Sturm und Drang in Money Market Funds

When Money Market Funds Cease to Be Narrow

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“Money market funds are boring, but safe.”

(Morningstar.de 08/16/2002)

Motivation: Why are Mutual Funds Interesting?

Similarity of Banks and Mutual Funds:

- Withdrawals are costly (liquidity-based trading).
- It takes time to restore cash balance $\rightarrow$ remaining investors bear most of the costs. $\rightarrow$ **negative externality**.

  Edelen(1996), JFE; Nanda, Narayanan & Warther(2000), JFE
- **The negative externality increases if assets are less liquid.**
- Expectation that other investors will withdraw $\rightarrow$ **"self-fulfilling run"**

  Diamond & Dybvig (1983), JPE

Mutual funds give us a setting to test hypotheses about strategic complementarities.

e.g. Goldstein & Pauzner (2005), JF; Chen, Goldstein and Jiang (2007)

Motivation: Why are Money Market Funds Interesting?

- Maturity intermediation $\longrightarrow$ **bank runs**
- Solution: deposit insurance
- Deposit insurance $\longrightarrow$ **moral hazard**

- Solution to the dilemma: reduction of maturity gap $\longrightarrow$ "narrow banking"
- Money market funds (short-term, high-grade debt) $\approx$ narrow banks

Are money market funds immune to market-wide liquidity shocks?

Run

A drop in market-wide liquidity leads to outflows.

Safe Haven

A drop in market-wide liquidity results in inflows.

- Studies using aggregate US data support the "safe haven" hypothesis.

  Gorton & Pennacchi (1992); Miles (2001), JEF; Pennacchi (2006), JME;

Motivation: Excess Return of German Money Market Funds

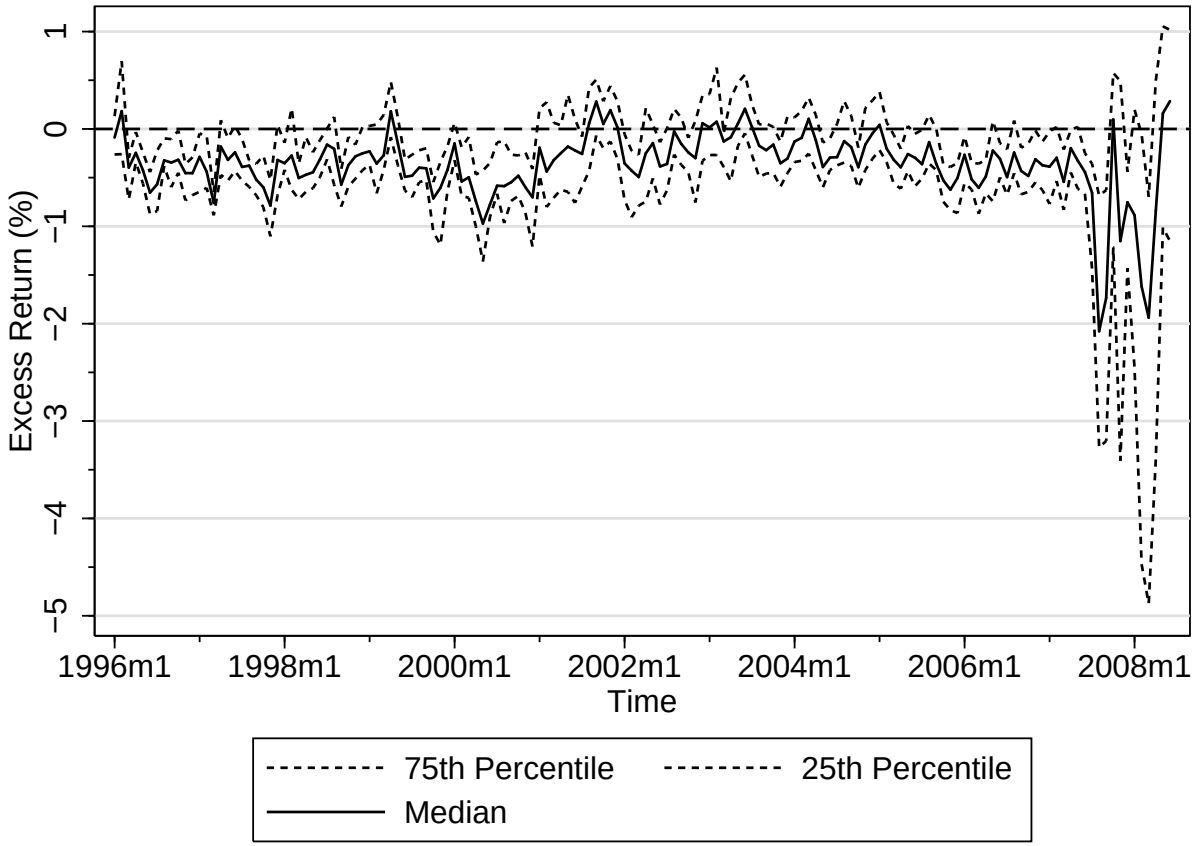


Figure: MMFs' Excess Return

Institutional Background

United States

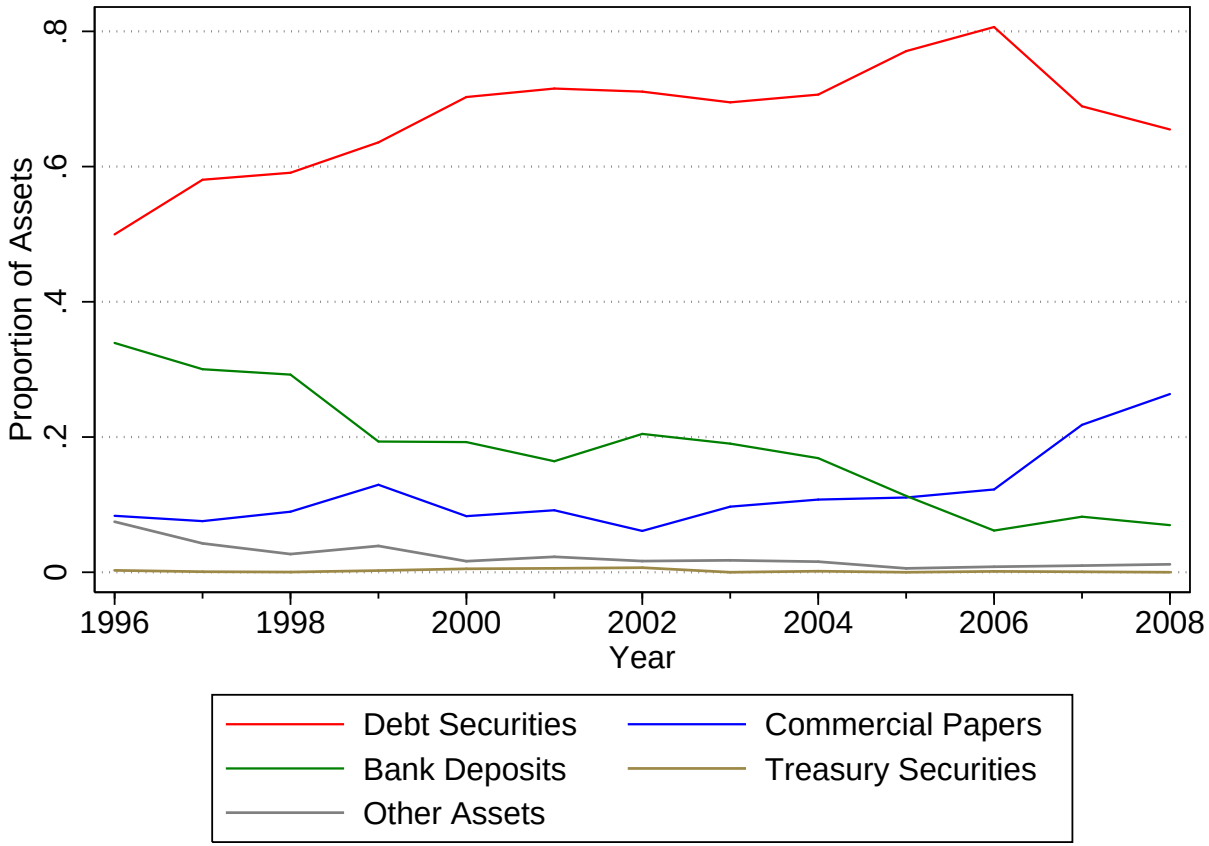
- Introduction in the 70s
- Total assets:
  3,107.1 billion USD
- 25.8 % of mutual fund assets
  ICI Factbook (End of 2007)
- Maximum maturity: 1 year
- Weighted average maturity:
  90 days (SEC)
- Implicit insurance of issuer
  "never break the buck"
- Constant NAV

Germany

- Introduction in the mid 90s
- Total assets:
  26.8 billion EUR
- 7.6 % of mutual fund assets
  Deutsche Bundesbank (End of 2007)
- Maximum maturity: 1 year
  (85 % of assets) InvG
- Weighted average maturity:
  no restriction
- No implicit insurance
- Floating NAV

Sample

- Survivorship-bias-free sample of all German retail money market funds
- Number of funds: 49
- Sample period: 1996/01 - 2008/06 (1999/01 - 2008/06)
- Assets: Euro denominated assets



Performance Persistence: Repeat Winners and Losers

- Who are the winning funds and do they repeat?
- Performance persistence of MMFs is usually very high.
- First-order autocorrelation of annual excess return: 0.54
- Now: a detailed view.

Performance Persistence: Repeat Winners and Losers

		Repeat Winners and Losers				Odds Ratio		
Year	Total	Winner-Winner	Winner-Loser	Loser-Winner	Loser-Loser	Odds-Ratio	z	p-value
1996	24	.	.	.	.	.	.	
1997	30	6	6	6	6	1.0	0.00	1.000
1998	31	8	7	6	9	1.7	0.73	0.466
1999	30	10	3	5	11	7.3	2.34	0.019
2000	30	12	3	3	12	16.0	3.04	0.002
2001	33	7	8	7	8	1.0	0.00	1.000
2002	36	9	5	5	11	4.0	1.77	0.076
2003	35	12	6	5	12	4.8	2.15	0.032
2004	37	13	4	4	13	10.6	2.92	0.004
2005	37	13	5	5	14	7.3	2.68	0.007
2006	37	16	2	2	17	68.0	3.98	0.000
2007	34	7	10	10	7	0.5	-1.02	0.306
Pearson's p_λ Test:								
λ:		76.2						
p-value:		0.000						

- Overall: persistence in performance
- Years without persistence and reversals also occur :
  Most winners in 2006 (high liquidity) are losers in 2007 (low liquidity)

The Determinants of Money Market Funds' Returns

Determinants of MMFs' Returns:

- Expense ratio (commodity view)

  Domian & Reichenstein (1998), FSR; Christoffersen & Musto (2002), RFS

- Riskiness of portfolio

  Koppenhaver(1999), FRB Chicago Proceedings

Asset Pricing Theory:

Illiquid assets outperform in liquid times and underperform in illiquid times.

Acharya & Pedersen (2005), JFE

Hypothesis 1:

Funds that hold illiquid assets outperform in liquid times and underperform in illiquid times.

Massa & Phialippou (2005)

Monthly Cross Sectional Regressions:

$$\textit{Excess Return}_{it} = \beta_0 + \beta_1 \textit{Liq. Assets}_{i,t-1} + \beta_2 \textit{Size}_{i,t-1} + \beta_3 \textit{Expense Ratio}_i + \varepsilon_{i,t}$$

$\textit{Excess Return}_{it}$	Money market funds' return minus Bubill rate
$\textit{Liq. Assets}_{i,t-1}$	Share of government securities, bank deposits and commercial papers
$\textit{Expense Ratio}_i$	Annual expenses/ average assets (fund average)
$\textit{Size}_{i,t-1}$	Log of total assets (EUR)

Hypothesis 1:

Funds that hold illiquid assets outperform in liquid times and underperform in illiquid times.

The Determinants of Money Market Funds' Returns
Monthly Cross Sectional Regressions

	Money Market Liquidity			
	(liquid) 1st Quartile	2nd Quartile	3rd Quartile	(illiquid) 4th Quartile
Liq. Assets$_{t-1}$	-0.444***	-0.268**	-0.194*	2.043***
	(0.08)	(0.12)	(0.10)	(0.69)
Size$_{t-1}$	0.020	0.000	-0.007	-0.050
	(0.01)	(0.01)	(0.02)	(0.04)
Expense Ratio	-0.627***	-0.937***	-1.018***	0.245
	(0.14)	(0.17)	(0.14)	(0.44)
Constant	-0.00766	0.361	0.319	-0.591
	(0.30)	(0.27)	(0.33)	(0.88)
Observations	895	1000	980	949
Number of funds	27	28	28	30
R^2	0.189	0.241	0.287	0.202

Fama-MacBeth Regression, Fama-MacBeth standard errors in parentheses.
*** p$<$ 0.01, ** p$<$ 0.05, * p$<$ 0.10

- Funds that hold illiquid assets outperform in liquid times and underperform in illiquid times.

The Determinants of Money Market Funds' Returns

- Money market funds are **not** a commodity.
- Fund managers are able to offset expenses and **enhance returns** by investing in **less liquid assets**.
- Illiquid funds outperform liquid funds in liquid times.
- Long period of high liquidity (2001-2006) $\rightarrow$ illiquid funds outperform persistently.

- Enhancing returns **widens** the **narrow structure** of money market funds and makes them **vulnerable to runs**.
- How does an illiquidity shock influence money market funds' flows?

Flows of Money Market Funds

- Withdrawals are costly (liquidity-based trading).
- Time to restore cash balance $\rightarrow$ remaining investors bear most of the costs. $\rightarrow$ **negative externality**
- **The negative externality increases if assets are less liquid.**
- Expectation that other investors will withdraw. $\rightarrow$ **"self-fulfilling run"**

Hypothesis 2:

In illiquid times funds that hold illiquid assets are more likely to experience a run than funds that hold liquid assets.

Net Flows by Portfolio Liquidity (2007/07 - 2008/06)

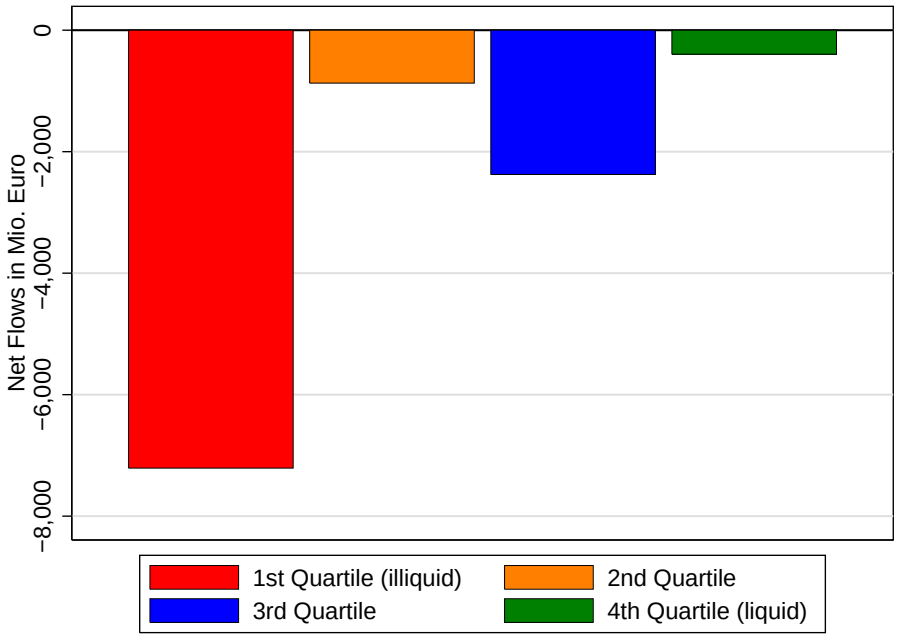


Figure: Absolute Flows

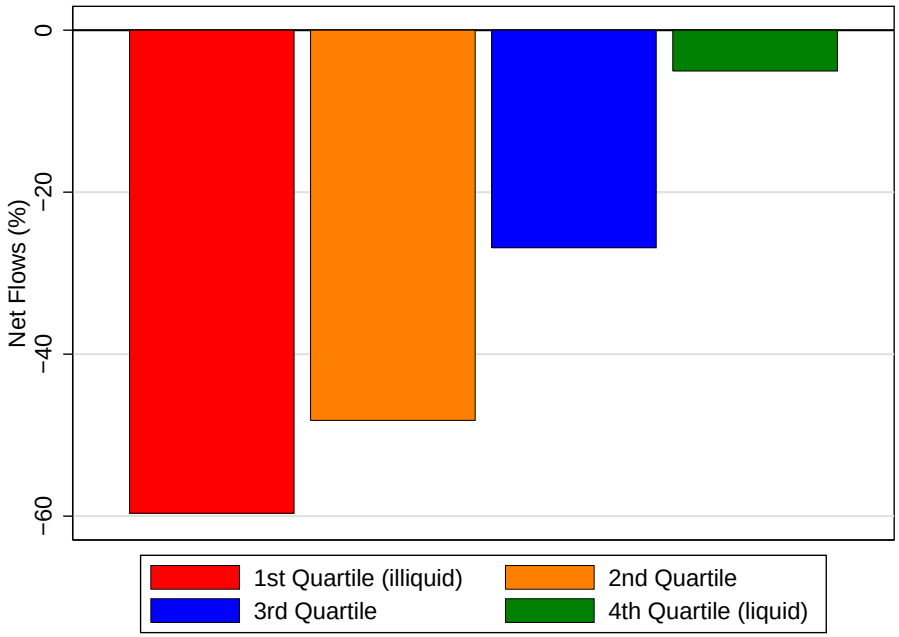


Figure: Relative Flows

Flows of Money Market Funds

$$
\begin{aligned}
Netflow_{it} \quad = \quad & \alpha_i + \beta_1 Liq.\ Assets_{i,t-1} + \beta_2 Exc.\ Return_{i,t-1} + \beta_3 Spread_t \\
& + \beta_4 Spread_t * Liq.\ Assets_{i,t-1} + \beta_5 Spread_t * Exc.\ Return_{i,t-1} \\
& + \beta_6 Size_{i,t-1} + \beta_7 Age_{i,t-1} + \varepsilon_{i,t}
\end{aligned}
$$

$Netflow_{it}$	Relative net-flows: (inflows - outflows)/total assets
$Excess\ Return_{it}$	Money market fund return minus Bubill rate
$Liq.\ Assets_{i,t-1}$	Share of government securities, bank deposits and commercial papers
$Spread_t$	Money market spread
$Size_{i,t-1}$	Log of total assets (EUR)
$Age_{i,t-1}$	Age in years since inception

Hypothesis 2:

In illiquid times funds that hold illiquid assets are more likely to experience a run than funds that hold liquid assets.

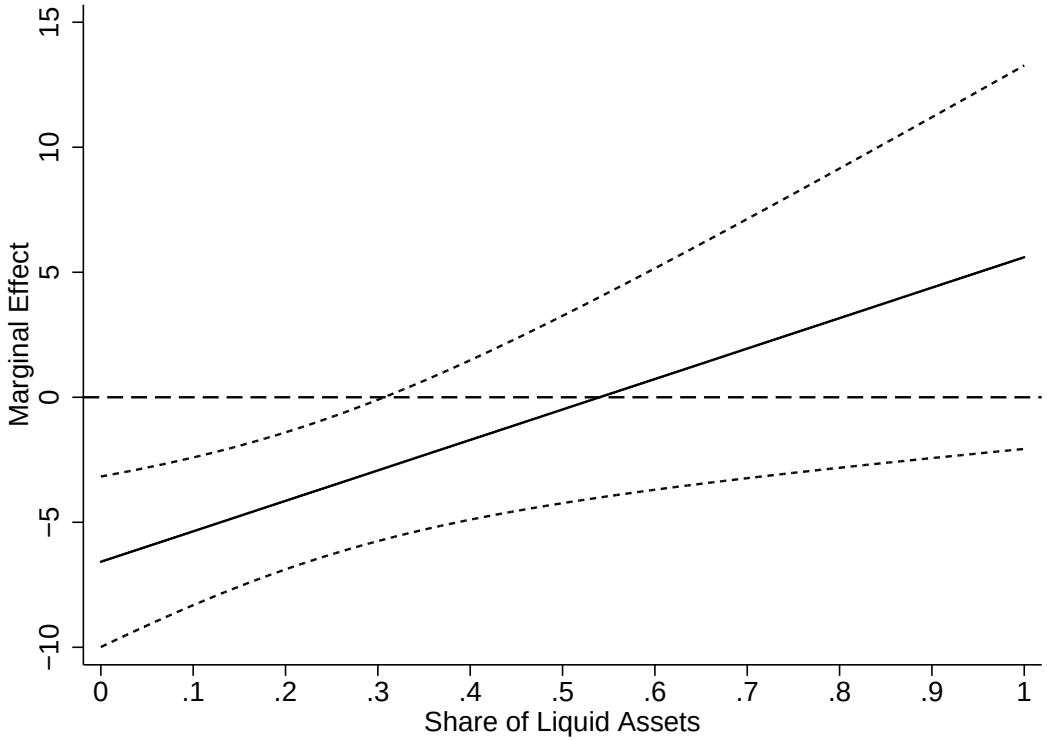
Flows of Money Market Funds

	(1)	(2)	(3)	(4)
Netflow$_{t-1}$				0.104*
				(0.05)
Liq. Assets$_{t-1}$	-2.742	-5.036*	-5.052*	-5.593**
	(2.23)	(2.83)	(2.85)	(2.63)
Exc. Return$_{t-1}$	0.744***	0.538***	1.170**	1.077**
	(0.16)	(0.16)	(0.46)	(0.43)
Spread$_t$		-6.224***	-6.579***	-6.227***
		(1.77)	(1.74)	(1.65)
Spread$_t$ * Liq. Assets$_{t-1}$		11.75**	12.18**	11.34**
		(4.70)	(4.70)	(4.22)
Spread$_t$ * Exc. Return$_{t-1}$			-0.74	-0.713
			(0.45)	(0.43)
Size$_{t-1}$	-1.058*	-1.297**	-1.309**	-1.438***
	(0.57)	(0.57)	(0.57)	(0.53)
Age$_{t-1}$	-0.478***	-0.315**	-0.310**	-0.292**
	(0.13)	(0.13)	(0.13)	(0.13)
Constant	25.02**	29.70***	30.08***	32.40***
	(10.88)	(10.87)	(10.95)	(10.25)
Fund Dummies	Yes	Yes	Yes	Yes
Time Dummies	No	No	No	No
No. of Obs.	3687	3687	3687	3687
No. of Funds	44	44	44	44
Within R^2	0.027	0.033	0.033	0.043

Fixed Effects Regression, robust standard errors clustered by fund in parentheses. *** p$<$ 0.01, ** p$<$ 0.05, * p$<$ 0.10

- Significant performance-flow relationship.
- Flows following an illiquidity shock differ across liquid and illiquid funds.

Marginal Effect of Market Illiquidity on Net Flows



A market illiquidity shock leads to...

- significant outflows, if the share of liquid assets is small **(Run)**
- no significant outflows, if the share of liquid assets is large enough **(Safe Haven)**

Conclusion: Sturm und Drang in Money Market Funds

- Fund managers have an **incentive to enhance** their returns.
- Illiquid funds outperform liquid funds as long as market-wide liquidity is high.
- Investing in less liquid assets **widens** the **narrow structure** of money market funds.
- Investors react to good and bad performance of money market funds.
- Following an illiquidity shock we observe runs on illiquid/enhanced funds.

Recent regulatory developments in Europe concerning Money Market Funds

- CESR guidelines on a common definition of European money market funds (May 2010).
- Two tiered approach with objective of investor protection
- Distinction through very short and longer weighted average maturity
- Short Term MMF
  - Only investments in highest quality assets: two highest available short-term credit ratings.
  - Ensure its portfolio has a weighted average maturity (WAM) of no more than 60 days.
  - Ensure its portfolio has a weighted average life (WAL) of no more than 120 days.
  - Residual maturity until the legal redemption date of less than or equal to 397 days.
  - Constant or a fluctuating net asset value
- Longer Term MMF
  - Only Fluctuating NAV
  - May invest in sovereign issuance of at least investment grade quality.
  - Residual maturity until the legal redemption date of less than or equal to 2 years.
  - Weighted average maturity (WAM) of no more than 6 months.
  - Weighted average life (WAL) of no more than 12 months.

Appendix: Summary Statistics

	Mean	Variance	25th Percentile	75th Percentile	Source
Excess Return	-0.463	2.641	-0.651	0.055	Datastream
Rel. Net Flow	0.967	422.84	-2.894	3.240	BBK
Debt Securities	0.736	0.056	0.621	0.919	BBK
Commercial Papers	0.067	0.018	0.000	0.068	BBK
Treasury Securities	0.004	0.001	0.000	0.000	BBK
Other Assets	0.025	0.005	0.005	0.014	BBK
Bank Deposits	0.167	0.040	0.038	0.208	BBK
Age	7.07	12.19	4.58	9.92	BBK
Size	18.84	3.63	17.44	20.17	BBK
Expense Ratio	0.546	0.038	0.400	0.650	BVI

Sample: 1999:01-2008:06

Appendix: Persistence of Returns: First-Order Autocorrelation

Sample Period:	1995 - 2007	1995-2001	2002-2007
Exc. Return$_{t-1}$	0.537***	0.564***	0.510*
	(0.11)	(0.11)	(0.21)
Constant	-0.977**	-1.030*	-0.925
	(0.37)	(0.51)	(0.58)
No. of Obs.	359	152	207
No. of Years	12	6	6
R^2	0.348	0.335	0.362

Fama-MacBeth standard errors are given in parentheses. *, **, and *** indicate significance at the 10%, 5% and 1% level respectively.

Appendix: First-Order Autocorrelation: Excess Return & Expense Ratio

Panel A: Year 2006

	Expense Ratio$_t$		Exc. Return $_t$
Expense Ratio$_{t-1}$	1.019***	Exc. Return $_{t-1}$	0.972***
	(0.10)		(0.23)
Constant	0.0107	Constant	-0.846*
	(0.06)		(0.48)
R^2	0.86	R^2	0.49

Panel B: Year 2007

	Expense Ratio$_t$		Exc. Return $_t$
Expense Ratio$_{t-1}$	1.184***	Exc. Return $_{t-1}$	-0.481
	(0.19)		(0.47)
Constant	-0.11	Constant	-5.145***
	(0.09)		(1.33)
R^2	0.77	R^2	0.03

Robust standard errors are given in parentheses. *, **, and *** indicate significance at the 10%, 5% and 1% level respectively.

Fixed Effects Regression:

$$\begin{aligned} \textit{Excess Return}_{it} &= \alpha_i + \beta_1 \textit{Liq. Assets}_{i,t-1} + \beta_2 \textit{Spread}_t \\ &\quad + \beta_3 \textit{Spread}_t * \textit{Liq. Assets}_{i,t-1} + \beta_4 \textit{Size}_{i,t-1} + \varepsilon_{i,t} \end{aligned}$$

$\textit{Excess Return}_{it}$	Money market funds' return minus Bubill rate
$\textit{Liq. Assets}_{i,t-1}$	Share of government securities, bank deposits and commercial papers
$\textit{Size}_{i,t-1}$	Log of total assets (EUR)

Hypothesis 1:

Funds that hold illiquid assets outperform in liquid times and underperform in illiquid times.

The Determinants of Money Market Funds' Returns

Fixed Effects Regression

	(1)	(2)	(3)	(4)	(5)	(6)
		1999-2006			1999-2008	
Exc. Return$_{t-1}$			0.070			0.305***
			(0.044)			(0.096)
Liq. Assets$_{t-1}$	-0.217**	-0.402***	-0.380***	0.655**	-0.861**	-0.501**
	(0.11)	(0.13)	(0.13)	(0.29)	(0.34)	(0.22)
Spread$_t$		-1.799***	-1.692***		-3.361***	-2.133***
		(0.19)	(0.21)		(0.83)	(0.48)
Spread$_t$* Liq. Assets$_{t-1}$		1.323***	1.251***		5.378***	3.387***
		(0.44)	(0.43)		(1.75)	(1.00)
Size$_{t-1}$	0.0767**	0.0724**	0.0669**	0.155*	0.09	0.04
	(0.03)	(0.03)	(0.03)	(0.08)	(0.06)	(0.05)
Constant	-1.677**	-1.274**	-1.171**	-3.537**	-1.37	-0.70
	(0.65)	(0.61)	(0.56)	(1.61)	(1.18)	(0.93)
No. of Obs.	3358	3355	3355	4050	4046	4046
No. of Funds	45	45	45	49	49	49
Within R^2	0.011	0.058	0.063	0.008	0.118	0.192

Fixed Effects Regression, robust standard errors clustered by fund in parentheses.
*** p< 0.01, ** p< 0.05, * p< 0.10

- Share of liquid assets matters!
- Omitted variable bias
- The influence of liquid assets varies as a function of market-wide liquidity

Appendix: The Determinants of Money Market Funds' Returns
Robustness Check: 2SLS

	(1)	(2)	(3)	(4)
	1999-2006		1999-2008	
Liq. Assets$_t$	-0.242**	-0.581***	0.474***	-0.581**
	(0.112)	(0.212)	(0.177)	(0.288)
Spread$_t$		-1.923***		-2.158***
		(0.279)		(0.500)
Spread$_t$* Liq. Assets$_t$		1.925***		3.541***
		(0.683)		(1.140)
Exc. Return$_{t-1}$	0.110**	0.0684	0.389***	0.302***
	(0.0427)	(0.0452)	(0.0970)	(0.0952)
Size$_t$	0.0735**	0.0704**	0.114**	0.0802*
	(0.0310)	(0.0297)	(0.0546)	(0.0486)
No. of Obs.	3310	3310	3996	3996
No. of Funds	45	45	49	49

2SLS fixed effects regression, robust standard errors clustered by fund in parentheses.
*** p$<$ 0.01, ** p$<$ 0.05, * p$<$ 0.10

- Liq. Assets$_t$ is instrumented by its first and second lag.

Appendix: Flows of Money Market Funds

Robustness Check: 2SLS

	(1)	(2)	(3)
Flow_{t-1}	0.0873	0.0906*	0.0748
	(0.0542)	(0.0539)	(0.0564)
Liq. Assets_t	-12.51**	-12.55*	-12.64*
	(5.127)	(6.563)	(6.465)
Exc. Return_t	1.005**	2.557	3.647
	(0.488)	(8.281)	(5.886)
Spread_t	-11.28***	-12.75***	-
	(3.460)	(3.068)	
Spread_t * Liq. Assets_t	40.39***	41.88**	42.98**
	(14.87)	(17.47)	(18.74)
Spread_t * Exc. Return_t		-2.199	-3.342
		(9.015)	(6.348)
Size_t	-2.140***	-2.143***	-1.992***
	(0.565)	(0.510)	(0.522)
Age_t	-0.163	-0.147	30.23*
	(0.112)	(0.180)	(15.76)
Fund Fixed Effects	Yes	Yes	Yes
Time Fixed Effects	No	No	Yes
No. of Obs.	3639	3639	3639
No. of Funds	44	44	44

2SLS fixed effects regression, robust standard errors clustered by fund in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

- Liq. Assets_t, Exc. Return_t and Size_t are instrumented by their first and second lag.