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Are retail prime money market fund investors increasingly more sensitive to stress events?¹

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1. Introduction

U.S. prime money market mutual funds (MMFs) experienced large redemptions and bank-like runs in 2008 and 2020. During these episodes, institutional investors in prime MMFs tended to redeem quicker and at much larger magnitudes than retail investors.

In this note, we examine how retail investors' redemption sensitivity has evolved between 2008 and 2020, to assess whether they have become relatively more attuned to stress in the MMF sector. To do this, we estimate the response of prime funds' net flows to periods of stress in the MMF industry. We find that, on average, institutional prime MMFs experienced similar aggregate net outflows in both stress periods. In contrast, the average aggregate net outflows from retail prime MMFs increased from 2008 to 2020. Our findings suggest that redemption dynamics of investors in retail prime MMFs, which are often thought of as slower to react to stress events than institutional investors, may be evolving.

¹ We thank Patrick McCabe and Scott Strah for their helpful comments and suggestions, and Sean Baker and Isabel Leigh for help with the data. The views expressed in this note are ours and do not necessarily reflect the opinions of the Federal Reserve bank of Boston or Federal Reserve System. All errors and omissions are those of the authors.

The rest of the note is organized as follows: Section 2 provides background information on MMFs and our motivation. Data and descriptive analysis are presented in Section 3. Section 4 discusses our empirical analysis and results, with concluding remarks in Section 5.

2. Background and Motivation

2.1. Historical MMF Runs and Reforms

MMFs are U.S. Securities and Exchange Commission (SEC)-registered investment vehicles that typically aim to maintain a stable or near stable net asset value (NAV) of \$1.00 per share. MMFs are classified as “prime” funds, which can invest in private short-term debt such as commercial paper (CP) and certificates of deposit (CD); “government” funds, which invest substantially all their assets in U.S. government and agency securities and repurchase agreements; and “tax-exempt” funds, which hold municipal securities. Additionally, MMFs are also classified as “institutional” and “retail”.²

MMFs are vulnerable to runs because they engage in liquidity and maturity transformation: that is, they issue money-like liabilities that can be redeemed each day while investing in assets with credit and interest rate risk. Indeed, prime MMFs experienced two significant runs in 2008 (see, generally, McCabe [2010]) and 2020 (see, generally, President’s Working Group on Financial Markets (PWG) [2022] and Li, Li, Macchiavelli, and Zhou [2021]). Both runs exacerbated stresses in short-term funding markets, which

² The SEC’s 2014 reforms defined retail MMFs as those with “policies and procedures reasonably designed to limit all beneficial owners of the money market fund to natural persons.” See, [Money Market Fund Reform; Amendments to Form PF \(Corrected\)](#). Prior to these reforms, the retail vs institutional fund distinction was informal, and industry analysts usually differentiate institutional and retail funds based on fund characteristics like minimum initial investment (usually lower for retail funds) and expense ratios (usually larger for retail funds).

abated after the Federal Reserve established emergency lending facilities. These facilities were intended to “...assist MMMFs in meeting demands for redemptions...[and] enhancing overall market functioning” (Federal Reserve Board, 2020).³

Following these runs, the SEC promulgated reforms in 2010, 2014 and 2023 to strengthen MMF resilience. The 2010 reforms introduced new minimum liquid asset and enhanced disclosure requirements. The 2014 reforms had two core elements: a floating NAV requirement for institutional prime and tax-exempt MMFs and new liquidity fee and gating provisions. The floating NAV requirement sought to reduce run incentives associated with institutional prime MMFs that maintain a stable NAV. Prior to the reforms, such funds typically rounded their NAVs to \$1.00 if their market-based value was at least \$0.995. This created a “threshold effect” that incentivized investors to redeem if the fund’s market-based value approached that threshold (Bouveret, Martin, and McCabe [2022]).

The latest reforms in 2023 removed the 2014 fees and gates requirement and introduced a dynamic liquidity fee requirement for institutional prime funds, among other changes.

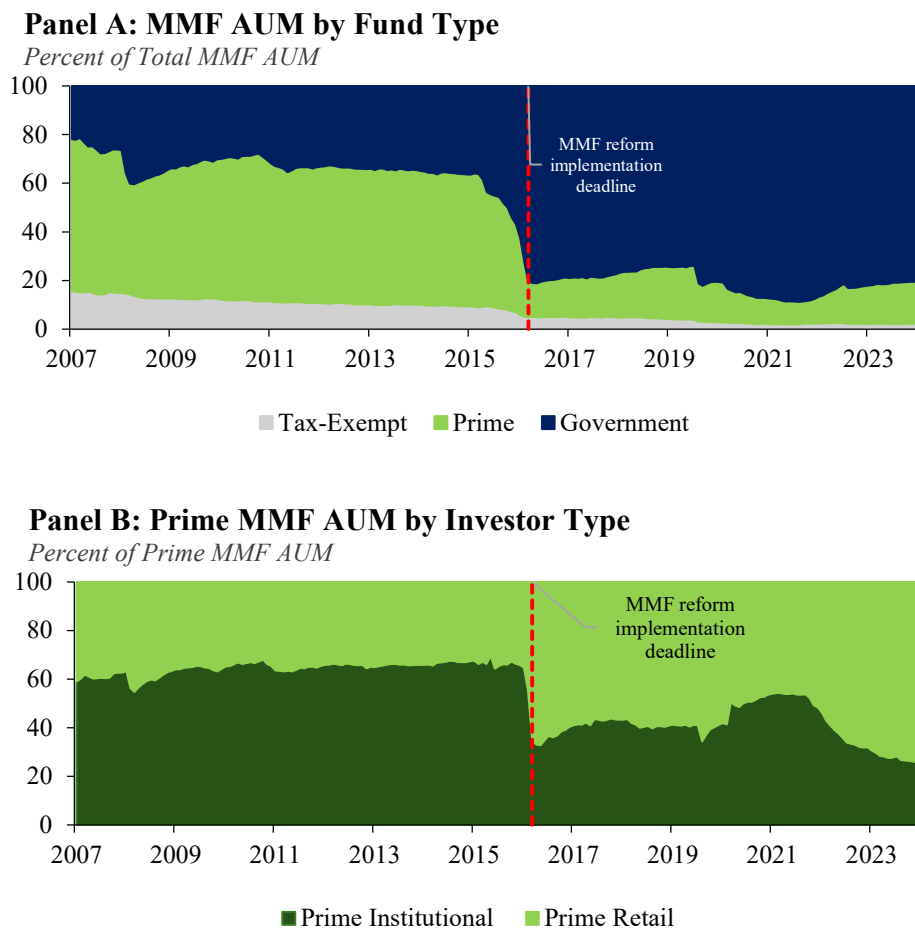
These reforms have affected the operation of institutional and retail prime funds differently: institutional prime funds now transact at a floating NAV (under the 2014 reforms) and have dynamic liquidity fee requirements (from the 2023 reforms), whereas retail prime funds continue to transact at a stable NAV and are not subject to liquidity fees. The

³ The Asset-Backed Commercial Paper Money Market Liquidity Facility was established in 2008 and the Money Market Mutual Fund Liquidity Facility in 2020. Both facilities helped to stem runs from prime MMFs (see, Duygan-Bump et al. [2013] and Anadu et al. [2021]).

heightened regulation for institutional prime funds reflects the magnitude of runs in these funds observed in 2008 and 2020.

Partly because of past runs on prime MMFs and the SEC’s reform responses, the composition of the MMF industry has shifted notably. Figure 1, Panel A shows that as the compliance date of the core elements of 2014’s reforms approached, in 2016, assets in government funds surged while those in prime funds declined sharply. The share of total prime MMF assets in institutional funds also declined (Figure 1, Panel B).

Figure 1: MMF net assets under management (AUM)



Notes: The red vertical lines correspond to October 14, 2016, the implementation deadline for the SEC’s 2014 MMF reforms. As described in Footnote 2, prior to these reforms, the retail vs institutional fund distinction was informally based on a fund’s minimum initial investment and expense ratios. *Source:* iMoneyNet, authors’ calculations.

2.2. *Motivation*

Following the run episodes and subsequent SEC reforms, we examine whether retail prime investors' sensitivity to runs has changed. Given that these funds continue to transact at a stable NAV, increased sensitivity could lead to increased redemptions during stress periods, potentially amplifying future strains in short-term funding markets, as observed with institutional prime MMF redemptions in 2008 and 2020.

Cipriani and La Spada (2020) document significant behavioral differences between institutional and retail prime MMF investors during the onset of the Covid-19 pandemic in March 2020. Institutional investors are primarily concerned with liquidity provision and the imposition of gates and fees, while retail investors are more likely to redeem shares if their fund family offers both institutional and retail prime MMFs. We build on Cipriani and La Spada (2020) by comparing retail investors' run dynamics in 2008 with those in 2020 to identify changes over time.

3. **Data and Descriptive Statistics**

We obtain daily MMF data on size, percent flows, percent of a fund's assets that matures within seven days, a proxy for Weekly Liquid Assets (WLA), and weighted average maturity (WAM), for institutional and retail prime MMFs from iMoneyNet.⁴ The sample period starts January 1, 2007, and ends December 31, 2023.

⁴The WLA requirement was introduced in the SEC's 2010 reforms. As our sample period precedes these changes, we used the fraction of a fund's assets that mature within seven days as a WLA-proxy. In the aggregate, this WLA-proxy is highly correlated with WLA (about 99 percent correlation coefficient).

Table 1 reports selected portfolio characteristics for prime MMFs in 2008, amid the global financial crisis (GFC) and 2020, following the onset of the Covid-19 pandemic. The average size of institutional prime funds remained relatively unchanged at about \$10 billion over this period, while the average size of retail prime funds increased by more than 200 percent, from \$5 billion to \$16 billion, along with a notable increase in fund size variability.

Other characteristics show little changes across institutional and retail prime funds. For example, allocations to U.S. Treasury and Agency debt and private debt (primarily CP and CD) remained steady from 2008 to 2020, while repo allocation increased slightly. In addition, portfolio duration measured by the portfolios' WAM decreased.

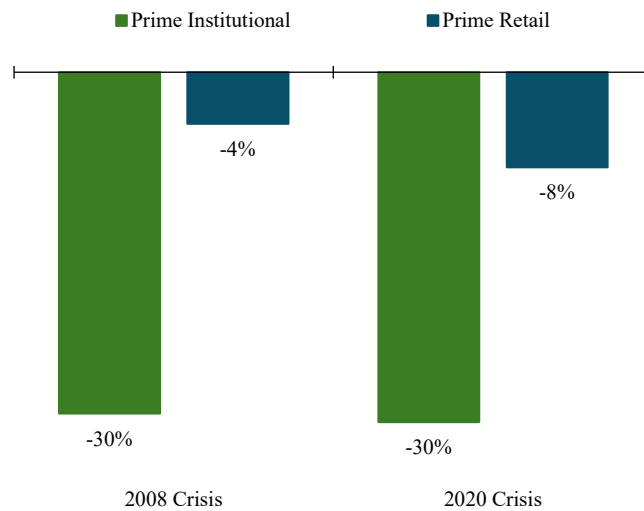
Table 1: Selected summary statistics for prime MMFs

	Prime Institutional		Prime Retail	
	2008	2020	2008	2020
Number of Funds	135	31	159	30
Size - USD Billions	10	10	5	16
<i>Standard Deviation</i>	<i>16</i>	<i>14</i>	<i>14</i>	<i>35</i>
UST and Agency - Percent	26	20	26	22
<i>Standard Deviation</i>	<i>20</i>	<i>15</i>	<i>20</i>	<i>17</i>
CP, CD, TD - Percent	59	60	61	60
<i>Standard Deviation</i>	<i>22</i>	<i>18</i>	<i>24</i>	<i>17</i>
Repo - Percent	15	20	13	18
<i>Standard Deviation</i>	<i>17</i>	<i>11</i>	<i>17</i>	<i>15</i>
WAM - Days	43	33	42	33
<i>Standard Deviation</i>	<i>13</i>	<i>9</i>	<i>11</i>	<i>9</i>

Notes: The columns show the mean and standard deviation of select characteristics of prime MMFs. Columns 1 and 2 are for institutional prime MMFs, while columns 3 and 4 are for retail. UST is U.S. Treasury securities; CP, CD, and TD are, respectively, commercial paper, certificates of deposit, and time deposits. WAM is weighted average maturity of fund's portfolio. The time periods are September 2008 and March 2020. *Sources:* iMoneyNet, authors' calculations.

Figure 2 shows the cumulative net flows of institutional and retail prime MMFs over a two-week period of heavy net outflows in 2008 and 2020. In 2008, institutional prime funds experienced cumulative outflows of almost 30 percent of net assets, like levels experienced in 2020. In contrast, cumulative outflows from retail prime funds, while significantly less than those from institutional prime MMFs, were larger as a share of funds' assets in 2020 than in 2008. Retail funds' net outflows in 2008 were about four percent of net assets, but 2020's outflows reached nine percent. (PWG [2020] notes similar flow magnitudes for retail MMFs between 2008 and 2020.)

Figure 2: Cumulative net flows of prime MMFs during stress periods



Notes: The bars represent the cumulative net flows from prime MMFs, over a two-week period. The measurement period for 2008 is two weeks after September 12, a day before Lehman Brothers failed, to September 26. Outflows in 2020 are from March 10, a day before the World Health Organization declared Covid-19 a pandemic, to March 24. *Source:* iMoneyNet, authors' calculations.

In the following section, we use econometric modelling to quantify the effect of each shock on net flows for both fund types across different time horizons.

4. Empirical Analysis

We estimate the effect of the 2008 and 2020 shocks on prime MMF net flows to analyze investor run behavior in institutional and retail prime funds and to identify variations across groups and over time.

Using the local projection method (Jorda, 2005), like the approach in Anadu et al. (2023), we estimate the response of MMF net flows to shock events. For each horizon h , we estimate the following daily regression separately for institutional and retail prime MMFs:

$$\begin{aligned}
 Flows_{i,t+h} = & \sum_{n=1}^4 (\beta_{h,n} \times Shock_{t-n} + \delta_{h,n} \times Flow_{i,t-n-1}) \\
 & + \gamma_{h,n} \times Portfolio\ Controls_{i,t-1} + \alpha_i + \gamma_t + \epsilon_{i,t}
 \end{aligned} \tag{1}$$

where $Flows_{i,t+h}$ is the cumulative percentage change in the net flow of MMF i at time $t + h$ relative to time $t - 1$. $Shock_t$ is a dummy variable, with 1 denoting shock periods and 0 otherwise. For the 2008 GFC, the shock period spans from September 15, when Lehman Brothers failed, to September 19, when the Federal Reserve (FR) announced the Asset-Backed Commercial Paper Money Market Liquidity Facility. For the 2020 Covid-19 crisis, the shock period spans from March 11, following the World Health Organization's pandemic declaration, to March 18, when the FR announced the Money Market Mutual Fund Liquidity Facility. $Portfolio\ Controls_{i,t-1}$ include fund-level one-month lagged WLA-proxy,

percent of CP and CD, and WAM. We include lagged flows to control for potential serial correlation.⁵

The regression is estimated using least squares based on the sample period November 30, 2007, to November 30, 2008, for the 2008 shock period, and May 30, 2019, to May 30, 2020, for the 2020 shock. We estimate (1) for horizons up to thirty days after the onset of the shock, that is, $h \in \{0,1,2, \dots, 30\}$. The key interest is the coefficient $\beta_{h,0}$ which measures the shock's effect on cumulative percentage flows of institutional and retail prime MMFs from time t to $(t + h)$. At horizon $h = 0$, $\beta_{0,0}$ captures the same-day effect.

Figure 3 shows MMFs' cumulative percentage flow response across horizons for both prime fund types; the corresponding estimation results are reported in Table A in the appendix.

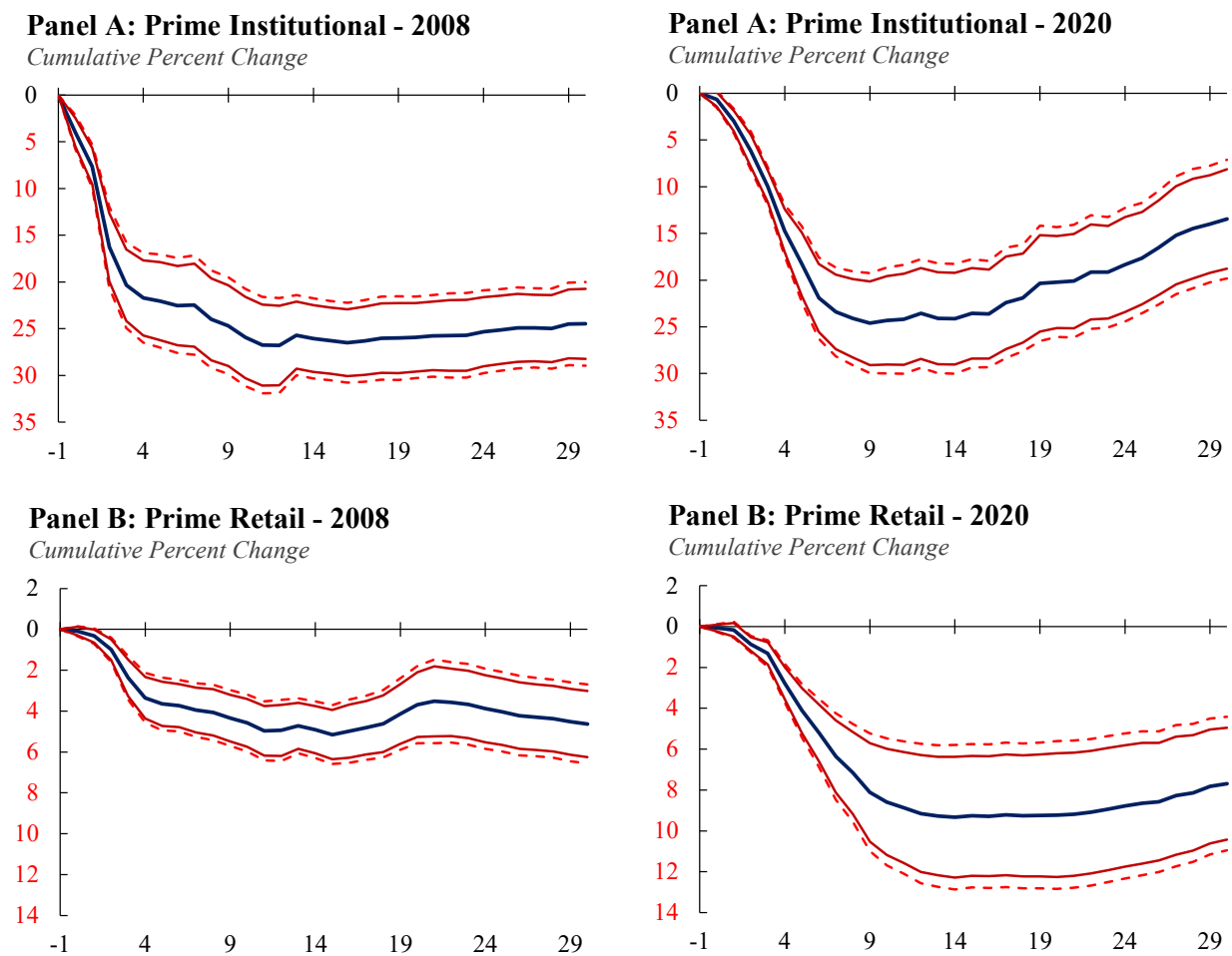
Panel A illustrates that institutional prime MMFs experienced similar run dynamics in both crises, with steep net outflows over the first nine days of each shock period before gradually stabilizing. The similarities between Columns 1 and 2 in Panel A suggest comparable investor behavior across the two crises.

In contrast, Panel B for retail prime MMFs shows heightened sensitivity to stress in 2020 compared to 2008. While retail prime MMFs saw modest outflows in 2008, redemptions nearly doubled in the 2020 crisis (Panel B, Column 2). This shift suggests retail prime MMF investors may have become more reactive to market stress.

⁵As noted in Footnote 4, we used a proxy for WLA. The optimal number of lag (equals 4 in the specification) is chosen based on information-based selection criteria (AIC and BIC); for robustness check, we also run the regression using different lag lengths and the results are similar.

An implication of this finding is that retail shareholders may be more likely to redeem from retail prime MMFs in a stressed market than generally assumed. Moreover, the relatively lenient treatment of retail prime MMFs in the 2023 SEC reforms - such as liquidity fees mandated only for institutional prime MMFs - may rest on an assumption that retail investors are unlikely to engage in large-scale redemptions.

Figure 3: Impulse Response Functions by MMF Type



Notes: Local projections for MMFs by types during 2008 and 2020 shock periods separately. Panel A for institutional prime funds and Panel B for retail prime funds. The blue lines show the response of net flows to the shock measure. The 90 and 95 percent confidence intervals are shown, respectively, in the solid and dashed red lines. Column 1 shows aggregate results for the 2008 shock period, while column 2 shows aggregate results for the 2020 shock period. *Source:* iMoneyNet data, authors' calculations.

5. Concluding Remarks

U.S. prime MMFs experienced large redemptions and runs in 2008 and 2020. During these periods, institutional and retail prime MMFs experienced bouts of shareholder redemptions, with institutional prime MMFs seeing greater outflows than retail prime MMFs. We examined differences in net outflows from retail prime funds, between the 2008 and 2020 runs, to assess if they have, on average, become more sensitive to stress events.

We find that, on average, retail prime funds' outflows were substantially larger in the 2020 stress period than in the 2008 episode. In contrast, net outflows from institutional prime funds, which were substantially larger than those of retail prime funds, remained relatively unchanged, on average, over both periods.

One interpretation of these findings is that retail investors have grown more sensitive to portfolio risks and more inclined to redeem shares under market stress. If so, retail prime MMF shareholder behavior may increasingly resemble that of institutional prime MMFs.

6. References

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7. Appendix

Table A: Regression results: local projections of cumulated flow on shock (value-weighted)

	Dependent Variable: Cumulative Percent Outflows h Days After Shock							
	Prime Institutional				Prime Retail			
	2008		2020		2008		2020	
	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat	Coefficient	T-Stat
$h = 0$	-2.87***	(-6.58)	-0.68	(-1.58)	-0.12	(-0.91)	-0.13	(-1.23)
$h = 1$	-5.96***	(-8.67)	-3.03***	(-4.37)	-0.21	(-1.19)	-0.27	(-1.22)
$h = 2$	-13.24***	(-10.16)	-6.36***	(-6.07)	-0.62***	(-2.62)	-0.97***	(-4.46)
$h = 3$	-17.48***	(-10.30)	-10.11***	(-9.97)	-1.61***	(-5.25)	-1.48***	(-4.33)
$h = 4$	-18.85***	(-10.11)	-14.66***	(-10.70)	-2.47***	(-6.00)	-2.92***	(-6.27)
$h = 5$	-19.13***	(-9.55)	-18.20***	(-9.18)	-2.74***	(-6.09)	-4.32***	(-6.63)
$h = 6$	-19.65***	(-9.53)	-21.72***	(-10.10)	-2.79***	(-6.26)	-5.42***	(-6.57)
$h = 7$	-19.61***	(-8.90)	-23.20***	(-9.93)	-3.08***	(-6.39)	-6.61***	(-6.38)
$h = 8$	-21.10***	(-9.62)	-23.83***	(-9.62)	-3.20***	(-6.17)	-7.45***	(-6.37)
$h = 9$	-21.84***	(-9.84)	-24.40***	(-9.46)	-3.52***	(-6.56)	-8.44***	(-5.99)
$h = 10$	-23.13***	(-10.15)	-24.22***	(-8.99)	-3.83***	(-6.81)	-8.95***	(-5.90)
$h = 11$	-24.01***	(-10.54)	-24.16***	(-8.71)	-4.37***	(-7.20)	-9.27***	(-5.86)
$h = 12$	-24.06***	(-10.69)	-23.73***	(-8.60)	-4.43***	(-6.92)	-9.62***	(-5.75)
$h = 13$	-24.43***	(-10.96)	-24.24***	(-8.65)	-4.63***	(-6.86)	-9.80***	(-5.76)
$h = 14$	-24.76***	(-11.02)	-24.39***	(-8.78)	-4.84***	(-6.96)	-9.92***	(-5.70)
$h = 15$	-25.07***	(-11.28)	-23.80***	(-8.64)	-5.08***	(-6.96)	-9.94***	(-5.75)
$h = 16$	-25.37***	(-11.39)	-24.03***	(-8.91)	-4.88***	(-6.16)	-10.02***	(-5.75)
$h = 17$	-25.25***	(-11.18)	-23.07***	(-8.25)	-4.70***	(-5.87)	-10.03***	(-5.70)
$h = 18$	-24.95***	(-10.86)	-22.68***	(-8.38)	-4.51***	(-5.40)	-10.14***	(-5.73)
$h = 19$	-24.96***	(-10.80)	-21.30***	(-7.17)	-4.05***	(-4.62)	-10.19***	(-5.69)
$h = 20$	-24.90***	(-11.02)	-21.28***	(-7.53)	-3.60***	(-3.82)	-10.22***	(-5.58)
$h = 21$	-24.74***	(-10.96)	-21.27***	(-7.28)	-3.44***	(-3.40)	-10.23***	(-5.57)
$h = 22$	-24.75***	(-10.61)	-20.36***	(-6.82)	-3.48***	(-3.57)	-10.21***	(-5.56)
$h = 23$	-24.77***	(-10.58)	-20.33***	(-6.99)	-3.57***	(-3.67)	-10.10***	(-5.49)
$h = 24$	-24.47***	(-10.71)	-19.52***	(-6.49)	-3.80***	(-3.92)	-9.98***	(-5.42)
$h = 25$	-24.25***	(-10.79)	-18.86***	(-6.47)	-3.96***	(-4.11)	-9.90***	(-5.42)
$h = 26$	-24.15***	(-10.84)	-17.80***	(-5.91)	-4.18***	(-4.32)	-9.87***	(-5.46)
$h = 27$	-24.18***	(-11.07)	-16.53***	(-5.26)	-4.32***	(-4.52)	-9.64***	(-5.28)
$h = 28$	-24.33***	(-11.05)	-15.88***	(-4.94)	-4.41***	(-4.63)	-9.53***	(-5.31)
$h = 29$	-23.81***	(-10.41)	-15.47***	(-4.88)	-4.56***	(-4.75)	-9.28***	(-5.22)
$h = 30$	-23.96***	(-10.44)	-14.99***	(-4.61)	-4.66***	(-4.85)	-9.16***	(-5.20)
Portfolio Controls	Y		Y		Y		Y	
Fund FE	Y		Y		Y		Y	
Robust SE	Y		Y		Y		Y	