The Risk-Taking Incentives of Money Market Funds

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Abstract

We examine the determinants of risk taking by money market funds. We argue that the risk choices are directly influenced by the sponsor's willingness (driven by reputation concerns) and its ability (driven by financial strength) to bail out its funds. Our identification strategy exploits a large, exogenous expansion in risk-taking opportunities of money market funds during the period of August 2007 to August 2008. We find that a fund's response to the expansion depends on its sponsor's willingness and ability to provide support to its distressed funds: Funds sponsored by financial institutions with greater reputation concerns take on less risk than those sponsored by financial institutions with smaller concerns. Conversely, funds sponsored by institutions with greater financial strength take on more risk, controlling for reputation concerns. The results hold separately for funds affiliated with independent investment managers and those affiliated with financial conglomerates. The differences in risk taking disappear once implicit guarantees by fund sponsors are replaced with an explicit government guarantee.

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Money market funds have been at the center of attention during the financial crisis of 2007-2010. Following the bankruptcy of Lehman Brothers in 2008, a prominent fund—the Reserve Primary Fund—suffered a run due to its holdings of Lehman's commercial paper. This run quickly spread to other funds, triggering investors' redemptions of more than $300 billion dollars within a few days of the bankruptcy. Its consequences appeared so dire to U.S. financial stability that the government decided to intervene by providing unlimited, explicit deposit insurance to all investors in money market funds. The intervention was successful in stopping the run but it transferred the entire risk of a $3 trillion money market fund industry to the government.

The turmoil in the money market fund industry came as a surprise to most market participants since investors generally regarded money funds as a low-risk investment option that was almost as safe as cash. Indeed, for most of their history, money market funds invested in safe asset portfolios and generated returns similar to those of U.S. government securities. However, during the early part of the financial crisis, some funds started to generate higher yields. As shown in Figure 1, the cross-sectional dispersion in fund yields was less than 30 basis points before August 2007 but increased to more than 150 basis points after August 2007. This sudden increase in the dispersion of money market funds' yields indicates that the underlying asset risk of some money market funds might have changed fundamentally during the financial crisis.

In this paper, we ask two questions: what caused the change in risk of the money market fund industry and, more importantly, what can explain the cross-sectional variation in fund yields? The answers to these questions are important for at least two reasons. First, money market funds are large financial intermediaries that are crucial to financial stability in the United States. Specifically, they are the largest provider of short-term financing in the U.S. economy, similar in size to the entire sector of equity mutual funds, and they are a large issuer of demand deposits, similar in size to the U.S. commercial banking sector. Second, money market funds provide a good laboratory in which to study risk-taking incentives of financial intermediaries, in general. Since all money market funds are affiliated with large financial companies, our results also shed light on the affiliates' risk-taking incentives. In this respect, our study applies to all

financial intermediaries that are financed with short-term debt and invest in longer-term assets.

Our analysis delivers three main results. First, we show that money market funds experienced an expansion in their risk-taking opportunities starting from August 2007. Money market fund regulation requires funds to invest exclusively in highly rated, short-term debt securities. As shown in Figure 2, the spread between eligible money market fund instruments and Treasuries was at most 25 basis points before August 2007. Hence, there was little scope for risk taking up to Summer 2007. However, from August 2007, the collateral and liquidation values underlying some money market fund instruments started to decline due to the U.S. subprime mortgage crisis. As a result, the spread between risky money market fund instruments, such as unsecured bank obligations, and Treasuries increased five folds up to 125 basis points. Hence, for the first time since the origin of money market funds in the 1970s, money market funds had a choice to invest in assets with a substantial risk premium relative to safe government securities.

Second, we evaluate the incentives for money market funds to take on more risk. We estimate a standard flow-performance relationship between fund flows and realized fund returns. We find that fund flows are highly elastic to returns: A one-standard-deviation increase in fund return increases fund assets by 42% on an annualized basis. This effect is economically large because money market funds charge a fixed percentage of assets under management and an increase in funds' size directly leads to a proportionate increase in their revenues. It is also robust to including standard controls such as fund age, fund expenses, fund size, fund-fixed effects, and time-fixed effects. Also, the flow-performance relationship is stronger after August 2007, consistent with the expansion in risk-taking opportunities taking place after the start of the financial crisis.

Third, we examine the variation in risk taking across funds. To analyze funds' risk taking, it is important to understand the pricing of the funds. In contrast to regular mutual funds, money market funds use historical cost accounting to assess the value of their holdings. The benefit of using historical cost accounting, as opposed to market value pricing, is that money market funds can always maintain a constant net asset value of \$1 per share. This allows them to sell demand

deposits that are considered almost as safe as bank deposits (or money) to outside investors. The downside of this valuation approach is that it exposes such funds to self-fulfilling runs a la Diamond and Dybvig (1983). If investors expect the market value of a fund's holdings to drop below its amortized cost, they may all redeem their shares at the same time, which can then trigger a drop in market value due to forced liquidation at fire-sale prices.

To mitigate the threat of self-fulfilling runs, money market funds rely on their sponsors, usually large financial institutions. These financial institutions manage a fund on behalf of investors and lend credibility to the fund's stability. Importantly, investors expect fund sponsors to bail out a fund in case of a run. Even though fund sponsors have no such contractual obligation, they may find it optimal to do so because the costs of a run may be large. Such costs are typically reputational in nature, in that an individual fund's default could generate negative spillovers for the remaining operations of the fund sponsor, such as other mutual funds, or other segments of a sponsor's business.[1]

To explain variation in risk taking across funds, we relate a fund's risk taking to the expected cost of a run to the sponsor. This cost depends on two factors: the extent of negative spillovers if a run occurs ("reputation") and the sponsor's ability to stop a run through a bailout ("financial strength"). We expect that funds with greater reputation and lower financial strength take on less risk in order to reduce the likelihood of a run.[2] We measure reputation in two ways: (1) as one minus the share of a fund's institutional money market assets relative to total assets of the fund's family; and (2) as an indicator variable equal to one if the fund sponsor is affiliated with a commercial bank, an investment bank, or an insurance company. We also use two measures of financial strength: (1) an indicator variable equal to one if a fund sponsor has a credit rating, and zero, otherwise; and (2) the price of the CDS contract of the sponsor. We measure our

[1]This expectation is evident in an investor alert by the Financial Industry Regulatory Authority (FINRA), which states: 'Typically, there has been an expectation that when a money market fund reaches a point where it might break the buck, the investment management firm that sponsors the fund will take action to infuse the fund with cash so that the fund can maintain a stable NAV of $1.00 per share.' (FINRA (2010)).

[2]This test relies on the assumption that the fund sponsor can set the fund's risk taking. In doing so, we abstract from agency problems between the fund sponsor and manager. We believe this assumption is plausible in the money market fund industry because a fund's portfolio risk is observable and there is little scope for manager skill in portfolio choice.

variables before the expansion of risk-taking opportunities as of January 2006. We choose this date because it unlikely that these variables were chosen in anticipation of a fund's risk-taking behavior because the expansion in risk-taking opportunities was largely unexpected.

We use weekly data on the universe of U.S. money market funds to estimate the effect of reputation and financial strength on risk taking. At the outset, we restrict our sample to institutional prime money market funds, which are funds that invest in non-government securities and are sold exclusively to institutional investors. We focus on these funds because we do not expect the subprime crisis to have an economically meaningful effect on funds that invest solely in government securities and because, in contrast to retail investors, we expect institutional investors to react promptly to yield differentials across funds. In general, these funds represent the majority of assets under management in the money market fund industry.

We use three empirical proxies for fund risk: (1) the share of risky assets holdings, proxied by fund investments in bank obligations, net of the share in safe assets holdings, proxied by holdings of Treasuries and repos (holdings risk); (2) the weighted average maturity of fund holdings (maturity risk); and (3) the fund return relative to that of Treasury Bills (spread).

We find that a one-standard-deviation increase in the mutual-fund-based measure of reputation reduces holdings risk by 3.6 percentage points, maturity risk by 2.3 days, and spread by 3.0 basis points after August 2007. This result is economically significant in that each respective effect accounts for 14.5%, 18.9%, and 18.3% of the cross-sectional standard deviation of each risk measure. We find that a fund's affiliation with a commercial bank, investment bank, or insurance company reduces risk by 27.1%, 13.9%, and 44.7% of the cross-sectional standard deviation of each risk measure. In turn, we do not find any statistically or economically significant impact of either measure of reputation on the risk measures prior to August 2007. Moreover, the coefficients are stable and statistically significant even if we control for sponsor and fund-fixed effects, which makes it unlikely that any unobserved fund or sponsor characteristics drive our results.

Next, we evaluate the impact of a sponsor's financial strength on each of the risk measures.

Since measures of financial strength can be correlated with the affiliation of the money market fund, which is our measure of reputation, we perform our tests within each sponsor group. This approach allows us to look more directly into a specific channel driving our results. Since the notion of financial strength is generally different across two different sponsor types, we use the price of the CDS contract for financial conglomerates, and an indicator variable equal to one if the fund sponsor has a rating for independent management companies.

We find that for financial conglomerates, a one standard-deviation increase in the natural logarithm of a sponsor's CDS price reduces holdings risk by 6.6 percentage points, maturity risk by 4.9 days, and spread by 3.9 basis points after August 2007. This result is statistically and economically significant in that each respective effect accounts for 26.6%, 40.1%, and 23.1% of the cross-sectional standard deviation of each risk measure. Likewise, independent investment companies with no credit rating have lower holdings risk by 8.2 percentage points, maturity risk by 1.7 days, and spread by 7.8 basis points after August 2007. Though economically significant, these results, however, are estimated less precisely due to weakness in power of our statistical test. In sum, our results indicate that conditional on reputation, financial strength of a fund sponsor increases a fund manager's risk taking.

Consistent with the importance of each of the determinants of risk, we further find that a sponsor's reputation and financial strength predict redemptions and financial support after the Lehman's bankruptcy. A one-standard-deviation increase in mutual fund reputation reduces redemptions in the week after the Lehman's bankruptcy by 2.4 percentage points and a fund's affiliation with a financial conglomerate reduces redemptions by 23.7 percentage points. A one-standard-deviation increase in financial strength increases the likelihood that a sponsor announces a bailout in the week after Lehman's bankruptcy by 4.1 percentage points. Similarly, the likelihood of a bailout increases by 13.1 percentage points if the fund sponsor has a credit rating. These results suggest that reputation concerns and financial strength significantly affect risk taking of money market funds.

One possible concern with our results is that, even if a sponsor's reputation and financial

strength were not chosen to accommodate risk taking, these measures might be correlated with other (unobserved) sponsor characteristics that directly affect risk taking. For example, our measure of reputation, based on the affiliation with a large financial institution, might be correlated with other sponsor characteristics, such as the quality of risk management, risk aversion, investment style, or access to private information. These variables would explain our results to the extent that the unobserved sponsor characteristic affects risk taking after (but not before) August 2007. This may be the case if, for example, the quality of risk management matters for risk taking only in times of greater risk-taking opportunities.

To address this concern, we introduce another dimension along which we can compare funds, the distinction between institutional and retail funds. Our analysis so far focuses on funds offered to institutional investors; yet, the same sponsors also offer funds to retail investors. Retail funds constitute a useful placebo group because the flow-performance relationship is much weaker for these funds and, as a result, the risk-taking incentives of such funds are smaller. This prediction is specific to our economic mechanism of reputation and financial strength and does not apply to other mechanisms that could explain risk taking, such as the quality of a sponsor's risk management. Indeed, we find that a sponsor's reputation and financial strength have almost no effect on risk taking of retail funds. This result supports our interpretation of the results.

In another identification strategy, we exploit the time-series variation in the importance of reputation and financial strength. Following the run on money markets in September 2008, the government introduced an explicit government guarantee program for all money market fund deposits, which effectively replaced sponsors' role in providing bailouts. Consequently, if the presence of internal bailouts causes the differences in risk taking, we should expect no differences in risk taking after the government guarantee was announced. This is indeed what we find: After the announcement, the differences in risk taking across funds gradually disappeared.

We further confirm the robustness of our results in a series of additional tests. First, we find that managerial compensation is similar across sponsors with different reputation and financial strength values. Any differences in managers' quality or managerial monetary incentives are thus

unlikely to explain our results. Second, our results hold if we include managerial tenure as an additional control variable, which indicates that managerial career concerns are not an important driver of our findings. Third, our effects are slightly stronger for larger fund companies, which is consistent with the general observation that large funds are more involved in active risk management. Last, we show that all our results are robust to excluding outliers.

Our study makes contributions to several strands of the literature. From a theoretical perspective, it is related to studies about the impact of reputation on risk-taking incentives of financial institutions. Stiglitz and Weiss (1983) and Diamond (1989) have established that borrowers' concerns about maintaining good reputations restrain their tendency to behave opportunistically. Similarly, theoretical studies of financial strength have considered the role of so-called balance sheet amplifiers in generating distress. The main sources of variation in financial strength addressed by the studies are leverage, credit constraints, and limited capital. An excellent summary of the main ideas offers Krishnamurthy (2010). We extend this research by analyzing empirical implications of differences in reputation concerns and financial strength for risk-taking behavior.

Our work is also related to literature on bailouts' provision. A substantial empirical literature has focused on explicit and implicit guarantees provided by the government to the banking sector. Keeley (1990) finds that the combination of deposit insurance and lower bank charter values leads to risk shifting among commercial banks. Saunders, Strock and Travlos (1990) show that stockholder-controlled banks take on more risk than manager-controlled banks. Esty (1997) finds that stock thrifts take on more risk than mutual thrifts because of limited monitoring by depositors. Kelly, Lustig and Van Nieuwerburgh (2011) show that during the financial crisis of 2008 the price of put options on individual member banks increased more than the price of a put option on a financial sector index, consistent with the idea that the provision of systemic guarantees is priced by investors. While all that literature emphasizes the role of moral hazard, we believe that the moral hazard problem is unlikely to explain risk taking in money market funds. The reason is that a given security's asset class and its return—both being good measures

of risk for most money market instruments—are readily observable outcomes. As a result, the provider of a guarantee (fund sponsor) can easily monitor a fund manager's risk taking and effectively mitigate the degree of risk-shifting behavior.[3] Moreover, fund sponsors are likely to lay off any fund manager contributing to a negative outcome such as a run, which effectively eliminates managers' downside protection.

A separate strand of literature examines the role of mutual funds within larger financial complexes. Ritter and Zhang (2007) show that lead underwriters allocate hot initial public offerings to affiliated funds. Massa and Rehman (2008) argue that information flows within financial conglomerates affect asset holdings of their equity mutual funds. Chen, Goldstein and Jiang (2010) examine runs in the context of equity mutual funds. More specific to our empirical context is a small literature on the workings of money market funds. Notable contributions in this group include Christoffersen (2001), Christoffersen and Musto (2002), Kacperczyk and Schnabl (2010), and Squam Lake Group (2011). Relative to these studies, we emphasize the role of reputation concerns and financial strength and their impact on risk-taking decisions.

Finally, our study parallels contemporaneous empirical literature on the impact of the recent financial crisis on money markets. Gorton (2009) and Gorton and Metrick (2009) investigate the impact of the crisis on the pricing of repo contracts. Brunnermeier (2009) studies the freeze in the market for asset-backed commercial paper. Kacperczyk and Schnabl (2010) investigate the relative role of demand and supply sources and their consequences for the commercial paper market. Krishnamurthy and Vissing-Jorgensen (2010) investigate the role of macroeconomic conditions in the pricing of Treasuries relative to corporate bonds. Cornett, McNutt, Strahan and Tehranian (2011) examine the impact of banks' funding liquidity on credit supply. Acharya, Schnabl and Suarez (2009) study the incentives for issuing asset-backed commercial paper.

The rest of the paper proceeds as follows. Section 1 describes our research setting, and Section 2 describes the data. In Section 3, we discuss our identification strategy and present

[3]Our multiple conversations with money market fund managers and their sponsors suggest that one of the specific characteristics of the money market industry is a high degree of transparency inside the organization in the process of information transmission between manager and fund sponsor.

main empirical results. Section 4 concludes.

1 Institutional Setting: Money Market Funds

1.1 Primer on money market funds

Money market funds emerged in the 1970s as an alternative to bank deposits. At that time, bank deposits were highly regulated and paid lower interest rates than did money market instruments, which made money funds attractive to investors as they paid higher interest for taking on comparable risks. Even though the regulation of bank deposits was eventually abolished, the size of money market fund industry grew steadily over time up to $2.4 trillion at the beginning of 2007 (see Federal Reserve Flow of Funds Data).

An important characteristic of money market funds is that, contrary to bank deposits, investments in money market funds are generally not insured by the government. Although money funds seek to preserve the value of their assets at $1 per share, it is still possible that fund investors could realize losses on their investments. Such losses could result from changes in interest rates or from defaults of individual securities.

To limit risks of money market funds, their holdings have been regulated under Rule 2a-7 of the Investment Company Act of 1940. This regulation restricts fund holdings to short-term assets and prevents funds from purchasing long-term assets such as mortgage-backed securities, corporate bonds, or equity. Moreover, the regulation requires short-term debt to be of high credit quality. For example, the regulation limits commercial paper holdings to those that carry either the highest or second-highest rating from at least two of the nationally recognized credit rating agencies. Also, the regulation requires portfolio diversification: Money market funds must not hold more than 5% of their assets in securities of any individual issuer with the highest rating and not more than 1% of their assets in securities of any other individual issuer.

To provide an overview of the various money market instruments held by money market funds, we use data provided by iMoneyNet. These data are the most comprehensive source

of money market funds' holdings. We focus on taxable funds because non-taxable funds hold tax-exempt instruments issued by state and municipal governments, which are not the focus of our study. Taxable money market funds account for 84.5% of all assets under management in the money market fund industry.

As of January 2006, there were 485 taxable money market funds holding assets worth $1.67 trillion. About $396 billion, or 23.8% of total assets, were held by Treasury funds, which only hold government debt, government-backed agency debt, and repurchase agreements. The remaining $1.26 trillion, or 76.2% of total assets, were held by prime funds that also invest in non-government assets. The largest asset class held by prime funds was commercial paper, accounting for $325.3 billion or 25.6% of total assets. The other asset classes were government debt and government-backed agency debt ($62.5 billion), repurchase agreements ($151.1 billion), bank obligations ($235.3 billion), floating-rate notes ($265.9 billion), asset-backed commercial paper ($186.3 billion), and bank deposits ($39.4 billion) (Kacperczyk and Schnabl (2010)).

Most large money market funds are geared towards institutional investors. In Table 1, we present summary information for the 20 largest institutional prime funds as of January 2006. At that time, these 20 funds accounted for a total of $429 billion worth of assets. The largest fund was the JP Morgan Prime Money Market Fund with assets under management equal to $68.1 billion, followed by Columbia Cash Reserves and BlackRock Liquidity funds, which were about half the size. The last fund on the list, Dreyfus Institutional Cash Fund still managed a considerable $12.6 billion worth of assets. On average, institutional prime funds were well diversified across asset classes but highly exposed to risks in the financial industry as a whole. Assets originated by the financial industry—measured as a total of financial commercial paper, structured securities, bank obligations, and repurchase agreements—accounted for 91.4% of money market fund assets.

In addition, Table 1 provides information about the funds' sponsors: their reputation values—based on the share of other mutual funds in the total value of assets managed by the sponsor—and organizational form, that is, whether a fund sponsor is independent or affiliated with a

commercial bank, investment bank, or insurance company. Among the largest 20 funds, an equal number was independent or had an affiliation. The sponsors with the largest reputation values were Fidelity, followed by State Street, and Morgan Stanley.

1.2 Money market funds during the financial crisis

1.2.1 Change in risk-taking opportunities

Money market funds played an important role during the financial crisis of 2007–2010. Prior to August 2007, fund regulation effectively prevented the funds from investing in risky assets. As a result, since its origins in the 1970s, money market funds invested in similar assets and paid similar returns. However, starting from August 2007, a number of events changed the risk-taking opportunities of money market funds. On August 9, 2007, the French bank BNP Paribas halted withdrawals from its three funds invested in mortgage-backed securities and suspended calculation of their net asset values. Even though defaults on mortgages had been rising throughout 2007, the suspension of withdrawals by BNP Paribas had a profoundly negative effect on money market assets. Within one day, the interest rate spread of overnight asset-backed commercial paper over the Fed funds rate rose from 10 basis points to 150 basis points, possibly because investors became concerned about the credit quality and liquidation values of collateral underlying money market instruments and stopped rolling over these instruments.

Even though money market funds suffered almost no losses from impaired asset-backed commercial paper because these assets were effectively insured by commercial banks, going forward, it became clear that liquidation values of money market instruments were lower and that new issuances had to offer higher risk premia. Similar increases in risk premia also built up in other money market instruments that were perceived as risky—bank obligations, floating-rate notes, and commercial paper. At the same time, the rates of asset classes that were perceived as safe, such as Treasuries, repurchase agreements, and bank deposits, remained at much less elevated levels.

Figure 2 presents evidence of this sudden change in relative asset returns. From January 2005

to July 2007, all asset classes had returns of about 15 to 25 basis points higher relative to those of Treasury Bills and agency debt, with no significant differences across asset classes. However, beginning with August 2007, the returns on risky asset classes started to increase rapidly with a peak in March 2008 when relative returns reached up to 125 basis points. After March 2008, the returns started to decline but still remained at a high 60 basis points as of August 2008. Over the same period, the returns of safe asset classes remained constant at around 20 basis points or even declined. In sum, starting in August 2007, we observed a clear divergence in returns across risky and safe asset classes.[4]

Notably, the observed variation in returns on risky and safe asset classes coincided with key events during the financial crisis. First, the expansion in risk-taking opportunities occurred at the same time as did the run on asset-backed commercial paper in August 2007. Further, the peak in returns to risky asset classes happened at the same time as the near-bankruptcy of the investment bank Bear Stearns. Finally, the decline in relative returns prior to August 2008 and the sudden spike in September 2008 (not shown in the Figures) matched market conditions around the Lehman's bankruptcy. Indeed, common indicators of market distress during the financial crisis, such as the LIBOR-OIS spread, exhibited similar time-series patterns as did the returns on risky asset classes of money market funds. Based on the above evidence, we conclude that the start of the financial crisis in August 2007, provided money market funds the opportunity to invest in riskier assets.

1.2.2 Tale of two funds: Reserve Primary Fund and Columbia Cash Reserves

We illustrate possible reactions to this change with an example of two funds: the Reserve Primary Fund (RPF) and the Columbia Cash Reserves (CCR). Between the two, RPF was particularly well known in the industry because of its owner, Bruce Bent, the founder of the first money market fund in the 1970s. Until July 2007, both funds had about $25 billion of assets under

[4]The returns on individual asset classes are not directly observable to us, but we can impute them using fund-level data on returns and holdings. To this end, we regress fund returns on interaction terms of indicator variables for each asset class and month-fixed effects plus standard controls. For each asset class, the interaction terms capture the monthly return relative to that of Treasury Bills and agency debt.

management and charged similar management fees. In what follows, we present the evolution of each fund's returns, fund assets, and holdings over the period from July 2006 to August 2008.

In Figure 3, we present the returns of both funds relative to the industry average. Prior to August 2007, the returns roughly matched the industry average. However, starting in August 2007, the relative returns of the two funds diverged sharply: Relative to the industry average, the return of RPF increased by about 50 basis points, while at the same time the return of CCR decreased by about 30 basis points. The return differential triggered significant money flows: RPF tripled its assets under management, from $20 billion in August 2007 to $60 billion in August 2008, while CCR's asset value declined, from $30 billion to $20 billion.

The observed differences in both returns and fund flows were largely a consequence of the differences in the underlying fund portfolios, especially after August 2007. Figure 4 shows that RPF increased its holdings of risky assets from 0% to 60% while it reduced its exposure to safe Treasury Bills and repurchase agreements from 40% to 10%. In contrast, CCR actually decreased its holdings of risky assets slightly and kept the same level of safe Treasury Bills and repurchase agreements.

We argue that the difference in the risk taking between RPF and CCR can be attributed to the differences of their sponsors in terms of their reputation concerns and financial strength. While RPF was managed by an independent mutual fund company with almost no additional franchise value and little financial strength, CCR was managed by a mutual fund company sponsored by Bank of America with a large reputation cost at stake and significant financial strength. As an example, its equity, as of January 2007, equaled $57.1 billion dollars. As a result, it seems plausible that CCR was more likely to offer sponsor support for its funds. As it turns out, the underlying difference was a crucial determinant of how each of the funds chose its own risk levels and how each of them absorbed the shocks related to bankruptcy of Lehman Brothers.

1.2.3 Collapse of the Reserve Primary Fund and money market fund runs

One of the important assets among RPF's holdings was commercial paper issued by Lehman Brothers. According to quarterly SEC filings, RPF had no holdings of Lehman's commercial paper prior to August 2007, but by November 2007 the fund had purchased $375 million in Lehman's commercial paper. By May 2008, the fund additionally increased its Lehman's holdings to $775 million, which at that time accounted for about 1% of its holdings.

On September 15th, 2008, Lehman Brothers declared bankruptcy. Its failure triggered a panic in financial markets and lead to a credit market freeze. As a direct result of the bankruptcy, the net asset value of RPF fell below $1 per share. The revelation of the fund's exposure to Lehman's risk triggered an immediate run on the fund. On September 16, 2008, the fund was forced to pay out $10.8 billion in redemptions and faced about $28 billion of additional withdrawal requests. The fund's sponsor did not have sufficient financial resources to guarantee payments and was forced to halt redemptions. The run on RPF quickly spread to other funds. Within a week, institutional investors reduced their investments in money market funds by more than $172 billion. Among others, the sponsor of CCR, Bank of America, set aside $600 million to support its money market funds, which helped stabilize CCR's operations.

Eventually, many funds got distressed and the consequences of the industry collapse became dire. To stop the run on funds, on September 19, 2008, the U.S. Department of the Treasury announced an explicit deposit insurance covering all money market investments made prior to Lehman's bankruptcy. This announcement stopped the run and redemption requests receded shortly after. However, the announcement meant that the U.S. government had effectively insured the credit risk of $3 trillion in fund assets holdings.

2 Data and Summary Statistics

Our study combines six data sources. First, we obtain data on the universe of taxable money market funds from iMoneyNet, which cover the period from January 2005 to December 2009

and include weekly fund-level data on returns, expense ratios (charged and incurred), holdings by asset class, and average maturities of fund holdings. Second, we complement the data using information from CRSP Mutual Fund Survivorship Bias Free Mutual Fund Database, especially assets under management by family and different asset classes, which we use to construct one of our reputation measures. Third, we use COMPUSTAT to collect information on fund manager characteristics. Fourth, we use Lehman Brothers' Bond Database, COMPUSTAT, and companies' websites to collect data on their credit ratings. Fifth, we collect data on sponsors' CDS prices from Datastream. Sixth, we collect data on no-action letters issued by the SEC—an indication that a sponsor provided financial support to its fund. Altogether, we obtain a novel data set that, to the best of our knowledge, has not been used in academic research before.

Column (1) of Table 2 provides summary statistics for all prime institutional money market funds (henceforth, prime funds) as of January 2006. Our sample includes 148 prime funds. The average fund size is \$4.9 billion and the average fund age is 10.6 years. We compute the annualized spread as the fund return net of expenses minus the return on the three-month Treasury Bills. The average spread is 6.9 basis points and the average expense ratio is 32 basis points. In terms of asset holdings, prime funds hold 6.5% in U.S. Treasuries and agency-backed debt, 13.5% in repurchase agreements, 3.2% in deposits, 12.2% in obligations, 19.8% in floating-rate notes, 32.0% in commercial paper, and 13.4% in asset-backed commercial paper.

Next, we divide fund sponsors into two groups based on their reputation concerns due to potential lost business in other mutual fund assets. Our primary measure of the concerns is the fraction of institutional money market funds inside the fund family relative to the total size of the fund family. The idea behind this measure is that fund families with larger values of assets in other asset classes have more at stake in case their money market operations face distress. We further subtract this measure from one to make it an increasing function of reputation.

Column (2) provides summary statistics for funds whose sponsors have reputation values above the median value of 81.6% as of January 2006. Column (3) provides summary statistics for funds whose sponsors have reputation values below the median value. We find that funds

associated with sponsors of both high and low-reputation concerns have similar fund characteristics and average asset holdings. The only difference is that funds sponsored by high-reputation companies are on average more likely to be part of the financial conglomerate. In fact, the affiliation with financial conglomerate (i.e., commercial bank, investment bank, or insurance company) defines our second measure of reputation, which improves upon our initial reputation measure in that it captures the broader idea of a franchise value at stake, especially if the fund company is involved in operations other than investment management, which is especially true for companies that are broadly defined as financial conglomerates. The downside of the latter measure is that it largely ignores the variation in reputation within each sponsor type. Hence, in our remaining tests we use both measures bearing in mind that each of them may capture a slightly different type of cross-sectional variation in the data.

3 Empirical Strategy and Results

3.1 The choice of a sponsor's type

Any credible assessment of the impact of reputation concerns and financial strength on risk taking must address the problem that fund sponsors optimally choose whether to provide implicit guarantees. For example, some sponsors may be better at incentivizing fund managers to take on less risk, hence may be more willing to provide implicit guarantees. In this case, a simple comparison of funds sponsored by companies with strong reputation concerns and/or financial strength and funds sponsored by companies with little reputation concerns and/or financial weakness does not represent the counterfactual of interest—namely, the level of risk taking for a given fund with strong vs. weak reputation or with or without financial strength. In an ideal experiment, we would like to randomly assign reputation values to funds and then analyze the causal impact of the random assignment. In practice, funds might choose their types based on their relative costs and benefits, which could include access to private information, diversification of income revenues, incentive system for fund managers, and cross-selling of fund products.

An important advantage of our setting is that money market funds played a negligible role in most fund sponsors' structures prior to Summer 2007. In particular, money market funds typically constituted a small part of larger mutual fund families and the choice regarding the fund family's equity was likely independent of money market funds themselves. Since the inception of money market funds in the 1970s, all funds paid similar returns and there was little scope for exploiting private information or superior managerial ability. Indeed, money market funds were considered a low-fee, low-cost business that invested in safe assets and was offered in conjunction with other, more profitable funds. The level of sponsor's reputation concern was thus primarily driven by the characteristics of the entire mutual fund family of which money market funds were only minor consideration. In support of this claim, the summary statistics in Table 2 show that funds sponsored by mutual fund families with weak reputation concerns were similar to funds sponsored by mutual fund families with strong reputation concerns.

Given that money market funds look similar on an ex-ante basis, our empirical strategy relies on the differential response by sponsor's type to an exogenous change in risk-taking opportunities. Specifically, starting in August 2007, money market instruments became significantly riskier, which allowed more scope in funds' risk-taking choices. This change in riskiness of the instruments provided money market funds, usually constrained in their risk choices, with an opportunity to take on more risk.[5] Even though money market instruments experienced episodes of increased relative spreads in the past, it is fair to say that the change in risk-taking opportunities was largely unanticipated, at least around the period of August 2007. Hence, it is unlikely that the fund sponsor's reputation was chosen in anticipation of the change in risk-taking opportunities.

Instead, we argue that differences in the reputation concerns and financial strength affected the observed risk choices. To test this hypothesis, we proceed in four steps. First, we estimate the impact of fund returns on fund flows, the relationship which speaks to the incentives of funds to take on more risk. Next, we present evidence on the role of reputation concerns and

[5]More generally, other studies, including Brunnermeier (2009), Gorton (2009), and Kacperczyk and Schnabl (2010) have documented significant increases in the riskiness of other asset classes over the same period.

financial strength in risk-taking behavior. Further, we show that a fund sponsor's reputation cost was indeed a good predictor of which funds received support from their sponsors during the market-wide run in September 2008. Finally, we provide a series of additional tests that support our baseline empirical results.

In all regressions, we pay particular attention to differences across sponsor types prior to August 2007. If sponsor type were not chosen with regard to risk taking of money market funds, then we should not observe any impact of reputation concerns prior to August 2007. Hence, we expect neither absolute differences nor differential trends by sponsor type before August 2007.

3.2 Expansion of risk-taking opportunities

3.2.1 Relative returns to money market instruments

We document the change in risk-taking opportunities using data on fund holdings and fund returns. Specifically, we estimate the following regression model:

$$Spread_{i,t+1} = \alpha_i + \mu_t + \beta_j Asset_{i,j,t} + \gamma \mathbf{X_{i,t}} + \varepsilon_{i,t+1} \tag{1}$$

where $Spread_{i,t+1}$ is the annualized return (spread) of a fund i in week $t+1$, $Asset_{i,j,t}$ denotes a fund i's fractional holdings of asset category j at the end of week t, α_i denote fund-fixed effects, and μ_t denote week-fixed effects. The asset categories we consider include repurchase agreements, bank deposits, bank obligations, floating-rate notes, commercial paper, and asset-backed commercial paper. The omitted category is Treasury Bills and government agency debt. $X_{i,t}$ is a vector of fund-specific controls that includes the natural logarithm of fund size (*Log(TNA)*), fund expenses (*Expenses*), fund age (*Age*), and the natural logarithm of the fund family size (*Log(FamSize)*). Our coefficients of interest are β_j, which measure the return of money market instrument j in week $t+1$ relative to that of Treasury Bills and agency assets.

We estimate the regression model separately for the *post*-period from August 2007 to August 2008 and the *pre*-period from January 2006 to July 2007. The post-period starts with the

beginning of the subprime crisis in August 2007 and ends immediately before the market-wide run in September 2008. We do not include observations during the run and the period thereafter because subsequent government interventions significantly altered risk-taking incentives.

Our estimation strategy is akin to estimating a standard difference-in-differences regression model. Specifically, the difference in the coefficients of interest, β_j, between the post and pre-period is identical to the coefficient one would obtain from estimating such model. We choose to report our estimation results separately for the pre and post-period because the results help us validate our identification strategy which asserts no difference in risk taking in the pre-period. For most results, we also report relevant coefficients from estimating the standard difference-in-differences regression model to assess statistical significance of our findings. In all regression models, we allow for the flexible correlation of error terms within funds by clustering standard errors at the fund level.

Columns (1) and (2) of Table 3 report the pre and post-period results for the model without fund-fixed effects. We find that risky asset classes experience significantly larger returns in the post-period relative to those in the pre-period, whereas safe asset classes have similar returns during both periods. For example, in the post-period, the return on a fund fully invested in (risky) bank obligations would have been 87 basis points higher than the return on a fund fully invested in (safe) Treasury and agency debt. The comparable differential in the pre-period would have only been 15 basis points. We find similar effects for other risky asset classes, such as floating-rate notes, commercial paper, and asset-backed commercial paper. In contrast, the return on a fund fully invested in (safe) repurchase agreements would have been 13 to 17 basis points higher than the return on a fund fully invested in Treasury and agency assets, both in the pre and post-period. We obtain similar results for other safe asset classes.

One possible concern with the results is that funds with large holdings of risky asset classes might be also riskier along other unobserved dimensions. For example, these funds may choose the most risky assets within an asset class such that we would overestimate the average impact of holding riskier assets. To address this concern, we introduce fund-fixed effects, which account

for any unobserved time-invariant fund characteristics within the pre or post-period.

We find quantitatively and qualitatively similar results, as reported in columns (3) and (4). For example, the return on a fund fully invested in bank obligations would have been 93 basis points higher than the return on a fund fully invested in Treasury and agency assets. In contrast, the comparable differential would have been only 7 basis points in the pre-period. Hence, our findings are unlikely to be driven by unobserved fixed fund characteristics.

Overall, these results suggest that money market funds did experience a large exogenous expansion in risk-taking opportunities. The expansion was large in the sense that the returns on risky asset classes relative to safe ones were five folds larger after August 2007, compared to before. Moreover, the expansion was likely exogenous to money market funds as it was caused by financial distress among issuers of money market instruments and not by the funds themselves. The issuers were directly exposed to the subprime crisis and their instruments therefore commanded higher risk premia. Hence, starting in August 2007, funds were given a choice of whether to invest in risky or safe assets.[6]

3.2.2 Flow-performance relationship

The main incentive for a fund to increase risk is to raise its income. This happens because risk taking increases returns, which in turn translates into greater fund inflows. Given that money market funds earn a fixed percentage of assets under management, fund inflows lead to a higher fund income. This model of competition has been widely documented in studies of equity mutual funds. These studies usually find that past performance is one of the strongest predictors of flows to equity funds (e.g., Chevalier and Ellison (1997)).

We therefore assess the benefits of investing in riskier asset classes by estimating the sensi-

[6]We note that overall issuance of riskier asset classes declined over this period. For example, total asset-backed commercial paper outstanding dropped by almost 50% from $1.3 trillion in August 2007 to $700 billion in August 2008. Importantly, our focus is on the variation in holdings *across* funds. While the majority of money market funds decreased their holdings of risky asset classes, some funds, such as the Reserve Primary Fund, increased their holdings.

tivity of fund flows to past returns using the following regression model:

$$FundFlow_{i,t+1} = \alpha + \beta Spread_{i,t} + \gamma \mathbf{X_{i,t}} + \varepsilon_{i,t+1} \tag{2}$$

where $FundFlow_{i,t+1}$ is the percentage increase in fund size from week t to week $t+1$ accounting for earned interest, $Spread_{i,t}$ and X are defined as in (1). In addition, we include the volatility of fund flows, measured as a standard deviation of fund flows over the previous 13 weeks. Our coefficient of interest is β, which measures the sensitivity of fund flows to fund past returns. We allow for correlation of error terms within funds by clustering observations at the fund level.

Table 4 reports the results. Columns (1) and (2) show the results separately for the pre and post-period for the model without fund-fixed effects. We find that during the post-period a one-standard-deviation increase in fund returns increases subsequent fund flows by 0.6% per week, or equivalently a fund size by 42% per year. In contrast, we find no statistically significant effect of fund past returns on fund flows during the pre-period. To rule out the possibility that our results are driven by unobserved time-invariant fund-specific attributes correlated with fund spreads, in columns (3) and (4), we additionally report the pre and post-period results for the model with fund-fixed effects. The flow-performance relationship is even larger: by 2.6 times in the post-period; again, we observe no impact on flows during the pre-period.

The incentives to take risk may also be shaped by differences in flows that funds with different levels of reputation concerns receive conditional on their performance. In particular, if funds sponsored by companies with high reputation receive more flows because they provide implicit guarantees, one would expect them to be more willing to take relatively less risk since their compensation relies to a lesser extent on their performance. We test this hypothesis by estimating the flow-performance relationship while controlling for *Reputation*. If investors incorporate guarantees in their investment decisions, we should expect the coefficient of *Reputation* to be positive.

We find that, conditional on fund performance, the level of the sponsor's reputation capital does not affect fund flows. As before, we find a strong flow-performance relationship in the

post-period but not in the pre-period. Hence, our results are unlikely to be driven by different responses of flows to the levels of reputation concerns.

We also examine whether the observed change in the sensitivity of flows to performance depends on the sponsor's willingness to provide implicit guarantee. To this end, we extend our empirical model in (2) by including interaction terms of fund spread and the reputation. We present the results in columns (5)-(6).

For both subperiods, we find that the coefficients of the interaction terms are statistically and economically insignificant. Hence, the benefits to having a greater fund performance in terms of greater fund inflows do not differ significantly across the sponsors' types.

In sum, the results support our premise that there was little scope to increase fund returns in the pre-period, but a large incentive to take on more risk in the post-period and the ability to attract flows was not driven by the underlying differences in the scope of implicit guarantees.

3.3 Reputation concerns and risk taking

We now study the response of different fund sponsors to the change in risk-taking opportunities. In particular, we compare risk-taking behavior of funds sponsored by companies with strong reputation concerns to that of funds sponsored by companies with weak reputation concerns. Our hypothesis is that firms with greater concerns are more likely to provide implicit guarantees to their money market funds and the existence of such guarantees decreases the funds' incentives to take on risk. To this end, we estimate the following regression model:

$$Risk_{i,t+1} = \alpha + \beta Reputation_i + \gamma \mathbf{X_{i,t}} + \varepsilon_{i,t+1} \tag{3}$$

where we define $Reputation_i$ in two ways: (1) as one minus the share of fund's institutional money market assets relative to total assets as of January 2006, and (2) as an indicator variable equal one if the fund sponsor is affiliated with a financial conglomerate, and zero, otherwise. X_{it} is a vector of control variables that is identical to the one we use in equation (2). Our regression model also includes week-fixed effects, which account for any time differences in aggregate fund

flows or macroeconomic conditions driving the risk-taking decisions of different fund sponsors. Since $Reputation_i$ is specific to the fund sponsor, it is possible that risk taking within the same sponsor may be correlated across its funds. To address this concern, we cluster standard errors at the sponsor level. Our coefficient of interest is β, which measures the impact of a sponsor's reputation concern on risk taking.

We use three measures of risk ($Risk_{it}$). The first measure is *Spread*, which is the weekly fund return, net of the Treasury Bill rate. In the context of money market funds, spreads are a good measure of risk because there is little scope for managerial skill, which makes fund returns largely reflect its portfolio risk. One potential problem with using this measure, however, is that it may vary over time even though managers may not make any active changes in the risk profile of their portfolios, only because the returns on individual assets in the portfolio change. This could also happen in our setting since the relative returns on individual assets changed significantly between the pre and post-period.

To account for such mechanical changes in portfolio riskiness, we propose two other measures. Our second measure is *Holdings Risk*, defined as a fraction of obligations net of repurchase agreements and Treasuries in a fund portfolio, measured weekly. Obligations are the most risky asset class as reported in Table 2 and repos and Treasuries are least risky assets.

Our third measure, *Maturity Risk*, is the average maturity of assets in a fund portfolio, observed weekly. In general, funds with greater maturities of their assets would be considered more risky. We also studied implications of using the sensitivity of fund returns to changes in Treasury Bill rates (akin to duration risk). The measure is obtained from the fund-level time-series regression model in which the estimation is performed separately for the pre and post-period. The results are qualitatively similar to the ones we report below.

We begin with a nonparametric analysis of the observed effects. For each month between January 2006 and August 2008, we estimate the coefficient β from the regression model (4) on *Reputation*. Panel A of Figure 5 presents the results for *Holdings Risk*. We find no visible differences in the impact of reputation on portfolios risk prior to August 2007 but, starting

August 2007, we observe a large negative effect of *Reputation* on holdings risk. Panel B reports the results for *Maturity Risk*, and Panel C for *Spread*. Again, we observe similar patterns in loadings on reputation as for holdings risk.

We present the regression results in Table 5. For the post-period, we find that a one-standard-deviation increase in a sponsor's reputation reduces holdings risk by 3.6 percentage points, average maturity by 2.3 days, and fund spreads by 3.0 basis points. The results are statistically significant. They are also economically significant: A one-standard-deviation increase in *Reputation* corresponds to a 14.5% drop in spread relative to the cross-sectional standard deviation of fund holdings risk. The respective quantities for maturity risk and spread account for 18.9% and 18.3%. In contrast, we do not find any statistically significant impact of reputation on any of the risk measures in the pre-period. These results suggest that implicit guarantees provided by fund sponsors reduce risk taking in the post-period.

3.4 The role of financial strength

Our empirical analysis so far reveals the importance of reputation concerns as a driver of risk-taking decisions of money market funds. This result should be particularly strong if the bailout by fund sponsor is optimal ex post. However, the willingness to bail out the fund needs to be also contrasted with the sponsor's ability to do so. In particular, conditional on a given reputation level, one would expect funds with greater financial strength to take on more risk. In our setting, however, financial strength is likely correlated with reputation and thus introducing each factor in separation would not be helpful in establishing the role of financial strength.

To allow for such a separation we refine our empirical design. To this end, we analyze risk choices separately for funds sponsored by financial conglomerates and for those sponsored by investment management companies. By analyzing separately financial conglomerates only, we can fix the reputation concerns margin while varying the financial strength margin. Likewise, by looking into independent investment management companies, we can fix the financial strength margin while varying the reputation concern margin.

Our measure of financial strength for financial conglomerates is the price of CDS contract of the sponsor. These data are obtained from Datastream. We argue that higher CDS price would indicate weaker financial situation of the sponsor. Panel A of Table 6 presents the results from estimating the following regression model for financial conglomerates:

$$Risk_{i,t+1} = \alpha + \beta CDS_i + \gamma \mathbf{X_{i,t}} + \varepsilon_{i,t+1} \tag{4}$$

Columns (1), (3), and (5) present the results from the difference-in-differences model for holdings risk, maturity, and spread. We find that for each measure of risk the coefficient of the interaction term between CDS and *Post* is negative and statistically significant. In columns (2), (4), and (6), we report results from estimating regression model in which we additionally include *Reputation* as a control variable. While *Conglomerate* already captures some degree of reputational concerns this measure captures a slightly different notion of reputation than the one related to asset management business. The coefficient of *Reputation* is negative and statistically significant. Importantly, the coefficient of *CDS* retains its sign and statistical significance.

In Panel B, we report the results from estimating the risk regression for independent investors only. In columns (1), (3), and (5) we control for *Reputation*, under the assumption that independent investors exhibit financial weakness. Consistent with our hypothesis, we find that all three measures of risk are negatively correlated with reputation. In columns (2), (4), and (6), we allow for any unexplained variation in financial strength. Our measure of financial strength for this group is a fund sponsor's credit rating. The reason why credit rating might be a good proxy for our purpose is that fund sponsors with a good credit standing may be more able to access short-term funding markets and as such they may have more capacity to provide support. Nevertheless, in our data, credit ratings are only available for a subset of sponsors, mostly represented by companies with banking and insurance divisions. In this respect, our tests are likely to suffer from low statistical power. This concern is reflected in the precision of our estimates on *Rating*. They are positive but statistically insignificant.

Overall, our results strengthen our interpretation that, conditional on financial strength, rep-

utation negatively affects risk taking and, conditional on reputation, financial strength positively affects risk taking.

3.5 Evidence on redemptions and sponsor support

We estimate the effect of sponsors' reputation on the ex-post provision of implicit guarantees. Specifically, we examine financial support provided by fund sponsors during the one-week period after the start of the run in September 2008 but prior to the introduction of the Federal Deposit Insurance of money market fund assets.

We first test whether sponsors with more reputation are more likely to offer financial support to their money market funds. To this end, we estimate a regression model in which the response variable measures whether a fund sponsor provides support:

$$Support_{i,t+1} = \alpha + \beta_1 Reputation_i + \beta_2 Financial\ Strength_i + \gamma \mathbf{X_{i,t}} + \varepsilon_{i,t+1} \tag{5}$$

where *Support* takes a value of one if the fund sponsor offered support to its fund and zero, otherwise. Information on fund support is based on the no-action letters filings from SEC and is further appended with hand-collected data from newspaper accounts and individual funds' press releases. X is a vector of control variables that includes *Log(TNA)*, *Age*, *Expenses*, and *Log(Family Size)*.

We present the estimation results in columns (1) and (2) of Table 7. Consistent with our hypothesis, we find a positive and statistically significant effect of a fund's affiliation on the probability of receiving financial support. As shown in column (1), funds affiliated with financial conglomerates are 27.1% percentage points more likely to receive financial support in the week after the Lehman bankruptcy. Similarly, conditional on being affiliated with a financial conglomerates, sponsors with higher financial strength are more likely to provide support. As shown in column (2), funds with sponsors that have a credit rating are 44.7% percentage points more likely to receive financial support.

Subsequently, we assess the impact of implicit guarantees on fund redemptions. To this end,

we estimate the following regression model:

$$Redemptions_{i,t+1} = \alpha + \beta_1 Reputation_i + \beta_2 Financial\ Strength_i + \gamma \mathbf{X_{i,t}} + \varepsilon_{i,t+1} \qquad (6)$$

where *Redemptions* is the change in a fund size between September 18 and September 25, 2008. *Reputation*, *Financial Strength*, and X are defined as before.

We present the estimation results in columns (3) and (4) of Table 7. Consistent with our hypothesis, we find that funds of sponsors with a stronger reputation suffer smaller redemptions. As shown in column (3), a one-standard deviation increase in reputation reduces redemptions by 3.0 percentage points, or by 30.2% of the average redemption. As shown in column (4), we also find that redemptions are lower for funds affiliated with sponsors with credit ratings and sponsors with lower CDS albeit these results are not statistically significant.

3.6 Do unobserved sponsors' characteristics explain risk choices?

In our conceptual framework, we posit that the sponsor's reputation and financial strength have a significant impact on its funds' risk-taking decisions. However, our effects might be driven not by differences in the sponsor's degree of reputation and/or financial strength, but rather by unobserved differences in investment styles or manager ability across fund families, which in turn might be correlated with the sponsor's level of reputation and financial strength. For example, a fund sponsored by Blackrock, a low-reputation company, might be willing to take more risk than a fund sponsored, by Bank of America, a high-reputation company, due to its superior financial expertise or greater risk tolerance. To the extent that the variation in style or risk aversion among funds is permanent, our difference-in-differences estimator would account for any such differences. But, our empirical approach might fail if the variation differentially affects risk taking in the pre and post-period. For example, fund sponsors may differ in their reactions to any changes in the quantity of risk, or in their propensities to take risk when risk-taking opportunities arise.

3.6.1 Evidence from retail money market funds

Although we believe such differences are not *a priori* obvious, we conduct a more direct test, in which we identify the coefficients of interest off the differences between institutional and retail funds. To the extent that the fund sponsors offer both retail and institutional fund portfolios to their investors, one would imagine that both types of portfolios, within the same fund sponsor, should have similar levels of risk as long as their risk-taking behavior is governed by sponsor-specific characteristics. However, retail investors react much less to differences in return differentials across funds; therefore, we expect a much smaller effect for retail funds. Hence, even though sponsors of retail and institutional funds have the same unobserved characteristics, we expect a difference in their risk taking in the post-period.

We begin our analysis with estimating the flow-performance relationship for retail funds, separately for the pre and post-period, with and without fund-fixed effects. Panel A of Table 8 presents the results. Consistent with our premise, we find that the flow-performance relationship is quite weak for the sample of retail funds in both periods. The effect is also not driven by the ability of fund sponsors to provide support. Hence, the risk-taking incentives for retail funds are smaller than they are for institutional funds.

Building on this result, we further compare risk taking across fund sponsors, separately for institutional and retail funds using the setting of Table 5. Our primary interest is on the post-period estimation. We present the results in Panel B of Table 8. In the table, the results for institutional funds mirror those in Table 5 and are presented merely for ease of comparison.

The results for the two groups of funds are quite striking. While we observe statistically and economically significant differences with respect to reputation for institutional funds, these differences are almost zero for retail funds. For two out of four risk measures, the differences in coefficients on *Reputation* between retail and institutional funds are statistically significant at the 5% level of statistical significance.

Overall, the observed patterns in risk taking across funds with different scope of guarantees are unlikely to be driven by differences among fund management companies along some unob-

served characteristics, such as managerial information quality, style, or risk aversion, that are correlated with the level of sponsors' reputation concerns.

3.6.2 Evidence from the government's post-Lehman intervention

Another direct test of our identification strategy relies on yet another, exogenous change in the importance of reputation and financial strength. In particular, following the default of Lehman Brothers in September 2008, the market experienced a run on the entire money market fund industry. Since the likely consequences of this run were severe, the government decided to save the entire money market industry and extend explicit guarantees to all money market funds and their investors. Effectively, for the duration of the guarantee, which lasted over a year, this intervention eliminated the need for implicit guarantees. Notably, given that the government did not rescue the Reserve Primary Fund this guarantee was likely unexpected. Consequently, if the presence of implicit guarantees drives the observed differences in risk taking, we should expect that any pre-existing differences in risk-taking behavior among funds should be attenuated afterwards.

To evaluate this hypothesis, we revisit the risk regression model in Table 5 and extend our analysis to November 2009. We now consider three periods: January2006–July 2007, August 2007–August 2008, and January 2009–November 2009. We do not include the data for the quarter immediately following Lehman's default because the process of implementing explicit guarantees really did not take place until the end of 2008.[7] Also, many financial markets were very illiquid right after the default, so any adjustment of risk on the side of the funds was quite difficult to accomplish. Our empirical strategy involves estimating the risk-taking regression model using a difference-in-differences approach, in which *Reputation* is interacted with two indicator variables: *Post*, equal to one for the period August 2007–August 2008, and zero, otherwise; and *Post-Lehman* equal to one for the period January 2009–November 2009, and zero, otherwise. In line with our hypothesis, we should observe a zero effect of *Reputation* in

[7]Duygan-Bump, Parkinson, Rosengren, Suarez and Willen (2010) and Kacperczyk and Schnabl (2010) discuss the workings and exact timing of different government interventions.

the pre-period, a negative effect in the post-period, and again a zero effect in the post-Lehman period.

We report the results in Table 9. Consistent with our hypothesis, we find that the coefficient of *Post-Lehman* is close to zero for two out of three measures of risk. This result suggests that the role of reputation has become negligible once the government rolled out an explicit support for all funds, which confirms that reputation concerns played an important role in the post-period.

4 Concluding Remarks

We study the determinants of risk-taking decisions by money market mutual funds. Using the change in relative risks of money market instruments as an exogenous shock to the risk-taking opportunities of the funds, we find that funds sponsored by companies with little reputation and significant ability to provide support took on more risk relative to funds sponsored by companies with greater reputation and lower ability to provide such support starting August 2007, but not before. Consistent with our explanation, we further show that funds whose sponsors had greater reputation concerns experienced smaller outflows and were more likely to provide financial support during a market-wide run in September 2008.

We view our setting as a unique laboratory in which to study the microeconomic foundations of financial bailouts. Recent financial literature (e.g., Freixas, Loranth and Morrison (2007); Panageas (2010)) investigates the impact of government guarantees on risk-taking incentives. We argue that some of the macro effects may also have their counterparts at the individual firm level though the direction of the effects may actually reverse.

We want to emphasize one possible difference between ours and previous studies. While prior settings largely focus on interventions in which guarantors do not have a direct stake in the company (e.g., government), in our study, guarantors have a stake in the company. What makes such a setting potentially interesting and novel is that incentive problems related to asymmetric information and moral hazard, typically present in the context of external guarantors, might be

significantly altered in the presence of internal guarantors. We anticipate more exciting research to be done along these lines.

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Table 1: Summary Statistics of Institutional Prime Money Market Funds

This table provides information for the 20 largest institutional money market funds ranked by assets under management as of January 2006. *Fund Name* is the name of the fund, *Assets* is Assets under Management (in $ Billion), *Sponsor Name* is the name of the fund sponsor, *Reputation* is the sponsor's share of mutual fund assets other than institutional prime money market funds in total sponsor's assets, and *Conglomerate* indicates whether the fund sponsor is affiliated with a financial conglomerate.

Fund		Sponsor		
Fund Name	Assets	Sponsor Name	Reputation	Conglomerate
JPMorgan Prime Fund	68.1	JP Morgan	63.2%	Y
Columbia Cash Reserves Fund	42.4	Bank of America	71.8%	Y
Blackrock Liquidity Temp Fund	36.5	Blackrock	62.0%	N
Goldman Sachs FS Prime Fund	26.6	Goldman Sachs	61.1%	Y
Federated Prime Fund	21.8	Federated	62.8%	N
Citi Institutional Liquid Reserves Fund	21.8	Legg Mason	81.7%	N
Merrill Lynch Premier Fund	19.8	Blackrock	62.0%	N
AIM STIT Liquid Assets Fund	18.7	Invesco	74.1%	N
Morgan Stanley Institutional Liquidity Fund	17.3	Morgan Stanley	82.9%	Y
Fidelity Institutional Money Market Fund	16.5	Fidelity	93.9%	N
Reserve Primary Fund	16.1	Reserve Dividends	39.1%	N
Fidelity MMT Fund	16.0	Fidelity	93.9%	N
Columbia Money Market Reserves Fund	14.7	Bank of America	71.8%	Y
Dryden Core Investment Fund	13.8	Prudential	66.9%	Y
Evergreen Institutional Money Market Fund	13.3	Wachovia	82.8%	Y
Fidelity Institutional Prime Money Market Fund	13.3	Fidelity	93.9%	N
Dreyfus Cash Management Fund	13.2	Bank of New York Mellon	67.4%	Y
Fidelity Prime Fund	13.1	Fidelity	93.9%	N
State Street Global Advisors Money Fund	12.9	State Streets Bank	87.4%	Y
Dreyfus Institutional Cash Fund	12.6	Bank of New York Mellon	67.4%	Y

Table 2: Summary Statistics of Institutional Prime Money Market Funds

Our sample covers all U.S. institutional prime money market funds as of 1/1/2006. *Reputation* is the sponsor's share of mutual fund assets other than institutional prime money market funds in total sponsor's assets. High (Low) Reputation includes all funds with reputation above (below) the median value of reputation (81.6%). Fund characteristics are spread, expenses, total net assets (TNA), average portfolio maturity, age, and family size. Holdings are the share of assets invested in Treasuries and agency paper, repurchase agreements, bank deposits, bank obligations, floating-rate notes, commercial paper, and asset-backed commercial paper.

	All	High Reputation	Low Reputation
	(1)	(2)	(3)
Fund Characteristics			
Spread (bp)	6.9	6.6	7.2
	(6.4)	(7.5)	(5.0)
Annual Expenses (bp)	31.641	32.403	30.815
	(19.100)	(18.426)	(19.902)
TNA ($mil)	4,886	2,981	6,951
	(8,685)	(4,833)	(11,169)
Maturity (days)	34.318	35.117	33.451
	(11.016)	(12.485)	(9.173)
Age (years)	10.611	10.429	10.810
	(4.749)	(5.533)	(3.747)
Reputation	0.764	0.897	0.619
	(0.198)	(0.064)	(0.192)
Family Size ($bil)	72.8	97.5	45.9
	(149.1)	(200.9)	(39.2)
Conglomerate	0.399	0.442	0.352
	(0.491)	(0.500)	(0.481)
Portfolio Holdings			
U.S. Treasury & Agency	0.060	0.072	0.048
	(0.109)	(0.120)	(0.095)
Repurchase Agreements	0.135	0.142	0.126
	(0.150)	(0.169)	(0.128)
Bank Deposits	0.032	0.021	0.044
	(0.057)	(0.039)	(0.069)
Bank Obligations	0.122	0.111	0.135
	(0.126)	(0.120)	(0.132)
Floating-Rate Notes	0.198	0.192	0.204
	(0.162)	(0.168)	(0.156)
Commercial Paper	0.320	0.356	0.280
	(0.224)	(0.252)	(0.182)
Asset-backed CP	0.134	0.106	0.164
	(0.155)	(0.151)	(0.154)
Funds	148	77	71

Table 3: Returns by Asset Class

The sample is all U.S. institutional prime money market funds. The dependent variable is *Spread*, computed as the annualized return minus the Treasury Bill rate. Holdings variables are the share of assets invested in repurchase agreements, bank deposits, bank obligations, floating-rate notes, commercial paper (CP), and asset-backed CP (omitted category is U.S. Treasury and agency). Fund Characteristics are natural logarithm of fund assets, expense ratio, fund age, and natural logarithm of fund family size. All regressions are at the weekly level and include week-fixed effects. Columns (3) and (4) include fund-fixed effects. Columns (1) to (3) cover the period 8/1/2007-8/31/2008 (*Post* period). Columns (2) and (4) cover the period 1/1/2006-7/31/2007 (*Pre* period). Standard errors are clustered at the fund level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	$Spread_{i,t+1}$			
Period	Post	Pre	Post	Pre
	(1)	(2)	(3)	(4)
Holdings				
$Repurchase\ Agreements_{i,t}$	13.015	17.762***	41.099**	11.652**
	(8.168)	(3.428)	(16.124)	(5.659)
$Bank\ Deposits_{i,t}$	1.990	17.040***	12.030	18.555***
	(26.656)	(3.936)	(25.266)	(6.913)
$Bank\ Obligations_{i,t}$	86.983***	15.382***	92.672***	6.994
	(8.035)	(3.494)	(17.672)	(4.931)
$Floating\text{-}Rate\ Notes_{i,t}$	81.602***	22.414***	87.255***	10.287
	(7.989)	(3.470)	(21.674)	(6.553)
$Commercial\ Paper_{t}$	58.502***	16.182***	70.678***	16.400***
	(8.002)	(3.274)	(23.470)	(5.745)
$Asset\text{-}backed\ CP_{i,t}$	75.565***	20.573***	82.345***	15.966**
	(8.402)	(3.155)	(18.917)	(6.233)
Fund Characteristics				
$Log(TNA)_{i,t}$	0.628	0.197**	3.790**	0.532
	(0.418)	(0.100)	(1.615)	(0.483)
$Expense\ Ratio_{i,t}$	10.020***	1.637*	82.207***	53.555***
	(2.967)	(0.956)	(26.479)	(11.616)
$Age_{i,t}$	-1.957	-0.47	-0.666	-0.601
	(1.470)	(0.491)	(0.551)	(0.453)
$Log(FamSize)_{i,t}$	0.553	0.174	6.863	0.261*
	(0.500)	(0.131)	(5.623)	(0.134)
Constant	65.190***	5.441	-43.076	-12.149
	(10.546)	(4.148)	(78.309)	(8.947)
Week-Fixed Effects	Y	Y	Y	Y
Fund-Fixed Effects	N	N	Y	Y
Observations	7,756	11,927	7,756	11,927
R-squared	0.94	0.79	0.95	0.80

Table 4: Flow-Performance Relationship

The sample is all U.S. institutional prime money market funds. Columns (1), (3), and (5) cover the period from 8/1/2007 to 8/31/2008 (*Post*-period). Columns (2), (4), and (6) cover the period from 1/1/2006-7/31/2007 (*Pre*-period). The dependent variable is *Fund Flow*, computed as the percentage change in total net assets from time *t* to time *t+1*, adjusted for market appreciation. Independent variables are the weekly annualized spread from *t* to *t-1*, natural logarithm of fund assets, fund expense ratio, fund age, volatility of fund flows based on past 13-week fund flows, and natural logarithm of fund family size. In columns (5) and (6), additional independent variables are the interactions of *Spread* with *Reputation* and *Conglomerate*. *Reputation* is the sponsor's share of mutual fund assets other than institutional prime money market funds in total sponsor's assets. *Conglomerate* is an indicator variable equal to one if the fund sponsor is affiliated with a financial conglomerate, and zero, otherwise. All regressions are at the weekly level and include week-fixed effects. Columns (3) to (6) include fund-fixed effects. Standard errors are clustered at the fund level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Fund Flow$_{i,t+1}$					
Period	Post	Pre	Post	Pre	Post	Pre
	(1)	(2)	(3)	(4)	(5)	(6)
Spread$_{i,t}$	0.013***	0.003	0.024***	0.000	0.026***	0.009
	(0.005)	(0.005)	(0.008)	(0.004)	(0.009)	(0.010)
Reputation$_i$*Spread$_{i,t}$					-0.003	-0.009
					(0.006)	(0.009)
Conglomerate$_i$*Spread$_{i,t}$					0	-0.003
					(0.003)	(0.005)
Log(TNA)$_{i,t}$	-0.120**	-0.077***	-7.659***	-4.146***	-7.656***	-4.148***
	(0.051)	(0.029)	(1.341)	(0.720)	(1.344)	(0.720)
Expense Ratio$_{i,t}$	-0.551*	-1.276***	-2.72	-1.365	-2.737	-1.475
	(0.320)	(0.354)	(5.899)	(3.703)	(5.853)	(3.704)
Age$_{i,t}$	0.159	-0.078	0.015	0.715**	0.013	0.713**
	(0.180)	(0.149)	(0.322)	(0.323)	(0.322)	(0.323)
Flow Volatility$_{,t}$	4.239*	2.476**	1.378	-0.213	1.328	-0.23
	(2.323)	(1.243)	(3.177)	(2.152)	(3.168)	(2.146)
Log(FamSize)$_{i,t}$	0.025	0.032**	0.53	0.042	0.523	0.045
	(0.023)	(0.014)	(1.239)	(0.126)	(1.246)	(0.127)
Week-Fixed Effects	Y	Y	Y	Y	Y	Y
Fund-Fixed Effects	N	N	Y	Y	Y	Y
Observations	7,808	11,984	7,808	11,984	7,808	11,984
R-squared	0.022	0.017	0.085	0.052	0.085	0.052

Table 5: Sponsor's Reputation and Risk Taking

The sample is all U.S. institutional prime money market funds for the period from 1/1/2006 to 8/31/2008. The dependent variables are: the fraction of assets held in risky assets, net of the riskless assets (*Holdings Risk*) in Columns (1)-(3), average portfolio maturity (*Maturity Risk*) in Columns (4)-(6); and the weekly annualized spread (*Spread*) in Columns (7)-(9). *Reputation* is the sponsor's share of mutual fund assets other than institutional prime money market funds in total sponsor's assets. *Conglomerate* is an indicator variable equal to one if the fund sponsor is affiliated with a financial conglomerate, and zero, otherwise. Other independent variables are fund assets, expense ratio, fund age, and fund family size (coefficients not shown). *Post* is an indicator variable equal one for the period from 8/1/2007-8/31/2008, and zero, otherwise. All regressions are at the weekly level and include week-fixed effects. Columns (2), (5), (8) include sponsor-fixed effects and Columns (3), (6), and (9) include fund-fixed effects. Standard errors are clustered at the sponsor level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Holdings Risk$_{i,t+1}$			Maturity Risk$_{i,t+1}$			Spread$_{i,t+1}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Reputation$_i$*Post$_t$	-18.271*	-21.216**	-19.562**	-11.436**	-12.572**	-11.886**	-15.040**	-15.473**	-14.218*
	(9.296)	(8.705)	(8.941)	(5.334)	(5.782)	(5.911)	(7.470)	(7.443)	(7.419)
Conglomerate$_i$*Post$_t$	-6.774**	-5.573*	-6.319**	-1.664	-1.519	-1.701	-7.263***	-7.215***	-7.321***
	(3.018)	(2.885)	(2.962)	(1.722)	(1.750)	(1.762)	(2.429)	(2.424)	(2.428)
Reputation$_i$	-18.126			5.398			-2.764		
	(13.540)			(5.310)			(1.929)		
Conglomerate$_i$	-6.539			-1.698			-1.212*		
	(4.233)			(1.938)			(0.655)		
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Week-Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sponsor-Fixed Effects	N	Y	N	N	Y	N	N	Y	N
Fund-Fixed Effects	N	N	Y	N	N	Y	N	N	Y
Observations	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097	19,097
R-squared	0.209	0.624	0.78	0.142	0.482	0.587	0.952	0.957	0.959

Table 6: Sponsor's Capital and Risk Taking

The sample is all U.S. institutional prime money market funds for the period from 1/1/2006 to 8/31/2008. The dependent variables, *Reputation*, and *Post* are defined in Table 5. All regressions include the same control variables as in Table 5 (coefficients not shown). They are at the weekly level and include week-fixed effects and fund-fixed effects. Standard errors are clustered at the sponsor level. **Panel A** is restricted to funds that are affiliated with financial conglomerates. *Log(CDS)* is the natural logarithm of the sponsor's credit default swap (CDS) price. **Panel B** is restricted to funds that are affiliated with a stand-alone asset manager. *No Rating* is an indicator variable equal one if the sponsor has a credit rating, and zero, otherwise. ***, **, * represent 1%, 5%, and 10% significance, respectively.

Panel A: Conglomerates						
	Holdings $Risk_{i,t+1}$		Maturity $Risk_{i,t+1}$		$Spread_{i,t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Log(CDS)_i$*$Post_t$	-7.766***	-7.996***	-5.694*	-5.284**	-4.415*	-3.635*
	(1.977)	(1.914)	(2.758)	(2.295)	(2.711)	(2.037)
$Reputation_i$*$Post_t$		8.947		-15.941		-30.319***
		(11.985)		(12.203)		(8.736)
Controls	Y	Y	Y	Y	Y	Y
Week-Fixed Effects	Y	Y	Y	Y	Y	Y
Fund-Fixed Effects	Y	Y	Y	Y	Y	Y
Observations	7,587	7,587	7,587	7,587	7,587	7,587
R-squared	0.696	0.696	0.53	0.534	0.969	0.97
Panel B: Asset Managers						
	Holdings $Risk_{i,t+1}$		Maturity $Risk_{i,t+1}$		$Spread_{i,t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Reputation_i$*$Post_t$	-38.602***	-38.616***	-10.003**	-10.006**	-22.394***	-22.413***
	(13.602)	(12.660)	(4.436)	(4.409)	(7.198)	(7.470)
$No\ Rating_i$*$Post_t$		-8.249		-1.684		-7.777**
		(5.410)		(1.356)		(3.065)
Controls	Y	Y	Y	Y	Y	Y
Week-Fixed Effects	Y	Y	Y	Y	Y	Y
Fund-Fixed Effects	Y	Y	Y	Y	Y	Y
Observations	7,646	7,893	7,646	7,646	7,645	7,645
R-squared	0.715	0.968	0.67	0.671	0.968	0.968

Table 7: Support and Redemptions following Post-Lehman Run

The sample is all U.S. institutional prime money market funds that were active in the week before the Lehman's bankruptcy. The dependent variable *Support* is an indicator variable equal to one if the fund's sponsor filed a no-action letter with the SEC in the week after the Lehman's bankruptcy (9/18/2008-9/25/2008), and zero, otherwise. The dependent variable *Redemptions* is total value of redemptions (fund outflows) in the week after the Lehman's bankruptcy. All independent variables are defined in Tables 5 and 6. Standard errors are clustered at the sponsor level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Support		Redemptions	
	(1)	(2)	(3)	(4)
$Reputation_i$	-0.237		-0.154*	
	(0.313)		(0.088)	
$Conglomerate_i$	0.271**		0.008	
	(0.108)		(0.027)	
$No\ Rating_i$		-0.447*		0.072
		(0.232)		(0.077)
$Log(CDS)_i$		0.057		0.034
		(0.136)		(0.033)
$Log(TNA)_{i,t}$	-0.007	0.023	0.013	0.025
	(0.015)	(0.042)	(0.009)	(0.009)
$Expense\ Ratio_{i,t}$	0.051	0.393	-0.171**	-0.022
	(0.145)	(0.312)	(0.071)	(0.062)
$Age_{i,t}$	-0.071	-0.170	-0.004	-0.019
	(0.064)	(0.140)	(0.028)	(0.049)
$Log(FamSize)_{i,t}$	0.033*	0.047	0.010**	0.003
	(0.005)	(0.037)	(0.005)	(0.007)
Constant	0.556	0.143	0.102	-0.171
	(0.409)	(0.823)	(0.144)	(0.201)
Observations	142	58	142	58
R-squared	0.178	0.165	0.183	0.2356

Table 8: Institutional vs. Retail Funds

The sample is all U.S. retail prime money market funds for the period from 1/1/2006 to 8/31/2008. **In Panel A**, we examine the flow-performance relationship for retail prime money market funds (similar to Table 4). Columns (1), (3), and (5) cover the period from 8/1/2007 to 8/31/2008 (*Post*-period). Columns (2), (4), and (6) cover the period from 1/1/2006-7/31/2007 (*Pre*-period). The dependent variable is *Fund Flow*, computed as the percentage change in total net assets from time *t* to time *t+1*, adjusted for market appreciation. Independent variables are the weekly annualized spread from *t* to *t-1*, natural logarithm of fund assets, fund expense ratio, fund age, volatility of fund flows based on past 13-week fund flows, and natural logarithm of fund family size. In columns (5) and (6), additional independent variables are the interactions of *Spread* with *Reputation* and *Conglomerate*. All regressions are at the weekly level and include week-fixed effects. Columns (3)-(6) include fund-fixed effects. Standard errors are clustered at the fund level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

Panel A: Flow-Performance Relationship

	Fund Flow$_{i,t+1}$					
Period	Post	Pre	Post	Pre	Post	Pre
	(1)	(2)	(3)	(4)	(5)	(6)
Spread$_{i,t}$	0.002	0.006**	0.005*	0.004*	0.008	0.021***
	(0.002)	(0.003)	(0.003)	(0.002)	(0.005)	(0.005)
Reputation$_i$*Spread$_{i,t}$					-0.007	-0.015**
					(0.005)	(0.007)
Conglomerate$_i$*Spread$_{i,t}$					0.001	-0.002
					(0.002)	(0.004)
Log(TNA)$_{i,t}$	-0.041	-0.022	-4.342**	-2.975***	-3.165**	-2.886***
	(0.031)	(0.030)	(1.682)	(0.975)	(1.506)	(1.046)
Expense Ratio$_{i,t}$	-0.109	-0.459***	-3.009**	2.274	-3.003**	-0.808
	(0.220)	(0.167)	(1.283)	(1.691)	(1.339)	(1.455)
Age$_{i,t}$	0.014	-0.089	-0.038	-0.068	-0.134	-0.095
	(0.120)	(0.164)	(0.135)	(0.169)	(0.150)	(0.206)
Flow Volatility$_{,t}$	0.254	2.332	-3.942	-2.332	-3.919	-4.813**
	(2.608)	(1.950)	(5.000)	(2.116)	(7.244)	(2.271)
Log(FamSize)$_{i,t}$	0.011	0.027	0.029	0.055*	-0.009	0.395
	(0.017)	(0.023)	(0.020)	(0.032)	(0.494)	(0.294)
Week-Fixed Effects	Y	Y	Y	Y	Y	Y
Fund-Fixed Effects	N	N	Y	Y	Y	Y
Observations	5,925	9,333	5,925	9,333	3,724	6,004
R-squared	0.043	0.022	0.093	0.072	0.11	0.076

In Panel B, we examine the relationship between reputation and risk for retail prime money market funds (similar to Table 5). The dependent variables are: the fraction of assets held in risky assets, net of the riskless assets (*Holdings Risk*) in Columns (1)-(3), average portfolio maturity (*Maturity Risk*) in Columns (4)-(6); and the weekly annualized spread (*Spread*) in Columns (7)-(9). *Retail Reputation* is the sponsor's share of mutual fund assets other than retail prime money market funds in total sponsor's assets. *Conglomerate* is an indicator variable equal to one if the fund sponsor is affiliated with a financial conglomerate, and zero, otherwise. Other independent variables are fund assets, expense ratio, fund age, and fund family size (coefficients not shown). *Post* is an indicator variable equal to one for the period from 8/1/2007 to 8/31/2008, and zero, otherwise. All regressions are at the weekly level and include week-fixed effects. Columns (2), (5), (8) include sponsor-fixed effects and Columns (3), (6), and (9) include fund-fixed effects. Standard errors are clustered at the sponsor level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

Panel B: Sponsor's Reputation and Risk Taking

	Holdings $Risk_{i,t+1}$			Maturity $Risk_{i,t+1}$			$Spread_{i,t+1}$		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$Retail\ Reputation_i * Post_t$	14.569	15.071	15.712	-1.702	3.482	2.682	-10.629	-8.992	-8.85
	(16.298)	(13.917)	(14.104)	(7.096)	(6.465)	(6.323)	(13.895)	(14.178)	(14.405)
$Conglomerate_i * Post_t$	3.78	7.108	7.219	-5.055*	-4.05	-3.92	-3.848	-4.131	-4.238
	(6.783)	(5.913)	(5.970)	(2.891)	(2.535)	(2.635)	(5.273)	(5.305)	(5.403)
$Retail\ Reputation_i$	-48.277***			-20.188**			-0.698		
	(10.726)			(8.069)			(2.587)		
$Conglomerate_i$	-6.217			-2.379			0.127		
	(4.445)			(2.306)			(1.039)		
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y
Week-Fixed Effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sponsor-Fixed Effects	N	Y	N	N	Y	N	N	Y	N
Fund-Fixed Effects	N	N	Y	N	N	Y	N	N	Y
Observations	9,740	9,740	9,740	9,740	9,740	9,740	9,744	9,744	9,744
R-squared	0.34	0.74	0.77	0.31	0.60	0.63	0.90	0.91	0.91

Table 9: Capital and Risk Taking After Government Guarantee

The sample is all U.S. institutional prime money market funds for the period from 1/1/2006 to 11/30/2009. We estimate the same regression models as in Table 5 for the period from July 2006 to November 2009. We drop the month of the Lehman's bankruptcy and the quarter immediately after the Lehman's bankruptcy to focus on risk taking after a short adjustment period. We interact our main variables of interest with an indicator variable for the Post period (July 2007 to August 2008) and the Post-Lehman period (January 2009 to November 2009). All regressions include the control variables specified in Table 5 (coefficients not shown). They are at the weekly level and include week-fixed effects. Columns (1), (3), and (5) include sponsor-fixed effects and Columns (2), (4), and (6) include fund-fixed effects. Standard errors are clustered at the sponsor-level. ***, **, * represent 1%, 5%, and 10% significance, respectively.

	Holdings $Risk_{i,t+1}$		Maturity $Risk_{i,t+1}$		$Spread_{i,t+1}$	
	(1)	(2)	(3)	(4)	(5)	(6)
$Reputation_i$*$Post_t$	26.810***	22.776**	20.843**	18.841**	14.511***	13.600**
	(9.428)	(9.735)	(8.655)	(8.714)	(5.116)	(5.377)
$Reputation_i$*Post-$Lehman_t$	10.061	2.78	-8.147	-10.104	-3.459	-5.839
	(13.216)	(13.527)	(10.699)	(10.792)	(10.756)	(10.709)
$Conglomerate_i$*$Post_t$	5.01	6.177**	11.834***	12.240***	1.576	2.001
	(3.032)	(3.076)	(3.103)	(3.125)	(1.548)	(1.577)
$Conglomerate_i$*Post-$Lehman_t$	-4.137	-2.988	-4.555	-4.123	5.470*	5.818*
	(4.486)	(4.383)	(3.135)	(3.153)	(3.221)	(3.176)
Controls	Y	Y	Y	Y	Y	Y
Week-Fixed Effects	Y	Y	Y	Y	Y	Y
Sponsor-Fixed Effects	Y	N	Y	N	Y	N
Fund-Fixed Effects	N	Y	N	Y	N	Y
Observations	26,522	26,522	26,520	26,520	26,522	26,522
R-squared	0.473	0.552	0.923	0.925	0.596	0.713

Figure 1: Dispersion in Money Market Fund Yields

This figure plots the 5th and the 95th percentile of monthly money market yields for the period January 2002 to August 2008 for the universe of U.S. money market funds.

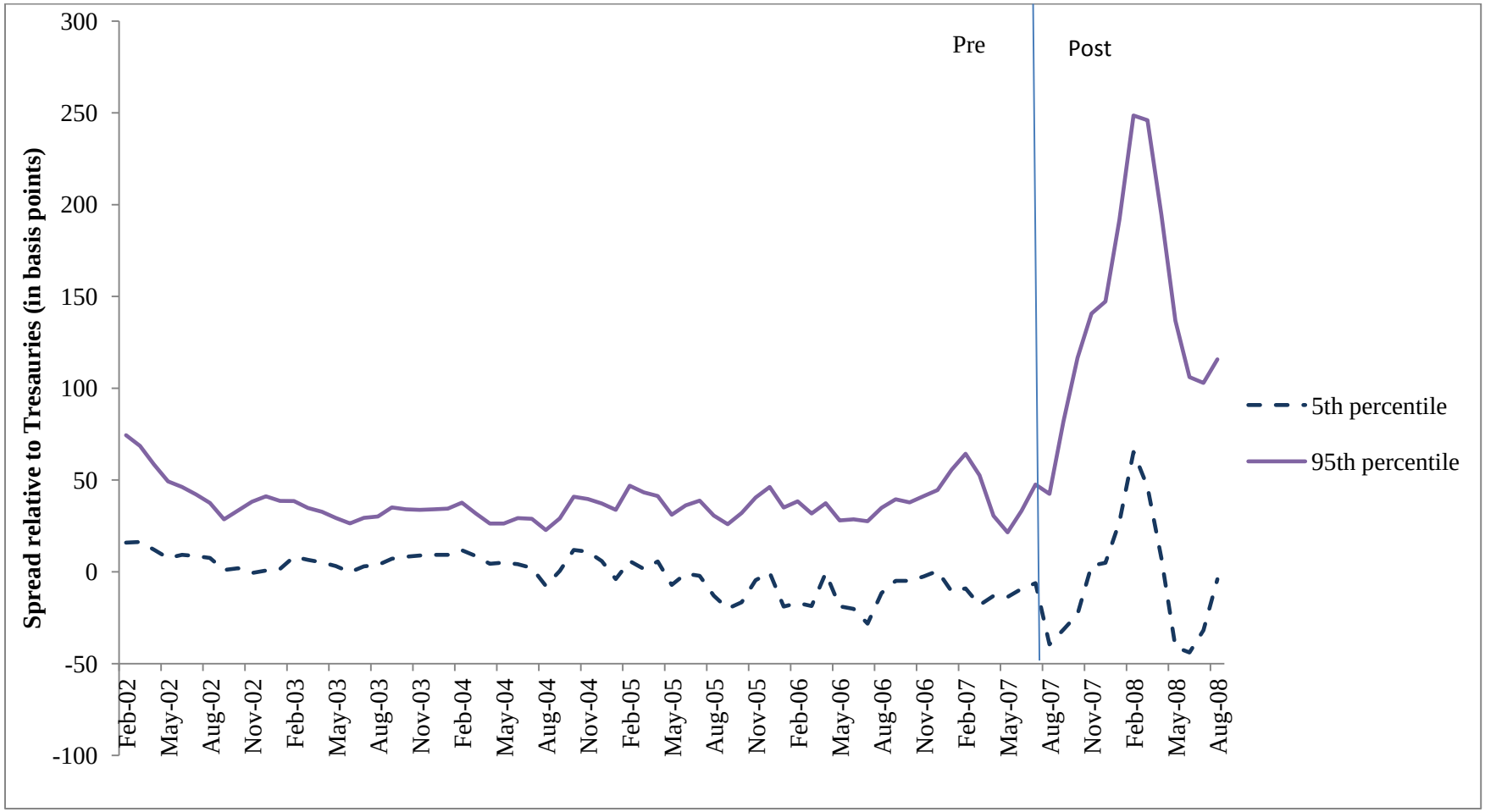


Figure 2: Assets Holdings and Spread

We implement the regression in Table 3 for the period from January 2005 to August 2008. Each point represents the three-month average of coefficients on the interaction between month-fixed effects and an indicator variable for repurchase agreements (*Repo*), bank deposits (*Deposits*), bank obligation (*Obligation*), floating rates notes (*FRNS*), commercial paper (*CP*), and asset-backed commercial paper (*ABCP*), respectively. Each point represents the return relative to the omitted category (*Treasury bills and agency debt*) measured in percentage points.

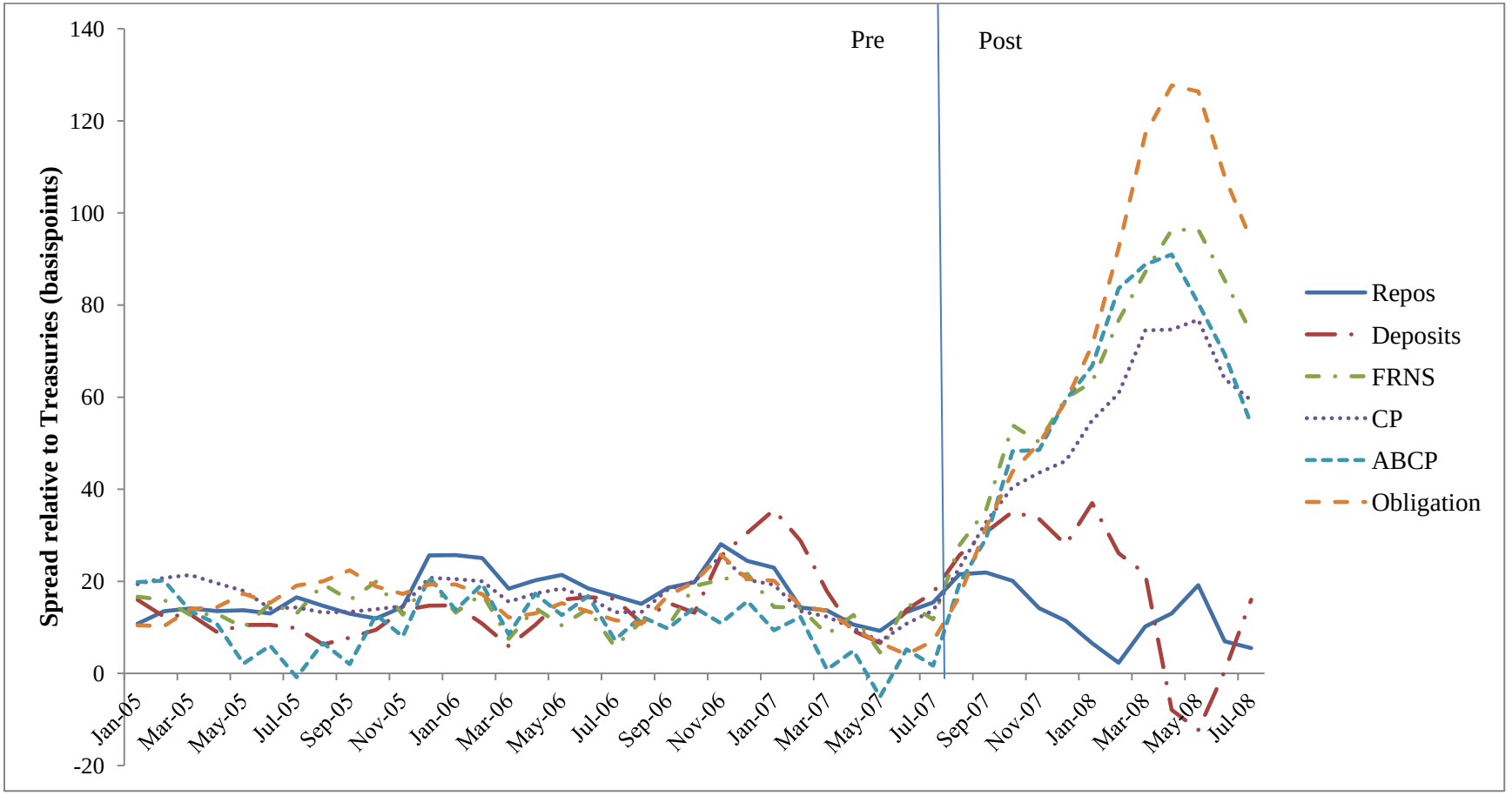
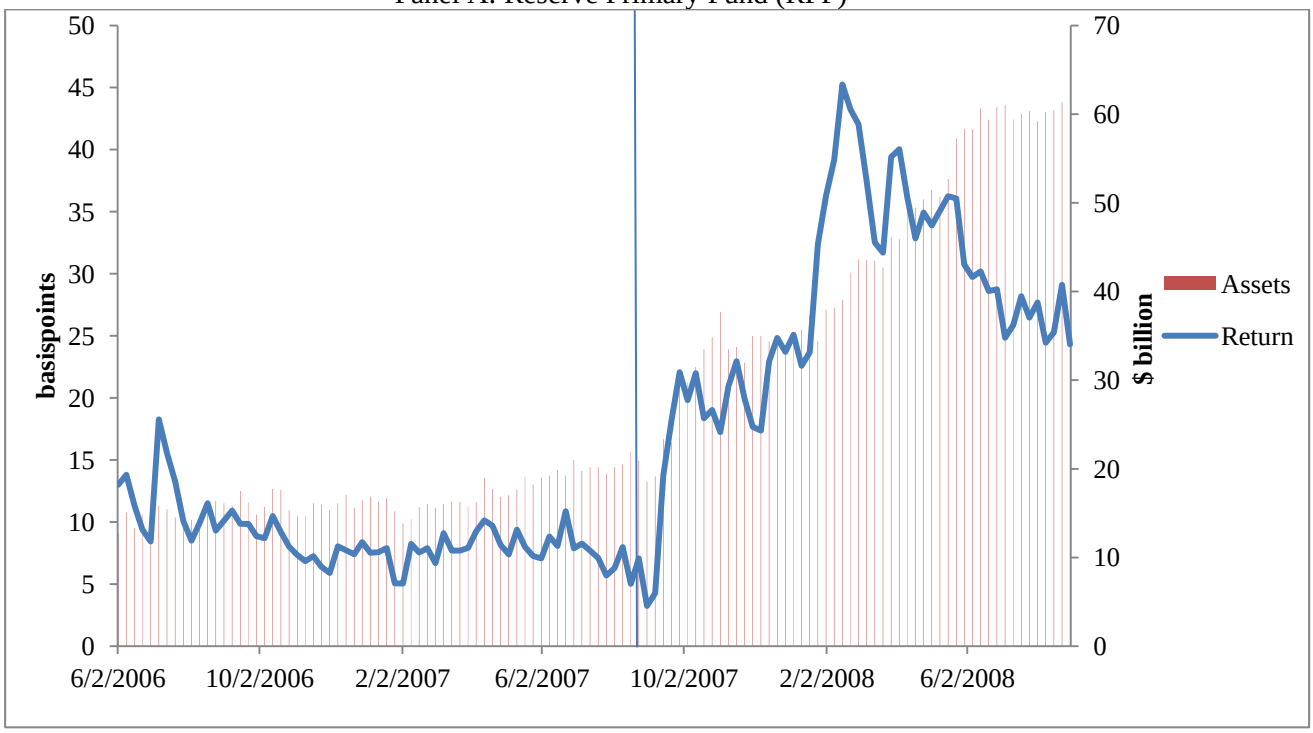


Figure 3: Relative Performance and Assets: RPF vs. CCR

This figure plots weekly total assets and the industry-adjusted spread of the Reserve Primary Fund (Panel A) and the Columbia Cash Reserves (Panel B) from January 2006 to August 2008. The industry-adjusted spread is computed as a difference between each individual fund's spread and the value-weighted average spread of all institutional prime funds.

Panel A: Reserve Primary Fund (RPF)

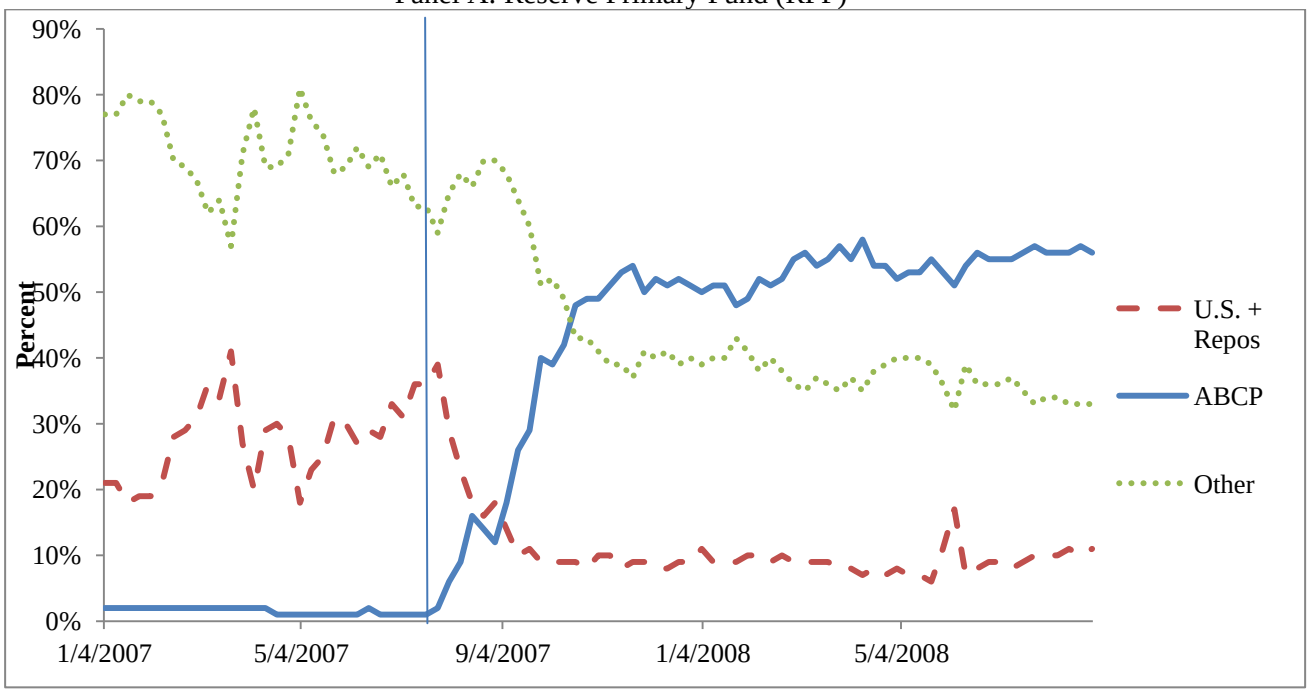


Panel B: Columbia Cash Reserves (CCR)

Figure 4: Assets Holdings: RPF vs. CCR

This figure plots weekly holdings of the Reserve Primary Fund (Panel A) and the Columbia Cash Reserves Fund (Panel B) from January 2007 to August 2008. U.S. + Repos is the share of assets invested in U.S. Treasures, U.S. agency-debt, and repurchase agreements. ABCP is the share invested in asset-backed commercial paper. Other is the share invested in other securities: bank obligations and floating rates notes.

Panel A: Reserve Primary Fund (RPF)



Panel B: Columbia Cash Reserves (CCR)

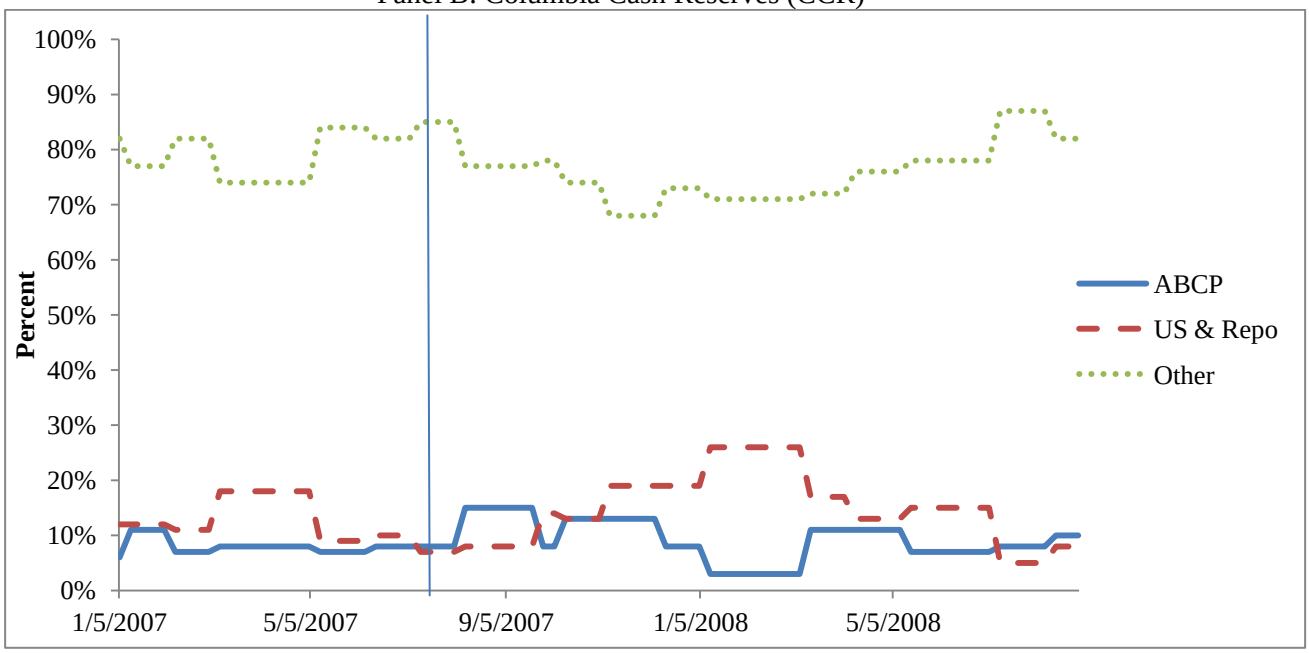
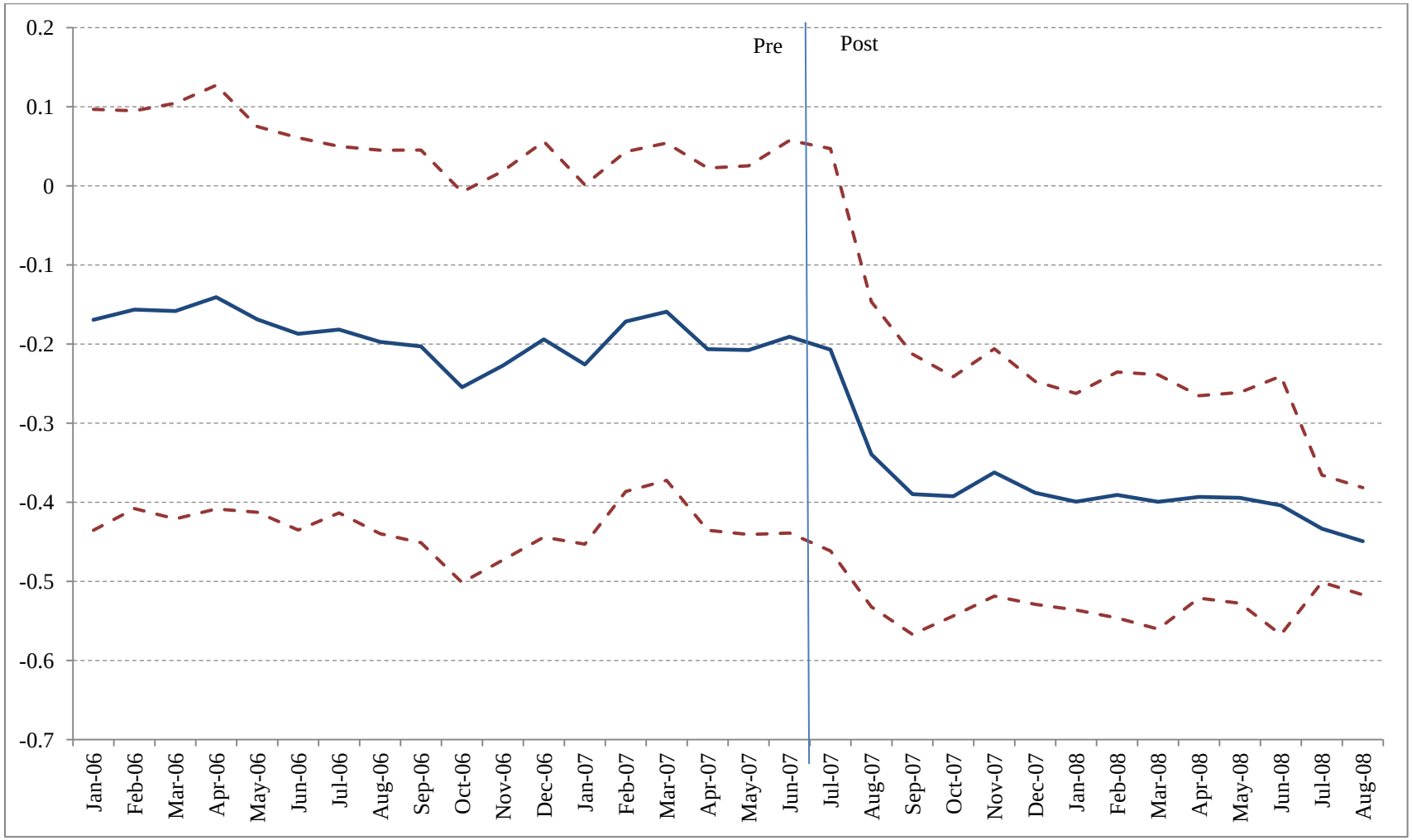


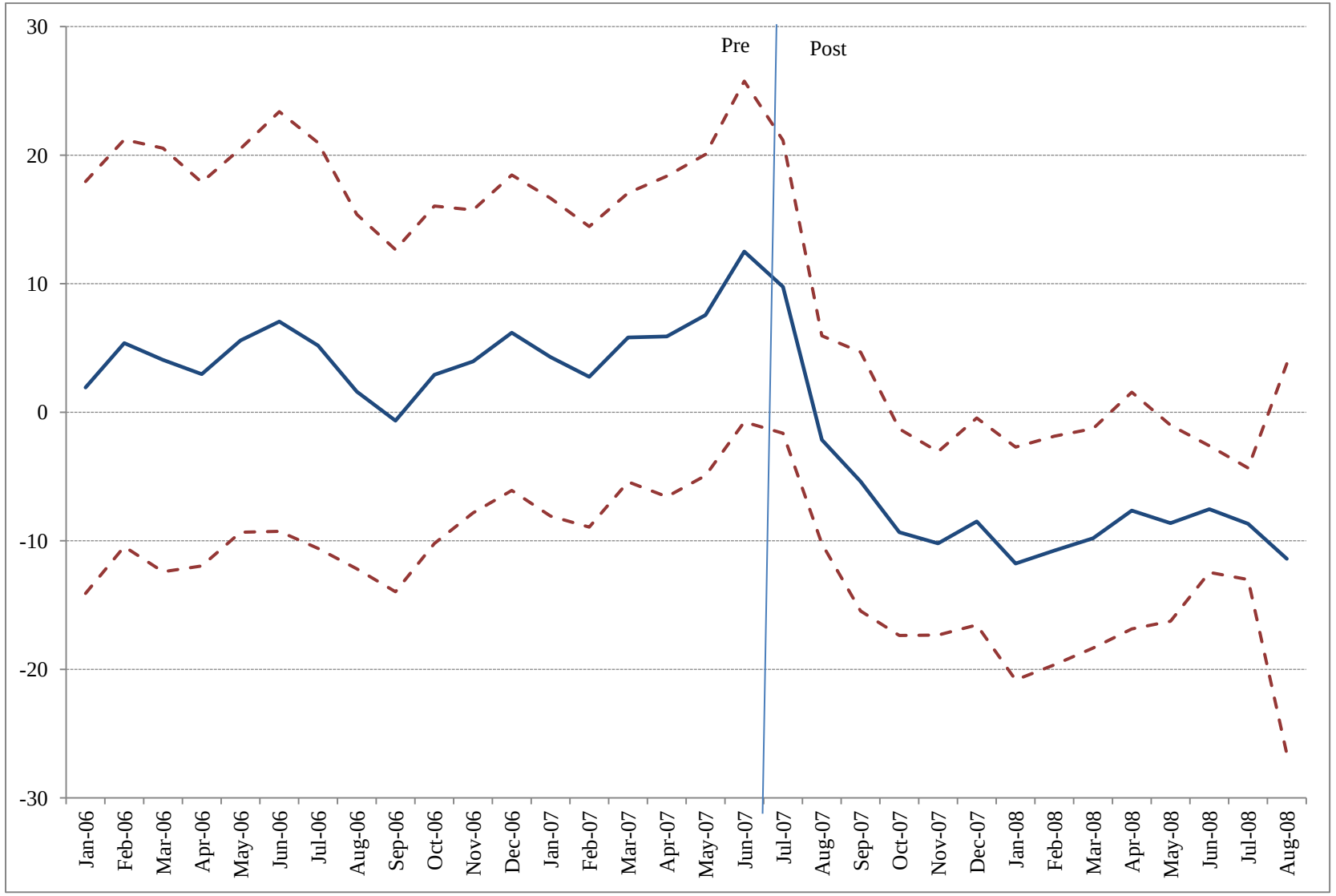
Figure 5: Implicit Guarantees and Risk Taking

Each of the four panels below plots interaction coefficients from an OLS regression. The dependent variable is one of the three risk measures: holdings risk, maturity, and spread. The main independent variable is the interaction of the fund sponsor's reputation and monthly indicator variables. We include all control variables defined in Table 5.

Panel A: Holdings Risk



Panel B: Maturity Risk



Panel C: Spread