money market funds with large Eurozone bank exposures. However, there are relatively few ABCP issuers so the coefficients are imprecisely estimated and not statistically significant. For non-EU financial firms, we find a negative and insignificant coefficient when we equal-weight and a significant negative coefficient when we value-weight. For nonfinancial firms we find large, significant, negative coefficients both when we equal-weight and when we value-weight.

5.1 Documenting the Mechanism: Fund-Issuer Level Evidence

We next document the mechanism driving our spillover results. In particular, we show that the reduction in financing we find in the previous section is indeed driven by the withdrawal of funding from money market mutual funds with high exposure to Eurozone banks.

To document this, we turn to our fund-issuer level data. We again work with a single cross section, but now the unit of observation is a fund-issuer pair. Specifically, for each money market fund f and each issuer i, we calculate the fund's average holdings of the issuer's securities in the pre (March–May 2010) and post (June–August 2010) periods. We then construct the percentage change in this fund-issuer exposure measure between the pre and post periods, winsorizing at the 10th and 90th percentiles because changes in exposure size can be quite volatile.[18] Finally, recall that the institutional friction we have in mind is that the issuer has to be on the pre-approved list in order for a money market fund to purchase its securities. Thus we would not expect to find significant spillovers for issuers pre-approved across a large number of funds. Yet these widely held issuers constitute a larger fraction of our fund-issuer level data set. Therefore to focus on issuers that are more likely to be affected, we exclude the top 10 issuers by the total outstanding during the pre period.

[18] The issuer-level change in outstanding measure used in the previous section has a standard deviation of 26.93 when unwinsorized and 1.27 when winsorized at the 1% level. The fund-issuer level measure has a standard deviation of 157.84 when unwinsorized and 0.66 when winsorized at the 10% level. This more aggressive winsorization only affects the equal-weighted results in columns 1 and 2 of Table 6.

We regress the percentage change in fund-issuer exposure on the exposure of the fund to Eurozone banks with issuer fixed effects:

$$\Delta \overline{Outstanding_{i,f}} = \alpha_i + \beta \times \textit{Fund Euro share}_f + \varepsilon_{i,f}$$

All our identification is coming within issuer. The regressions ask whether funds with higher exposure to Eurozone banks behave differently than those with lower exposure, holding fixed the issuer. Thus, the results cannot be explained by unobservable issuer characteristics, including riskiness. The identification strategy is similar in spirit to Khwaja and Mian (2008), who study the effects of bank liquidity shocks in Pakistan by looking within firms that borrow from multiple banks. We cluster our standard errors by fund because the independent variable is constant within fund (see Kloek, 1981; Moulton, 1990).

Table 6 shows the results. In the first column, the coefficient on *Fund Euro share* is negative and statistically significant. The magnitudes here are economically significant. A money market fund with a 10% larger exposure to Eurozone banks reduces its exposure to a given issuer 3.3% more.

In column 2, we try to more directly document the importance of relationships in this market. For each fund-issuer pair, we count the number of months during the November 2010–May 2011 period when the fund holds a positive amount of the issuer's securities. We call the relationship between a fund and an issuer strong if the number of months counted is above the median across all funds holding the issuer. Thus, a strong relationship is one where the issuer consistently raises financing from the fund. Column 2 shows that the effect of *Fund Euro share* is larger for weak relationships than for strong ones, though the difference between the two coefficients is not statistically significant.

Columns 3 and 4 show that the magnitudes of the point estimates get even larger when we value-weight the regression using fund-issuer exposure during the pre period. This is not simply a matter of the smallest issuers getting shut out of the market (keep in mind, however,

Table 6
Fund-Issuer Level Results

This table reports the results of the regressions of the change in fund f's exposure to issuer i between the pre and post periods. In Panel A, the dependent variable is $\Delta\overline{Outstanding}_{i,f}$, the relative change in the average exposure of fund f to issuer i between the pre and post periods. The change in exposure is winsorized at the 10th and 90th percentiles. In Panel B, the dependent variable, $Exit_{i,f}$, is equal to 1 if $\Delta\overline{Outstanding}_{i,f}$ is equal to -100%, and is equal to 0 otherwise. The sample includes ABCP, non-EU financial, and nonfinancial issuers. Issuer fixed effects are included in all specifications. Value-weighted regressions use average fund-issuer exposures during the pre period as weights. Top 10 issuers by the total outstanding during the pre period are excluded. Pre period is March–May 2011. Post period is June–August 2011. Standard errors are adjusted for clustering by fund. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	Equal-weighted		Value-weighted	
	(1)	(2)	(3)	(4)
Panel A: $\Delta\overline{Outstanding}_{i,f}$				
Fund Euro share$_{f,pre}$	−0.333**		−0.508**	
	(0.162)		(0.239)	
Weak relationship$_{i,f}$		0.054		0.204**
		(0.050)		(0.084)
Fund Euro share$_{f,pre}$× Weak relationship$_{i,f}$		−0.543**		−1.518***
		(0.244)		(0.435)
Fund Euro share$_{f,pre}$× Strong relationship$_{i,f}$		−0.251		−0.386
		(0.180)		(0.253)
Constant	−0.056**	−0.070***	−0.051	−0.070*
	(0.025)	(0.026)	(0.038)	(0.038)
N	6242	6242	6242	6242
Adjusted R^2	0.105	0.105	0.100	0.105
Panel B: $Exit_{i,f}$				
Fund Euro share$_{f,pre}$	0.379***		0.336***	
	(0.097)		(0.057)	
Weak relationship$_{i,f}$		0.186***		0.077*
		(0.032)		(0.044)
Fund Euro share$_{f,pre}$× Weak relationship$_{i,f}$		0.350**		0.689***
		(0.146)		(0.189)
Fund Euro share$_{f,pre}$× Strong relationship$_{i,f}$		0.275***		0.273***
		(0.098)		(0.063)
Constant	0.130***	0.097***	0.006	−0.002
	(0.016)	(0.015)	(0.012)	(0.011)
N	6242	6242	6242	6242
Adjusted R^2	0.149	0.195	0.122	0.166

that we are excluding the largest issuers). Moreover, column 4 shows that the importance of relationships is even more apparent when we value-weight. In this case, the difference

between the coefficients is statistically significant.

Panel B of Table 6 uses a different dependent variable. We simply look at whether fund-issuer level exposures that are nonzero in the pre period are completely closed out in the post period. This is equivalent to the change in the exposure variable used in Panel A being equal to -100%. The regression coefficient in column 1 is positive and significant. A fund with a 10% higher *Fund Euro share* is 3.8% more likely to completely exit its position in a given issuer. Given a baseline exit rate of 13%, this represents a 29% increase. Column 2 shows that weak relationships are more likely to be exited than strong ones. Finally, in columns 3 and 4, we get similarly strong value-weighted results. In fact, the economic magnitude is even larger because in value-weighted terms the baseline exit rate is lower.

5.2 Documenting the Mechanism: Substitution Across Funds

We now examine the extent to which issuers try to raise substitute financing from funds not facing significant redemptions in the post period.[19] We examine the fund-issuer level data, focusing only on variation within fund rather than the within issuer variation we analyzed in the last section. We provide evidence that unconstrained funds with low *Fund Euro share* try to fill the gap left when constrained funds with high *Fund Euro share* withdraw financing.

Specifically, we regress the change in fund-issuer exposure on *Issuer Euro share* with fund fixed effects. Now all identification is coming within fund. The regressions ask whether funds treat issuers with higher *Issuer Euro share* differently than they treat other issuers, holding fixed the fund.

Column 1 of Table 7 shows that the coefficient on *Issuer Euro share* is positive, though not significant, when we include fund level fixed effects. Within a given fund, funds actually

[19] Note that *Issuer Euro share* already impounds some information about the ability of issuers to substitute since it is a weighted average across all funds that provide the issuer with financing. Even if an issuer raises financing from a large number of funds, if those funds all have high *Fund Euro share*, the issuer will still have difficulty raising financing in the post period.

try to increase financing provided to issuers with high *Issuer Euro share* relative to other issuers. Columns 2 and 3 show that this effect is completely driven by funds with low (below median) *Fund Euro share*. These funds did not face heavy investor redemptions in the post period and therefore were able to provide partial substitute financing for issuers with high *Issuer Euro share*. In contrast, funds with high *Fund Euro share* faced heavy redemptions and had to reduce their positions across the board. The issuer-level results in Table 6 show that funds with low *Fund Euro share* were not able to completely offset this withdrawal of financing. This makes sense since larger funds tend to have higher *Fund Euro share*.

Table 7
Substitution across Funds

This table reports the results of the regressions of the change in fund f's average exposure to issuer i between the pre and post periods on fund fixed effects and issuer Euro share, split by fund Euro share. The sample includes ABCP, non-EU financial, and nonfinancial issuers. Fund fixed effects are included in all specifications. Value-weighted regressions use average fund-issuer exposures during the pre period as weights. Top 10 issuers by the total outstanding during the pre period are excluded. Pre period is March–May 2011. Post period is June–August 2011. Standard errors are adjusted for clustering by issuer. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	Equal-weighted			Value-weighted		
	All Funds	Low Euro Share Funds	High Euro Share Funds	All Funds	Low Euro Share Funds	High Euro Share Funds
	(1)	(2)	(3)	(4)	(5)	(6)
Issuer Euro share$_{f,pre}$	0.438	0.985**	−0.278	0.520	1.027**	0.143
	(0.339)	(0.389)	(0.546)	(0.518)	(0.512)	(0.796)
Constant	−0.188***	−0.240***	−0.078	−0.265**	−0.286***	−0.209
	(0.064)	(0.064)	(0.114)	(0.107)	(0.098)	(0.169)
N	6242	3120	3122	6242	3120	3122
Adjusted R^2	0.055	0.048	0.063	0.104	0.044	0.120

Columns 4–6 show that we obtain similar results when we value-weight the regressions.

6 Discussion

Our results show how money market funds transmitted funding difficulties from Eurozone banks to other issuers in the summer of 2011. It is important to keep in mind that the initial

shock here, while significant, was relatively slow-moving. Redemptions from prime money market funds totalled $170 billion, but took 3 months to accumulate. In contrast, prime money market funds lost $200 billion dollars in the *week* following the Lehman Brothers bankruptcy in September 2008. The spillovers we document here would likely be much more severe if the initial shock were of that magnitude.

Moreover, most firms raising financing from money market funds are large and highly rated. In the absence of broader disruptions to the financial system, such firms should be able to substitute to other sources of financing relatively easily. In Table 8, we provide suggestive evidence that even large and highly rated firms are not able to completely and instantaneously substitute. We match as many of the nonfinancial firms as possible from our N-MFP data to Capital IQ. From Capital IQ we obtain quarterly balance sheet information on commercial paper outstanding and cash holdings. To account for the relative importance of money market funds as a source of short-term financing for a given issuer, we scale *Issuer Euro share* by the fraction of the issuer's outstanding CP held by money market funds.

Table 8
Changes in Outstanding CP and Cash Holdings

This table reports the results of regressions of the percentage change in total outstanding Commercial Paper (CP) and cash holdings for non-European nonfinancial issuers on their CP Euro share. For all nonfinancial issuers in our data that are not located in Europe, we obtain aggregate CP and cash holdings from Capital IQ. Issuer CP Euro share is the March 2011 value of $Issuer\ Euro\ share_i$ multiplied by money market funds' share of the issuer's outstanding CP, calculated as the ratio of $Outstanding_{i,t}$ to issuer's outstanding CP from Capital IQ. Robust standard errors are reported. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	ΔOutstanding CP			ΔCash Holdings		
	$Q2-Q1$	$Q3-Q2$	$Q3-Q1$	$Q2-Q1$	$Q3-Q2$	$Q3-Q1$
	(1)	(2)	(3)	(4)	(5)	(6)
Issuer CP Euro share$_i$	−1.385	−7.524**	−8.612***	0.250	−1.476**	−1.220*
	(4.213)	(3.128)	(2.946)	(0.592)	(0.643)	(0.682)
Constant	0.186**	0.283*	0.311**	0.085*	0.117**	0.153**
	(0.092)	(0.149)	(0.121)	(0.044)	(0.047)	(0.059)
N	68	68	68	94	94	94
Adjusted R^2	−0.013	0.010	0.032	−0.010	0.007	−0.003

Since we can only match a subset of the firms in our sample and the data are only available

quarterly rather than monthly, the power of our tests is limited. However as Table 8 shows, for this small subsample, there is suggestive evidence that total CP outstanding and cash holdings decline with *Issuer Euro share*. This suggests that firms with higher *Issuer Euro share* are unable to fully substitute to non-money market fund sources of financing and use cash to pay off their commercial paper as it matures. Thus, even in the case of a significant, but by no means catastrophic, initial shock, there is a detectable effect on firm capital structure.

The spillovers we document here likely operate in a similar manner but at a much larger scale in periods of significant financial stress. Therefore, it is worth emphasizing the financial stability implications of our results. We show that in the pre period, money market funds had strong incentives to take on risk. In particular, column 3 of Table 2 shows that a fund offering a 10 basis points higher yield attracted 186 basis points more flows. Since Eurozone banks were offering yields 10–20 basis points higher than other financial firms, money market funds interested in maximizing assets under management would be enticed to take on exposures to those banks. This does not appear to be moral hazard on the part of fund managers. Our results suggest that investors monitor the holdings of their money market funds, and are therefore aware of their risk taking.

Of course, our results do not speak to the ex ante efficiency of this risk taking. The extension of credit to Eurozone banks may have been desirable ex ante. Our results simply demonstrate that once money market fund investors began to run, the risk taking stimulated by investors' desire to pick up a few basis points adversely affected other firms.

The transmission mechanism documented here is created by two key features of money market funds. First, the funds issue short-term liabilities with fixed values (i.e., the funds offer stable NAV shares). This gives fund investors incentives to run, redeeming their liabilities when they perceive a risk that the fund may suffer losses. Second, money market funds invest in assets that are relatively short-term (but of longer maturity than their liabilities). This means that issuers can have difficulty rolling their financing or raising new financing

when money market funds are constrained.[20]

Both of these features have recently come under scrutiny as academics and policymakers have tried to understand the role of money market funds in financial crises. The SEC recently enacted changes to rule 2a-7, which governs money market funds, requiring funds to invest in higher quality assets of shorter maturities and maintain larger buffers of "liquid assets." However, the events documented in this paper took place after these changes were enacted. There are three reasons these changes may not have fully eliminated the type of spillovers we document. First, incentives for investors to run remain. Second, the required liquidity buffers are fixed over time so funds may not be able to simply draw them down to meet redemptions in periods of turmoil. Third, the tighter restrictions on asset maturity mean that issuers must return to the money markets more often, increasing their vulnerability to short-term disruptions.

There have also been calls for stronger reforms. The SEC itself is studying a proposal to eliminate the stable NAV of money market funds and require them to quote the market value of their assets like other mutual funds. This would potentially reduce investor incentives to run. The Squam Lake Group (2011), a group of prominent financial economists, calls for money market funds to have capital buffers to insulate their investors from moderate fluctuations in asset values. Ricks (2011a,b) calls for regulations similar to those governing commercial banks for any issuer of short-term "money-like" claims. Gorton and Metrick (2010) call for insurance of money market funds to guarantee their investors payment and eliminate incentives to run.

[20] These two features also distinguish our results from the empirical literature on financial contagion, including Bae, Karolyi, and Stulz (2003) and Cella, Ellul, and Giannetti (2010). This literature typically studies equity prices, which impact issuers less directly since equity is permanent capital.

7 Conclusion

We use the market turmoil involving Eurozone banks in the summer of 2011 to explore the instabilities associated with money market funds. We document how money market funds transmitted distress from Eurozone banks to other issuers. Money market funds with large exposures to Eurozone banks suffered significant outflows between June and August 2011. Due to institutional and market frictions, other issuers that historically raised financing from these funds were unable to immediately and completely substitute to other money market funds. As a result, these issuers raised less overall financing from the money markets in the short run.

We make several contributions. First, we document how financial intermediaries transmit distress across firms. Our results demonstrate that problems at some firms raising financing from an intermediary can be detrimental to other firms raising financing from the same intermediary. Second, we show that fund-issuer relationships are important in the commercial paper market. Since these issuers are large, highly rated firms, this suggests that relationships always play a central role in finance—arm's length financing is never completely arm's length. Third, we study the consequences of money market fund risk taking for issuers. We show that creditworthy issuers may encounter financing difficulties because of risk taking by the funds from which they raise financing. Our results suggest that money market fund risk taking may have spillover effects to the broader economy.

References

Adrian, Tobias, Karin Kimbrough, and Dina Marchioni, 2011, The Federal Reserve's Commercial Paper Funding Facility, *Federal Reserve Bank of New York Economic Policy Review* 17, 25–39.

Babo, Naohiko, Robert McCauley, and Srichander Ramaswamy, 2009, US dollar money market funds and non-US banks, in *BIS Quarterly Review, March 2009* pp. 65–81.

Bae, Kee-Hong, G. Andrew Karolyi, and Rene M. Stulz, 2003, A new approach to measuring financial contagion, *Review of Financial Studies* 16, 717–763.

Bernanke, Ben S., 1983, Nonmonetary effects of the financial crisis in the propagation of the Great Depression, *The American Economic Review* 73, 257–276.

Brunnermeier, Markus, and Martin Oehmke, forthcoming, The maturity rat race, *Journal of Finance*.

Calomiris, Charles, and Gary Gorton, 1991, The origin of banking panics: Models, facts, and bank regulation, in R. Glenn Hubbard, ed.: *Financial Markets and Financial Crises* . pp. 109–174 (The University of Chicago Press).

Calomiris, Charles W., and Joseph R. Mason, 2003, Fundamentals, panics, and bank distress during the Depression, *The American Economic Review* 93, 1615–1647.

Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller, 2008, Bootstrap-based improvements for inference with clustered errors, *Review of Economics and Statistics* 90, 414–427.

Cella, Cristina, Andrew Ellul, and Mariassunta Giannetti, 2010, Investors' horizons and the amplification of market shocks, ECGI - Finance Working Paper No. 298/2010.

Chevalier, Judith, and Glenn Ellison, 1997, Risk taking by mutual funds as a response to incentives, *Journal of Political Economy* 105, 1167–1200.

——— , 1999, Career concerns of mutual fund managers, *The Quarterly Journal of Economics* 114, 389–432.

Diamond, Douglas W., and Philip H. Dybvig, 1983, Bank runs, deposit insurance, and liquidity, *Journal of Political Economy* 91, 401–419.

Donald, Stephen G., and Kevin Lang, 2007, Inference with difference-in-differences and other panel data, *Review of Economics and Statistics* 89, 221–233.

Duffie, Darrell, 2010, Presidential address: Asset price dynamics with slow-moving capital, *Journal of Finance* 65, 1237–1267.

Duygan-Bump, Burcu, Patrick M. Parkinson, Eric S. Rosengren, Gustavo A. Suarez, and Paul S. Willen, 2010, How effective were the Federal Reserve emergency liquidity facilities? evidence from the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, Federal Reserve Bank of Boston working paper QAU10-3.

Economist, 2011, Chest pains: Europe's sovereign-debt crisis is constricting the flow of money to its banks, *Economist* August 27, 2011.

Financial Stability Oversight Council, 2011, 2011 Annual Report, .

Gorton, Gary, 2010, *Slapped by the Invisible Hand: The Panic of 2007* (Oxford University Press: New York).

——— , and Andrew Metrick, 2010, Regulating the shadow banking system, *Brookings Papers on Economic Activity* 2010, 261–312.

——— , 2011, Securitized banking and the run on the repo, *Journal of Financial Economics* doi:10.1016/j.jfineco.2011.03.016.

Investment Company Institute, 2011, 2011 investment company fact book, .

Kacperzyk, Marcin, and Philipp Schnabl, 2010, When safe proved risky: Commercial paper during the financial crisis of 2007–2009, *Journal of Economic Perspectives* 24, 29–50.

——— , 2011, Implicit guarantees and risk-taking: Evidence from money market funds, NYU Stern working paper.

Khwaja, Asim Ijaz, and Atif Mian, 2008, Tracing the impact of bank liquidity shocks: Evidence from an emerging market, *The American Economic Review* 98, 1413–1442.

Kloek, Teun, 1981, OLS estimation in a model where a microvariable is explained by aggregates and contemporaneous disturbances are equicorrelated, *Econometrica* 49, 205–207.

Krishnamurthy, Arvind, 2010, How debt markets have malfunctioned in the crisis, *Journal of Economic Perspectives* 24, 3–28.

McCabe, Patrick E., 2010, The cross section of money market fund risks and financial crises, Federal Reserve Board, Finance and Economics Discussion Series working paper 2010-51.

Mishkin, Frederic S., 2011, Over the cliff: From the subprime to the global financial crisis, *Journal of Economic Perspectives* 25, 49–70.

Moulton, Brent R., 1990, An illustration of a pitfall in estimating the effects of aggregate variables on micro units, *The Review of Economics and Statistics* 72, 334–338.

Petersen, Mitchell A., and Raghuram G. Rajan, 1994, The benefits of lending relationships: Evidence from small business data, *Journal of Finance* 49, 3–37.

Rajan, Raghuram, 1992, Insiders and outsiders: The choice between informed and arm's-length debt, *Journal of Finance* 47, 1367–1400.

Ricks, Morgan, 2011a, Regulating money creation after the crisis, *Harvard Business Law Review* 1, 75–144.

——— , 2011b, Shadow banking and financial regulation, Columbia Law and Economics working paper 370.

Sirri, Erik R., and Peter Tufano, 1998, Costly search and mutual fund flows, *The Journal of Finance* 53, 1589–1622.

Squam Lake Group, 2011, Reforming money market funds, Proposal.

Appendix

Table AI
Variable Definitions

Adviser's MMMF share$_f$	The fraction of prime money market mutual funds in the fund adviser's total assets under management. *Adviser's prime money market mutual fund assets* are the sum of TNA of all prime money market mutual funds managed by the adviser. *Adviser's total assets under management* are the sum of TNA of all mutual funds in CRSP that are managed by the adviser. We manually match adviser names in N-MFP filings and CRSP. *Adviser's MMMF share* is calculated as of March 2011. Values outside the $[0, 1]$ interval are set to missing.
Δ*Cash Holdings*$_{i,s\to t}$	Percentage change in cash and short-term investments between quarters s and t. Defined for nonfinancial issuers using Capital IQ data, and winsorized at the 5th and 95th percentiles.
$\Delta CP_{i,s\to t}$	Percentage change in outstanding Commercial Paper (CP) between quarters s and t. Defined for nonfinancial issuers using Capital IQ data, and winsorized at the 5th and 95th percentiles.
Fee waivers$_f$	The ratio of expense reimbursements to fund's TNA. Expense reimbursements are from item 72Y on the fund's most recent annual N-SAR filing.
Fund Euro share$_{f,t}$	The share of fund f's portfolio invested in Eurozone banks in month t. In the cross-sectional regressions, we calculate the average value during the pre period, *Fund Euro share*$_{f,pre} = T_{pre}^{-1} \sum_{t\in pre}$ *Fund Euro share*$_{f,t}$.
Fund Euro share$^{GIIPS}_{f,t}$	The value-weighted share of the fund's portfolio invested in Eurozone banks, with the issuer's net direct exposure to GIIPS (as a share of tier 1 capital) as weights. *Fund Euro share*$^{GIIPS}_{f,t} = \frac{\sum_{i\in Eurobanks} 1}{\sum_{i\in Eurobanks} GIIPS_{i,t}} \sum_i \frac{Outstanding_{i,f,t}}{\sum_i Outstanding_{i,f,t}} \times GIIPS_{i,t}$
Fund flows$_{f,t}$	Net subscriptions scaled by lagged assets, $\frac{Flows_{f,t}}{TNA_{f,t-1}}$. Winsorized at the 1st and 99th percentiles.
Gross yield$_{f,t}$	The fund's 7-day gross yield reported on form N-MFP.
Institutional share$_{f,t}$	The share of fund's assets in institutional share classes. A share classes is considered to be institutional if a) its minimum initial investment is equal to or is greater than \$1 million or is equal to \$1, or b) the name of the share class includes "institutional."

Table AI—*Continued*

Issuer CP Euro share$_i$	As of March 2011, we calculate the value of *Issuer Euro share*$_{i,t}$ multiplied by money market funds' share of the issuer's outstanding CP, calculated as the ratio of *Outstanding*$_{i,t}$ to issuer's outstanding CP from Capital IQ.
Issuer Euro share$_{i,t}$	The value-weighted average of *Fund Euro shares*, calculated over all funds holding issuer i at time t, with the fraction of issuer i held by fund f as the weight. *Issuer Euro share*$_{i,f,t} = \sum_f \frac{Outstanding_{i,f,t}}{\sum_f Outstanding_{i,f,t}} \times$ *Fund Euro share*$_{f,t}$. In the cross-sectional regressions, we calculate the average value during the pre period, *Issuer Euro share*$_{i,pre} = T_{pre}^{-1} \sum_{t \in pre}$ *Issuer Euro share*$_{i,t}$.
Net yield$_{f,t}$	The value-weighted average of the 7-day net yields on the fund's share classes.
$\Delta\overline{Outstanding_i}$	Percentage change in the average outstanding of issuer i between the pre and post periods. $\Delta\overline{Outstanding_i} = \frac{T_{post}^{-1} \sum_{t \in post} Outstanding_{i,t}}{T_{pre}^{-1} \sum_{t \in pre} Outstanding_{i,t}} - 1$. Winsorized at the 1st and 99th percentiles.
$\Delta\overline{Outstanding_{i,f}}$	Percentage change in the average exposure of fund f to issuer i between the pre and post periods. $\Delta\overline{Outstanding_{i,f}} = \frac{T_{post}^{-1} \sum_{t \in post} Outstanding_{i,f,t}}{T_{pre}^{-1} \sum_{t \in pre} Outstanding_{i,f,t}} - 1$. Winsorized at the 10th and 90th percentiles.
Portfolio insurance$_{f,t}$	The cost, in percentage points, of insuring \$1 of the fund's portfolio using CDS. *Portfolio insurance*$_{f,t} = \frac{\sum_{i \in Eurobanks} Outstanding_{i,f,t} \times CDS_{i,t}}{\sum_i Outstanding_{i,f,t}}$. Portfolio insurance ignores the correlation of defaults across issuers, and assumes zero CDS spreads on all issuers other than the Eurozone banks.
Portfolio maturity$_{f,t}$	The fund's dollar-weighted average portfolio maturity reported on form N-MFP.
Relationship strength$_{i,f}$	The number of months between November 2010 and May 2011 in which fund f has a position in issuer i, divided by the number of months in which issuer i is held by any prime money market fund.
Size$_{f,t}$	The log of fund's TNA.
Strong relationship$_{i,f}$	Binary variable equal to 1 whenever *Relationship strength*$_{i,f}$ is greater than its median value for issuer i.

Eurozone Banks Experience Larger Declines in Outstanding and WAM than Other Issuers in the Post Period

Table AII formalizes the evidence provided in Figure 2 that money market funds withdrew funding from Eurozone banks in the post period. The first two columns look at the percentage change in outstanding for Eurozone banks versus other issuers. We exclude government, agency, supranational, and municipal issuers, as well as investment companies, i.e., holdings of other money market funds. Thus, our sample consists of Eurozone financials, financials outside the Eurozone but within the EU, non-EU financials, nonfinancials, and asset-backed commercial paper (ABCP) issuers.

Table AII
Changes in Outstanding and Weighted-Average Maturity of Eurozone Banks versus Other Issuers

The dependent variable is the relative change in the issuer's average outstanding, $\Delta\overline{Outstanding_i}$, the change in weighted-average maturity (WAM), or the relative change in WAM, between the pre (March–May 2011) and post periods (June–August 2011). Explanatory variables are mutually exclusive dummy variables indicating issuer's location. ABCP, Eurozone financial, rest of EU financial, non-EU financial, and nonfinancial issuers are included. Value-weighted regressions weight observations by the average outstanding during the pre period. Robust standard errors are reported. *, **, and *** indicate statistical significance at 10%, 5%, and 1%.

	$\Delta\overline{Outstanding_i}$		Δ WAM (days)		Δ WAM (%)	
	EW	VW	EW	VW	EW	VW
	(1)	(2)	(3)	(4)	(5)	(6)
Benelux	−0.411*	−0.130	−1.995	−8.166**	−0.206	−0.141
	(0.218)	(0.099)	(5.647)	(3.458)	(0.196)	(0.097)
France	−0.466***	−0.202***	−12.229***	−12.556***	−0.467***	−0.263***
	(0.072)	(0.037)	(3.287)	(3.299)	(0.069)	(0.059)
GIIPS	−0.959***	−0.676***	−1.148	−2.281	−0.393	−0.231
	(0.106)	(0.077)	(5.249)	(4.818)	(0.264)	(0.234)
Rest of Eurozone	−0.422**	−0.136	11.644*	0.438	0.106	−0.115
	(0.189)	(0.084)	(6.712)	(2.255)	(0.303)	(0.075)
Constant	0.200***	−0.039**	−5.652***	−4.689***	0.102**	−0.084**
	(0.067)	(0.019)	(1.376)	(1.417)	(0.051)	(0.033)
N	363	363	346	346	346	346
Adjusted R^2	0.003	0.184	−0.004	0.149	−0.006	0.087

We collapse the monthly data into averages for the pre period (March–May 2011) and the post period (June–August 2011). Our dependent variable is the percentage change in average outstanding amount between the pre and post periods, so that our analysis is simply conducted on a single issuer-level cross-section of the data. This approach is transparent and allows us to avoid issues associated with statistical inference in panel data sets with a short time dimension (Donald and Lang, 2007; Cameron, Gelbach, and Miller, 2008).

The explanatory variables are dummy variables for banks in a) the Benelux countries: Belgium, Luxembourg, and Netherlands; b) France; c) the GIIPS: Greece, Ireland, Italy, Portugal, and Spain; and d) the rest of the Eurozone.

Looking at the equal-weighted results in column 1, the coefficients on all four variables are negative, and strongly statistically significant in the case of France and the GIIPS. For banks in the GIIPS countries, outstanding amount declines by more than 95% on an equal-weighted basis during June, July, and August 2011. The amount of financing French banks raise from money market funds falls by 47%, while financing raised by banks in the rest of the Eurozone declines by 42%.

In column 2, we weight observations by their average outstanding during the pre period, and get similar results with smaller magnitudes. This suggests that money market funds were more aggressive in pulling funding from smaller Eurozone banks.

In the next four columns, we look at the change in weighted-average maturity, both in levels (columns 3 and 4) and in percentages (columns 5 and 6). The equal-weighted results in column 3 indicate that WAM has declined by about 12 days for French banks and 1–2 days for banks in the GIIPS. This result is consistent with Krishnamurthy (2010) and Brunnermeier and Oehmke (forthcoming), who argue that such maturity contractions are driven by increases in liquidity preference and risk aversion. Interestingly, despite significant declines in outstanding for banks in the rest of the Eurozone, there is little evidence that they experience any declines in WAM. If anything the coefficients are slightly positive.