

Liquidity Stress Testing of Maltese Retail Investment Funds (Update – 2024)

by

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Table of Contents

2
3
4
4
4
5
6
6
6
8
13
15
17
19

List of Figures

Figure 1: Extreme redemption shocks at the 10%, 5% and 1% level as a % of NAV7
Figure 2: Extreme redemption shock at the 1% level by strategy8
Figure 3: Liquidity shortfall and redemption coverage ratio for the 1% worst case scenario9
Figure 4: Liquidation of assets under the Waterfall approach10
Figure 5: Losses suffered to meet the 1% worst redemption under the Waterfall approach .11
Figure 6: Liquidation of assets using the Slicing approach11
Figure 7: Losses suffered to meet the 1% worst redemption using the Slicing approach12
Figure 8: Impact of extreme redemptions on the NAV by strategy12
Figure 9: Second-round redemptions following liquidation under the Waterfall approach13
Figure 10: Liquidation of assets due to second-round redemptions under the Waterfall
approach14
Figure 12: Liquidation of assets due to second-round redemptions under the Slicing approach
Figure 13: Impact of the second-round extreme redemptions on the strategy NAV15

List of Tables

Table 1: NAV and number of funds in the sample	6
Table 2: Funds with a liquidity shortfall	9
Table 3: Bayesian coefficients' prior distribution parameters	13
Table A.1: Summary statistics	19
Table A.2: GPD parameter estimates	20
Table A.3: Simulated worst redemptions and liquidity shortfall at the 10%, 5% and	1% levels
	21
Table A.4: Expected second-round redemptions	23

Abbreviations

- AIF Alternative Investment Fund
- GPD Generalised Pareto Distribution
- HQLA High Quality Liquid Assets
- MFSA Malta Financial Services Authority
- NAV Net Asset Value
- OLS Ordinary Least Squares
- RCR Redemption Coverage Ratio
- STIFF Stress Testing for Investment Funds Framework
- UCITS Undertakings for the Collective Investment in Transferable Securities

Executive Summary

As of December 2023, Malta's investment funds sector experienced a modest growth in net asset value (NAV), increasing by 0.5% year-over-year to reach €19.8 billion. However, this growth remains among the smallest compared to other European countries during the same period.

While the investment fund industry as a whole does not present immediate systemic risks, its complexity and diversity necessitate close monitoring, particularly in certain fund segments that could potentially disrupt the financial system. This has garnered attention from a range of stakeholders, including market participants, regulators, and central banks, who are increasingly focused on assessing the sector's resilience, especially concerning its liquidity conditions.

Open-ended investment funds with significant allocations to illiquid or limited-liquidity assets may face challenges if a surge in redemption requests occurs. Under such pressure, fund managers might be compelled to liquidate assets at unfavourable prices, leading to substantial capital losses. Additionally, these managers could struggle to raise sufficient cash or liquidity in time to meet unexpected investor redemptions, which could further destabilise the fund. To mitigate these risks, fund managers may need to deploy Liquidity Management Tools (LMTs), such as suspending redemptions, imposing redemption gates, or using antidilution mechanisms, to safeguard against sudden liquidity shortfalls.

In this report, we present the results of the liquidity stress testing framework for investment funds, referred to as STIFF, updated with data up to end 2023. We apply the same methodology adopted in previous studies. Compared to the previous year, a decrease in the proportion of highly liquid assets has increased the risk of liquidity shortfalls for some funds. Despite this, most funds would encounter liquidity shortfalls below 10% of their NAV. However, eight funds were identified as unable to meet redemption requests in specific scenarios, with five consistently failing across all stress testing scenarios. Most of these funds invest in foreign funds, which are classified as illiquid under stressed conditions due to uncertainty in the underlying assets' liquidity. Liquidation losses from second-round redemptions remain limited, but in the 1% worst-case scenario, nine funds would fail the test, including one that had previously passed.

The report is structured as follows: The first section gives an overview of the sample of investment funds selected for this stress testing exercise. The second part of the report contains an updated analysis for each of the four steps of the micro-level STIFF as defined in the 2021 study.

Funds Sample Composition

The sample comprises 74¹ Malta-domiciled retail investment funds, 65 of which are licensed as UCITS, while the remaining nine are licensed as retail AIFs. Collectively, these funds have a combined net asset value (NAV) of \leq 5.2 billion, representing 94% of the total NAV of Maltese retail funds as of the end of 2023. The NAV of the sampled funds ranges from a minimum of \leq 4.2 million to a maximum of \leq 1.4 billion, with an average NAV of \leq 69.8 million as of December 2023. A total of 12 new funds has been included in this stress testing exercise, while four funds have been excluded due to the surrender of their licence during 2023.

In terms of investment strategies, equity funds represent the largest portion of the sample's NAV (36.5%), followed by diversified funds² (29.8%), bond funds (24.5%), mixed funds³ (7.4%), and other funds⁴ (1.8%).

Type of fund	NAV (€ bn)	% share	Number of funds	% share
Equity	1.9	36.5%	17	23%
Diversified	1.5	29.8%	20	27%
Bond	1.3	24.5%	21	28.4%
Mixed	0.4	7.4%	11	14.9%
Other	0.1	1.8%	5	6.7%
Total	5.2	100%	74	100%

Table 1: NAV and number of funds in the sample

The selected funds' number of weekly redemption observations range from 100 to 939, with an average of 439 observations. The average weekly historical redemption, expressed as a percentage of the funds' NAV, varies from 0.02% to 1.35%, with a mean value of 0.32% across all funds. Table A.1 in the appendix provides summary statistics for the historical weekly redemptions and net flows of the funds in our sample.

Updating the STIFF with 2023 Data

This micro-level liquidity stress testing follows the methodology established in the 2021 Stress Testing for Investment Funds Framework (STIFF).⁵ The results for each of the four steps in the framework are presented in the subsequent sections.

Calibration of the redemption shock using the historical approach

Redemption shocks⁶ for each fund in our dataset are estimated using a historical approach. Three extreme but plausible redemption shocks are calibrated at the 10th, 5th and 1st

¹ Only investment funds which have been in operation for at least two years are included in the sample.

² Diversified funds invest in a broad set of assets.

³ Mixed funds invest in both equity and bonds.

⁴ Other funds is a residual category.

⁵ 2021 report outlining the methodology used can be found <u>here</u>.

⁶ Redemptions are expressed as a percentage of NAV.

percentiles of the funds' historical redemptions by fitting a Generalised Pareto Distribution (GPD) to the historical redemptions that exceed the 90th percentile (known as the threshold parameter μ).⁷

Maltese retail funds have experienced a generally low rate of redemptions. This is consistent with previous stress testing results and is reflected by the threshold parameter μ which remained below 1% in most cases (for 57 funds, representing 77% of the sample), while the remaining funds have a threshold parameter of 1% or higher.

For the first moment of the GPD to be finite, the shape parameter ξ must be statistically less than one. Out of the 74 funds analysed, 44 funds (59%) have an expected worst 10% redemption that can be estimated using the GPD's expected value. For the remaining funds, the redemption shock is calculated using the composite trapezoidal rule. The estimated GPD parameters for each fund are provided in Table A.2 in the appendix.

As shown in Figure 1, estimated redemption requests for both the 10% and 5% worst-case scenarios remain low for most funds. The overall majority of the sample (97% and 82% of the sample, respectively), would face redemption requests of less than 5% of their NAV. Additionally, no funds would experience outflows exceeding 10% in either the 10% or 5% worst-case scenarios.

In contrast, under the 1% worst-case scenario, 49% of the sample would have redemption requests below 5% of their NAV, while 47% would face redemption requests between 5% and 20% of their NAV. Only three funds⁸ (4% of the sample) would see redemption requests exceeding 20% of their NAV. The highest redemption rate in the 1% worst-case scenario is 34%.



Figure 1: Extreme redemption shocks at the 10%, 5% and 1% level as a % of NAV

In the most unfavourable 1% scenario, it is projected that the majority of funds in each strategy are expected to experience a redemption rate ranging between 0% and 10%. Specifically, 60%

⁷ Further details on the calibration of the extreme redemptions can be found in the <u>2020 STIFF report</u> (Meglioli & Gauci, 2020)

⁸ Fund 7, Fund 38 and Fund 59

of funds classified as 'other', 60% of diversified funds and 57% of bond funds are anticipated to have a 1% worst-case redemption rate in the 0% to 5% range. Only one bond fund, one diversified fund and one 'other' fund are expected to have a 1% worst-case redemption rate exceeding 20%. As for equity funds, 71% are expected to have a 1% worst-case redemption rate of up to 10%.



■ Bond ■ Diversified ■ Equity ■ Mixed ■ Other

Figure 2: Extreme redemption shock at the 1% level by strategy

Measuring Asset Liquidity and Liquidation of Assets⁹

This micro-level liquidity stress test uses a tiered approach for asset liquidation, as described in the 2021 STIFF. Assets are divided into distinct liquidity buckets, with each bucket given fixed liquidity weights¹⁰ that determine the haircuts suffered by a fund if assets belonging to that portion of the portfolio had to be sold. Cash and short-term deposits (highly liquid assets) are incorporated into the liquidity buffers either fully or partially, depending on the liquidation method used. As in earlier stress tests, we utilise two main liquidation approaches: the waterfall approach and the slicing approach.

Compared to 2022, 43 funds (or 69% of the funds included in both stress testing exercises) experienced a reduction in the proportion of highly liquid assets relative to their 2023 NAV. On the other hand, 17 funds (or 27% of the funds included in both exercises) reported an increase in highly liquid assets as a percentage of their NAV. Table A.3 in the appendix shows the percentage of highly liquid assets relative to the NAV for each fund, along with the corresponding liquidity shortfall¹¹.

⁹ Only securities reported on a security-by-security (SbS) basis have been considered. The minimum portfolio coverage is equal to 46% of total assets. For 81% of the sample, SbS data covers more than 90% of the fund's total assets.

¹⁰ The assigned liquidity weights can be found in the <u>2021 STIFF report</u>, Table 2 (Meglioli & Gauci, 2021).

¹¹ Liquidity Shortfall = Expected Redemptions_{α} – Highly Liquid Assets where α refers to the three levels of expected redemptions, that is, the 10%, 5% and 1% worst case redemptions and the highly liquid assets refer to cash and short-term deposits.

Compared to previous exercises, funds held a lower share of highly liquid assets at the end of 2023. This has contributed to a larger number of funds recording a liquidity shortfall in a stressed scenario. Consequently, in this exercise 20 additional funds experienced a liquidity shortfall. However, of note is that 14 out of these 20 funds encounter a liquidity shortfall only under the 1% worst-case scenario, two funds under both the 1% and 5% worst-case scenarios, and four funds under all three scenarios. Conversely, five funds that previously faced a liquidity shortfall under the 1% worst-case scenario can now meet their expected redemption requests under all three scenarios.

Overall, under the 10% worst-case redemption scenario, 18 funds would face a liquidity shortfall. This number rises to 27 funds under the 5% worst-case redemption scenario and 51 funds under the 1% scenario. At the strategy level, a significant portion of bond, diversified and equity funds encounter liquidity shortfalls across all three scenarios, as shown in Table 2.

	Average red	emption shoo	:k (% NAV)	% of funds with a liquidity shortfall			
	worst 10% redemption	worst 5% redemption	worst 1% redemption	worst 10% redemption	worst 5% redemption	worst 1% redemption	
Bond	1.5	2.3	6.8	14.3	33.3	85.7	
Diversified	2.2	3.3	7.0	30.0	40.0	70.0	
Equity	2.4	3.5	7.8	47.1	47.1	52.9	
Mixed	1.6	2.5	6.6	0.0	27.3	63.6	
Other	1.8	2.8	8.3	20.0	20.0	60.0	

Table 2: Funds with a liquidity shortfall

In Figure 3, the liquidity shortfall in the 1% worst-case scenario is shown in relation to the Redemption Coverage Ratio (RCR)¹², which indicates the proportion of highly liquid assets to expected redemptions. For all these funds, if a redemption shock arises, fund managers would need to begin liquidating their portfolios to meet the redemption demands. Figure 3 demonstrates that, among the funds with a redemption coverage ratio below one in the 1% worst-case scenario, 94% experience a liquidity shortfall of less than 10%.



Figure 3: Liquidity shortfall and redemption coverage ratio for the 1% worst case scenario

¹² A redemption coverage ratio less than one would imply a liquidity shortfall.

With the slicing approach, a larger number of funds would incur losses from asset liquidations compared to the waterfall approach, as all funds are expected to sell a portion of their portfolios to meet redemption requests while maintaining the portfolio's composition. This liquidation approach is preferable to preserve a fund's asset allocation, as opposed to selling the most liquid securities first (waterfall strategy). Additionally, the slicing method reduces the risk of violating investment constraints outlined in a fund's investment policy.

At first glance, this stress testing exercise identified eight funds unable to fulfil redemption requests. Five¹³ of these funds would fail to meet redemption requests under all three redemption scenarios, while the remaining three¹⁴ would be unable to do so only under the 1% worst case scenario. Upon reviewing the investment portfolios of these funds, it was found that six¹⁵ of them primarily invest in other foreign funds. In this analysis we do not apply a look through approach for funds that invest in other funds and any investment in other collective investment undertakings is assigned a liquidity weight of zero. The main reason for this is that, in a stressed scenario, it cannot be guaranteed that the target funds are not in distress themselves, nor is it certain whether the target managers would implement liquidity management tools, such as suspending redemptions.

On the other hand, two¹⁶ of the funds that fail the stress test only under the 1% worst-case scenario allocate a significant portion of their portfolios to corporate bonds with a credit rating of BB+ or lower. This segment of the portfolio is below investment grade, and while it offers higher yields, it also carries a higher default risk and lower liquidity, depending on how much the rating falls below investment grade. It is worth noting that only one of these funds was included in previous stress testing exercises.



Figure 4: Liquidation of assets under the Waterfall approach

¹³ Fund 25, Fund 51, Fund 53, Fund 55, Fund 56

¹⁴ Fund 38, Fund 58, Fund 68

¹⁵ Fund 25, Fund 51, Fund 53, Fund 55, Fund 56, Fund 58

¹⁶ Fund 38, Fund 68



Figure 5: Losses suffered to meet the 1% worst redemption under the Waterfall approach



Figure 6: Liquidation of assets using the Slicing approach



Figure 7: Losses suffered to meet the 1% worst redemption using the Slicing approach

Figure 8 illustrates that, when analysing the strategies collectively, mixed funds are the most vulnerable given the impact across all three worst-case redemption scenarios. Specifically, in the most adverse scenario (1% worst-case redemption) affecting all mixed funds simultaneously, the combined NAV of these funds would shrink by 6.3%. Additional liquidation losses under the waterfall approach would reduce the NAV by a further 0.8%, while the slicing approach would lead to an additional decline of 2%. Equity funds follow a similar trend, where the combined NAV would decrease by 8.1% if the 1% worst-case redemption scenario occurred for all equity funds simultaneously. Liquidation losses would further reduce the NAV by 0.4% under the waterfall approach and by an additional 0.4% under the slicing approach.



Figure 8: Impact of extreme redemptions on the NAV by strategy

Second-round Effects

To estimate the second-round redemptions, we use a Bayesian approach. First, an Ordinary Least Squares (OLS) regression is applied to the lagged net flows and lagged log returns to predict current net flows for each fund. The resulting coefficients are then grouped by strategy, and the mean and standard deviation of these coefficients are calculated for each strategy. These values provide the prior distributions for our Bayesian regression model. Table 3 summarises the mean and standard deviation for each parameter, categorised by strategy.

		Mean		Standard Deviation			
	α	β_1	β ₂	α	β_1	β ₂	
Bond	0.0287	0.1663	0.0138	0.1651	0.2239	0.0568	
Equity	0.1577	0.1310	0.0155	0.2126	0.1332	0.0392	
Mixed	0.0017	0.1218	0.0432	0.1969	0.1773	0.0460	
Other	0.0715	0.1535	-0.0431	0.2710	0.2257	0.1899	

Table 3: Bayesian coefficients' prior distribution parameters

After fitting a Bayesian model to each sampled fund, we incorporate the first-round redemptions and liquidation losses into the regression to forecast the expected second-round redemptions. Figure 9 shows the chart specifically for the waterfall method, as the expected second-round redemptions are similar for both the waterfall and slicing methods following the first liquidation round.





In line with previous stress test results, the expected second-round redemptions are generally contained and estimated to be below 2% in all three worst-case scenarios. Only two funds are expected to experience a second-round redemption of around 4% of their NAV under the 1% worst-case scenario.

The occurrence of liquidation losses from asset sales during the second round of redemptions continues to depend on the chosen liquidation method. However, under both approaches, losses as a percentage of a fund's NAV would remain limited. In the 1% worst case scenario,

nine¹⁷ funds would now fail the stress test. Eight of these had already failed due to the first round of redemptions, while one¹⁸ fund managed to meet the first round of redemptions, having sufficient cash reserves. Additionally, four¹⁹ of these funds would fail the stress test under all three redemption scenarios. As previously explained, most of these funds follow a fund-of-funds strategy, and under the weighted HQLA methodology, their investment portfolios are assigned a liquidity weight of zero due to their exclusive investment in other funds.



Figure 10: Liquidation of assets due to second-round redemptions under the Waterfall approach



Figure 11: Liquidation of assets due to second-round redemptions under the Slicing approach

¹⁷ Fund 25, Fund 38, Fund 51, Fund 52, Fund 53, Fund 55, Fund 56, Fund 58, Fund 68

¹⁸ Fund 52

¹⁹ Fund 25, Fund 53, Fund 55, Fund 56

When consolidating second-round redemptions and losses at the strategy level, both the waterfall and slicing methods produce very similar results. As seen in the first round of redemptions, mixed funds are most impacted under the 1% worst-case redemption scenario. However, the NAV decline due to second-round redemptions and liquidation losses is slightly less severe, ranging from 1% to 1.5%.



Figure 12: Impact of the second-round extreme redemptions on the strategy NAV

Conclusion

This report presents the liquidity stress testing results for Maltese retail investment funds for the latest available data (2023). The analysis was conducted on a sample of 74 retail funds with an aggregate NAV of \in 5.2 billion, representing 94% of the total NAV of the Maltese retail funds as of the end of 2023.

Under the 10% and 5% worst-case redemption scenarios, the majority of funds are expected to experience low redemption requests, with no fund seeing outflows exceeding 10% of their NAV. In the most adverse scenario, where funds would experience the worst 1% redemptions recorded, only three funds would encounter outflows exceeding 20% of their NAV. Across different investment strategies, most funds are projected to have relatively low redemption rates, even under the most challenging scenario, with only a few expected to face significant redemption pressures.

Of note is that when compared to the last exercise, a reduction in the holdings of highly liquid assets has left more funds at risk of liquidity shortfalls. Some funds that previously had sufficient liquidity are more vulnerable and may have to resort to the sale of assets to meet redemption demands. Bond, diversified, and equity funds are particularly vulnerable under various stress scenarios. However, for most funds facing liquidity shortfalls, the expected gaps remain mostly below 10% of NAV.

The stress testing exercise identified eight funds that would be unable to meet redemption requests under specific scenarios. Five of these would fail across all three adverse redemption scenarios, while the other three would only struggle under the most severe case. Most of these funds primarily invest in foreign target funds, which are considered illiquid under stressed conditions due to the applied methodology. This is because the target funds may be unable to liquidate their assets in such adverse conditions. Additionally, two funds that fail only in the worst-case scenario have substantial investments in lower-rated corporate bonds, which offer higher yields but come with increased default risk and lower liquidity.

Liquidation losses due to second-round redemptions remain limited as a percentage of a fund's NAV. In the 1% worst-case scenario, nine funds would now fail the stress test, with most having already failed in the first round. One fund, which passed the test on account of sufficient cash reserves, would now face liquidity issues. Four of these funds, primarily following a fund-of-funds strategy, would fail under all redemption scenarios, as their portfolios are classified as illiquid under the weighted HQLA methodology.

Limitations

This stress testing framework has a number of limitations, as outlined in the 2020 stress testing report, which are replicated below for ease of reference.

- The STIFF uses an adjusted HQLA approach, which is a modified version of the standard HQLA approach developed under Basel III. The adjusted HQLA assigns different liquidity weights to asset types. However, some of these haircuts can be seen as excessive for certain asset classes. Moreover, some instruments are classified as illiquid, while they could instead be liquidated under normal circumstances.
- The STIFF does not take into account the time to liquidation of the assets within the funds' portfolios.
- The results of the second-round effects estimate only an expected redemption scenario, conditional to the previous worst-case redemption and liquidation losses. Therefore, the results give no indication with regards to the loss magnitude caused by an additional worst-case redemption, should the distressed situation persist over time.
- This liquidity stress testing exercise is assuming no spill-over effects from the funds onto the financial markets when liquidating their holdings to satisfy the redemption requests. This assumption is supported by the relatively small size of the disposed holdings compared to the normally traded quantities in the financial markets. While this can be considered as a valid assumption when dealing with a large and very liquid stock exchange, it would not be the case if the assets liquidated are traded, for example, on the Malta Stock Exchange. This risk is partially mitigated by the fact that, due to the small market capitalisation of the Maltese public companies, most of the Maltese assets would be classified under the lowest liquidity classes by the adjusted-HQLA approach used, and therefore, the probability of such holdings being disposed is very low.
- The fund categories' series are obtained by aggregating the funds according to a classification which is based on the investment policies disclosed by the fund managers in the Offering Supplement. However, these investment policies often include a wide range of instruments which the funds can invest in, while they could be targeting only one asset type. Therefore, this may create bias in the classification adopted.
- This study does not take into consideration the liquidity stress tests conducted by UCITS which they are required to undertake as part of their regulatory obligations.

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Appendix

		% of NAV						
Fund	No. of Weekly Obs.	Average Red.	Average Net Flow	Max Red.	Max Net Outflow	Max Net Inflow		
Fund 1	368	0.24	-0.17	11.19	-11.19	5.94		
Fund 2	439	0.34	0.27	18.54	-18.54	104.33		
Fund 3	321	0.02	25.70	0.54	-0.50	8099.22		
Fund 4	165	0.05	0.54	2.01	-1.68	5.43		
Fund 5	821	0.09	5.11	4.84	-4.79	3930.82		
Fund 6	597	0.08	0.24	9.30	-9.28	7.00		
Fund 7	255	0.65	0.37	99.35	-10.35	43.93		
Fund 8	377	0.08	0.76	4.56	-4.15	221.60		
Fund 9	364	0.38	0.40	8.19	-7.99	57.26		
Fund 10	448	0.28	0.15	9.15	-8.17	26.94		
Fund 11	404	0.21	0.24	12.76	-7.86	80.39		
Fund 12	410	0.26	0.92	10.53	-10.53	121.33		
Fund 13	261	0.98	0.90	11.31	-11.09	27.04		
Fund 14	264	0.94	0.18	11.63	-7.46	12.40		
Fund 15	359	0.25	0.89	1.98	-1.43	54.50		
Fund 16	359	0.22	1.00	1.41	-1.16	99.62		
Fund 17	359	0.25	1.09	3.30	-2.56	120.80		
Fund 18	322	0.25	0.82	13.45	-4.52	110.72		
Fund 19	434	0.25	0.24	2.84	-2.25	9.00		
Fund 20	531	0.49	0.44	15.92	-5.98	105.07		
Fund 21	643	0.17	0.64	9.22	-1.53	77.00		
Fund 22	350	0.11	1.68	12.07	-11.08	100.00		
Fund 23	300	0.13	1.00	3.03	-2.68	18.44		
Fund 24	119	0.13	1.12	2.08	-2.08	33.04		
Fund 25	112	0.15	1.39	3.41	-3.41	100.30		
Fund 26	112	0.11	0.78	1.91	-0.93	26.64		
Fund 27	411	0.75	0.31	10.41	-7.96	16.00		
Fund 28	411	0.86	-0.18	20.64	-20.47	4.19		
Fund 29	411	0.75	0.44	20.32	-15.14	19.88		
Fund 30	339	0.73	0.62	34.87	-11.00	29.99		
Fund 22	2/3	0.43	0.00	1.91	-/.91	100.00		
Fullu 32	204	0.29	0.13	12.31	-12.31	10.00		
Fund 24	939 007	0.10	0.12	4.50	-4.34	50.40		
Fund 25	007 007	0.20	_0.09	4.00	-4.00	0.60		
Fullu 33 Eurod 24	007 007	0.24	-0.11	5.27	-5.22	0.00		
Fund 37	007 887	0.3Z	-0.22	2.01	-3.91	1 77		
Fund 32	126	0.21	0.00 0.12	0.90	-0.15	Λ.ΩΛ		
Fund 20	136	0.17	-0.72	5.10	-5.62	2.64		
Fund 40	250	0.40	0.24 0.87	1/ 25	-1/ 25	08 56		
Fund /1	230	0.30	0.07	7 /1	-6.07	1/ 22		
Fund 47	247	0.20	0.02	5 07	-5.97	27 /5		
Fund 43	486	0.40	0.53	7 92	-7 46	13.06		
	.50	0.22	0.00	1.72	7.40	10.00		

Table A.1: Summary statistics

Fund 44	5/19	0.23	0 59	3 33	-2 75	13 32
Fund 45	200	0.23	0.09	0.00	2.75	10.02
Fund 45	369	0.07	0.06	3.02	-3.02	33.33
Fund 46	352	0.10	0.46	3.28	-1.3/	22.90
Fund 4/	352	0.12	0.55	2.55	-1.34	18.65
Fund 48	411	0.06	0.21	3.41	-3.31	5.90
Fund 49	331	0.65	0.75	15.46	-15.46	56.81
Fund 50	461	0.44	0.02	16.27	-16.27	8.01
Fund 51	100	0.08	0.34	1.80	-1.42	1.11
Fund 52	152	0.19	-0.09	1.58	-1.41	0.61
Fund 53	152	0.29	0.83	4.30	-2.92	136.20
Fund 54	461	0.21	-0.06	23.84	-23.84	9.76
Fund 55	152	0.24	0.08	1.50	-1.44	1.28
Fund 56	152	0.32	-0.04	3.63	-1.23	0.62
Fund 57	152	0.60	-0.36	2.94	-2.87	1.20
Fund 58	152	0.71	-0.31	8.18	-5.65	1.49
Fund 59	313	0.15	-0.11	18.34	-18.34	1.52
Fund 60	634	0.36	0.11	18.00	-17.99	35.95
Fund 61	634	0.30	0.27	32.55	-29.50	35.91
Fund 62	311	0.55	0.06	21.83	-21.83	29.18
Fund 63	752	0.31	-0.13	21.25	-11.68	3.05
Fund 64	752	1.35	-0.38	21.99	-21.99	22.16
Fund 65	823	0.40	0.05	11.83	-10.88	35.88
Fund 66	752	0.32	0.08	13.44	-11.78	23.34
Fund 67	823	0.16	0.24	3.45	-3.43	2.84
Fund 68	752	0.26	0.09	11.13	-2.79	7.68
Fund 69	752	0.24	0.04	4.35	-4.07	2.40
Fund 70	752	0.26	0.10	4.34	-1.51	2.82
Fund 71	752	0.24	-0.03	10.27	-10.24	51.79
Fund 72	753	0.14	0.06	3.41	-0.80	3.03
Fund 73	511	0.23	0.40	2.61	-2.59	17.81
Fund 74	362	0.13	0.04	5.24	-5.24	5.17`

Table A.2: GPD parameter estimates

Fund	μ	σ	ξ	Fund	μ	σ	ξ
Fund 1	0.32	1.15	0.37	Fund 38	0.00	0.04	2.84
Fund 2	0.30	1.79	0.45	Fund 39	0.91	2.12	-0.29
Fund 3	0.04	0.06	0.40	Fund 40	0.40	1.23	0.44
Fund 4	0.11	0.16	0.54	Fund 41	0.48	1.23	0.16
Fund 5	0.19	0.12	0.71	Fund 42	1.32	1.02	0.12
Fund 6	0.15	0.09	1.00	Fund 43	0.52	0.23	0.89
Fund 7	0.44	0.66	1.26	Fund 44	0.52	0.43	0.26
Fund 8	0.00	0.19	1.26	Fund 45	0.04	1.65	-0.39
Fund 9	1.02	1.20	0.39	Fund 46	0.24	0.45	0.16
Fund 10	0.83	1.25	0.23	Fund 47	0.32	0.21	0.50
Fund 11	0.20	0.94	0.60	Fund 48	0.12	0.15	0.59
Fund 12	0.47	1.40	0.31	Fund 49	1.61	2.35	0.35
Fund 13	2.29	1.11	0.51	Fund 50	1.28	1.14	0.35
Fund 14	2.28	1.99	0.06	Fund 51	0.11	0.07	1.38

Fund 15	0.79	0.48	-0.29	Fund 52	0.41	0.36	-0.07
Fund 16	0.63	0.21	-0.08	Fund 53	0.82	1.78	-0.42
Fund 17	0.72	0.32	0.39	Fund 54	0.43	0.27	0.74
Fund 18	0.51	0.30	0.73	Fund 55	0.55	0.20	0.12
Fund 19	0.77	0.67	-0.15	Fund 56	0.84	0.43	0.22
Fund 20	1.14	0.56	0.56	Fund 57	1.37	0.98	-0.55
Fund 21	0.33	0.17	0.57	Fund 58	1.49	2.03	0.05
Fund 22	0.03	0.08	1.80	Fund 59	0.02	1.48	0.69
Fund 23	0.29	0.23	0.56	Fund 60	1.03	1.14	0.31
Fund 24	0.42	0.42	0.12	Fund 61	0.76	0.78	0.47
Fund 25	0.38	0.78	0.08	Fund 62	1.26	0.87	0.69
Fund 26	0.41	0.33	0.09	Fund 63	0.53	0.15	0.82
Fund 27	1.53	1.92	0.01	Fund 64	3.09	1.87	0.22
Fund 28	1.74	0.93	0.69	Fund 65	0.80	0.28	0.62
Fund 29	1.68	1.59	0.38	Fund 66	0.53	0.28	0.88
Fund 30	1.83	1.62	0.48	Fund 67	0.31	0.22	0.32
Fund 31	1.21	0.66	0.70	Fund 68	0.45	0.31	0.52
Fund 32	0.59	0.58	0.77	Fund 69	0.42	0.14	0.79
Fund 33	0.33	0.29	0.67	Fund 70	0.50	0.15	0.55
Fund 34	0.48	0.28	0.37	Fund 71	0.38	0.23	0.86
Fund 35	0.48	0.19	0.70	Fund 72	0.29	0.11	0.35
Fund 36	0.67	0.28	0.44	Fund 73	0.46	0.22	0.22
Fund 37	0.46	0.18	0.36	Fund 74	0.34	0.64	0.28

Table A.3: Simulated worst redemptions and liquidity shortfall at the 10%, 5% and 1% levels²⁰

Fund	Worst 10% Red.	Worst 5% Red.	Worst 1% Red.	Liquid Assets	Shortfall Worst	Shortfall Worst 5%	Shortfall Worst 1%
					10%		
Fund 1	2.14	3.55	8.60	2.49	-0.35	1.06	6.12
Fund 2	3.53	5.92	15.39	4.74	-1.20	1.18	10.65
Fund 3	0.14	0.22	0.52	1.15	-1.02	-0.93	-0.63
Fund 4	0.44	0.73	1.95	5.60	-5.15	-4.87	-3.64
Fund 5	0.58	0.91	2.61	1.31	-0.73	-0.40	1.30
Fund 6	0.71	1.21	4.37	2.15	-1.44	-0.94	2.22
Fund 7	3.84	7.19	26.82	26.55	-22.71	-19.36	0.28
Fund 8	1.49	2.94	12.22	3.34	-1.85	-0.40	8.87
Fund 9	2.98	4.51	10.13	5.30	-2.32	-0.79	4.83
Fund 10	2.44	3.65	7.31	3.15	-0.70	0.51	4.16
Fund 11	2.31	4.10	11.98	2.47	-0.16	1.64	9.51
Fund 12	2.49	4.04	9.22	0.75	1.74	3.29	8.48
Fund 13	4.45	6.23	13.45	1.40	3.05	4.83	12.05
Fund 14	4.40	5.90	9.64	1.61	2.79	4.29	8.03
Fund 15	1.17	1.40	1.80	1.92	-0.76	-0.52	-0.13
Fund 16	0.83	0.96	1.24	1.94	-1.11	-0.98	-0.70

²⁰ Red figures indicate a liquidity shortfall.

Fund 17	1.25	1.68	3.23	2.58	-1.33	-0.91	0.64
Fund 18	1.42	2.22	6.27	2.38	-0.96	-0.16	3.89
Fund 19	1.35	1.74	2.48	0.38	0.97	1.35	2.10
Fund 20	2.41	3.36	7.75	1.81	0.60	1.55	5.94
Fund 21	0.73	1.05	2.53	2.10	-1.38	-1.05	0.43
Fund 22	1.69	3.42	16.30	6.69	-5.00	-3.28	9.61
Fund 23	0.79	1.22	3.10	1.84	-1.05	-0.62	1.26
Fund 24	0.90	1.25	2.18	0.80	0.10	0.45	1.38
Fund 25	1.22	1.83	3.37	0.55	0.68	1.28	2.82
Fund 26	0.78	1.05	1.74	0.56	0.22	0.49	1.17
Fund 27	3.46	4.81	7.96	4.86	-1.39	-0.05	3.10
Fund 28	4.11	6.17	15.70	9.45	-5.34	-3.28	6.25
Fund 29	4.25	6.21	13.34	4.09	0.16	2.12	9.25
Fund 30	4.95	7.21	16.61	7.20	-2.26	0.00	9.40
Fund 31	2.96	4.49	11.77	22.11	-19.14	-17.61	-10.33
Fund 32	2.36	3.94	11.84	22.52	-20.15	-18.58	-10.68
Fund 33	1.21	1.81	5.17	8.22	-7.00	-6.40	-3.04
Fund 34	0.92	1.28	2.53	4.84	-3.92	-3.56	-2.31
Fund 35	1.10	1.52	3.94	3.49	-2.39	-1.97	0.45
Fund 36	1.18	1.59	3.18	1.91	-0.74	-0.32	1.27
Fund 37	0.74	0.98	1.77	1.88	-1.13	-0.90	-0.11
Fund 38	2.38	5.22	33.57	3.08	-0.70	2.13	30.49
Fund 39	2.56	3.59	5.33	4.95	-2.39	-1.35	0.38
Fund 40	2.60	4.28	10.91	14.46	-11.85	-10.17	-3.55
Fund 41	1.95	3.03	6.07	9.38	-7.43	-6.35	-3.31
Fund 42	2.47	3.30	5.52	5.87	-3.40	-2.57	-0.35
Fund 43	1.50	2.38	7.37	3.12	-1.61	-0.73	4.25
Fund 44	1.11	1.56	2.97	1.68	-0.57	-0.12	1.29
Fund 45	1.24	1.96	3.05	1.94	-0.70	0.02	1.12
Fund 46	0.77	1.17	2.28	2.30	-1.53	-1.13	-0.02
Fund 47	0.74	1.09	2.52	1.76	-1.02	-0.68	0.76
Fund 48	0.49	0.80	2.24	1.11	-0.62	-0.31	1.13
Fund 49	5.22	7.93	17.42	21.50	-16.29	-13.57	-4.08
Fund 50	3.03	4.40	9.17	1.99	1.05	2.41	7.19
Fund 51	1.00	1.84	1.75	0.76	0.25	1.08	6.99
Fund 52	0.75	0.98	1.47	1.53	-0.78	-0.55	-0.06
Fund 53	2.07	2.83	3.93	2.07	0.00	0.76	1.87
Fund 54	1.29	2.05	5.95	1.65	-0.55	0.20	4.10
Fund 55	0.70	0.90	1.40	0.75	0.03	0.21	0.03
Fund 57	1.39	1.00	3.04	0.47	0.92	1.33	2.57
Fund 57	2.00	2.30	2.02	5.1Z 6.25	-3.12	-2.70	-2.30
Fund 50	2.52	5.12	20.20	20.25	-2.03	-1.13	-19.99
Fund 60	2.50	3 92	20.39 8 21	9 N2	-6 35	-5 08	-0.82
Fund 61	2.00	3 30	8 10	8 31	-6.07	-1 92	-0.21
Fund 62	3 48	5 40	14.30	5 23	-1 75	0.17	9.07
Fund 63	1 1 2	1.62	Δ ΔΔ	1 08	0.05	0.54	3.36
Fund 64	5 49	7.02	12.63	53 35	-47.86	-46 08	-40 72
Fund 65	1.54	2.09	4.88	0.25	1.29	1.84	4.63
Fund 66	1.68	2.05	8 46	1.30	0.38	1 42	7 16
	1.00	<u> </u>	5.15	1.00	0.00	1.14	

Fund 67	0.63	0.87	1.70	0.18	0.45	0.69	1.52
Fund 68	1.11	1.63	3.92	1.71	-0.61	-0.08	2.20
Fund 69	0.97	1.42	3.98	2.24	-1.28	-0.82	1.74
Fund 70	0.84	1.14	2.41	3.43	-2.59	-2.29	-1.02
Fund 71	1.32	2.17	6.87	2.23	-0.91	-0.06	4.64
Fund 72	0.46	0.61	1.07	1.31	-0.85	-0.70	-0.24
Fund 73	0.73	0.94	1.56	1.00	-0.27	-0.06	0.56
Fund 74	1.23	1.92	4.13	8.85	-7.61	-6.93	-4.72

Table A.4: Expected second-round redemptions

	2 nd Round Redemptions - Waterfall Approach			2 nd Round Redemptions - Slicing Approach			
Fund	Worst 10% Red.	Worst 5% Red.	Worst 1% Red.	Worst 10% Red.	Worst 5% Red.	Worst 1% Red.	
Fund 1	0.24	0.39	0.94	0.27	0.42	0.97	
Fund 2	0.37	0.63	1.74	0.46	0.77	2.00	
Fund 3	-0.05	-0.03	0.04	-0.05	-0.03	0.04	
Fund 4	-0.15	-0.11	0.06	-0.15	-0.11	0.06	
Fund 5	0.12	0.19	0.53	0.12	0.19	0.55	
Fund 6	0.07	0.14	0.54	0.08	0.14	0.56	
Fund 7	0.58	1.14	4.43	0.55	1.09	4.21	
Fund 8	0.20	0.37	1.83	0.21	0.44	1.93	
Fund 9	0.30	0.44	1.03	0.34	0.51	1.14	
Fund 10	0.25	0.39	0.84	0.26	0.41	0.87	
Fund 11	0.21	0.41	1.30	0.24	0.44	1.32	
Fund 12	0.14	0.25	0.65	0.17	0.29	0.70	
Fund 13	0.63	0.91	2.03	0.64	0.91	2.04	
Fund 14	0.50	0.72	1.26	0.51	0.72	1.27	
Fund 15	-0.08	-0.07	-0.04	-0.09	-0.07	-0.05	
Fund 16	0.12	0.14	0.17	0.12	0.14	0.17	
Fund 17	0.02	0.06	0.19	0.02	0.05	0.18	
Fund 18	0.14	0.24	0.67	0.14	0.25	0.73	
Fund 19	0.33	0.54	1.59	0.34	0.54	1.62	
Fund 20	0.21	0.33	0.89	0.22	0.34	0.90	
Fund 21	0.33	0.42	0.61	0.34	0.44	0.63	
Fund 22	0.10	0.14	0.33	0.10	0.15	0.35	
Fund 23	0.13	0.29	1.48	0.13	0.29	1.50	
Fund 24	0.61	0.73	1.05	0.60	0.72	1.05	
Fund 25	0.20	0.32	0.62	0.20	0.32	0.62	
Fund 26	0.31	0.39	0.62	0.30	0.39	0.62	
Fund 27	0.39	0.58	1.04	0.41	0.60	1.06	
Fund 28	0.48	0.74	1.95	0.4/	0.74	1.94	
Fund 29	0.39	0.66	1.65	0.41	0.68	1.6/	
Fund 30	0.47	0.73	1.66	0.36	0.57	1.43	
Fund 31	0.23	0.41	1.28	0.25	0.44	1.34	
Fund 32	0.17	0.37	1.39	0.19	0.40	1.49	
Fund 33	0.05	0.13	0.57	0.06	0.14	0.60	
FUND 34	0.14	0.18	0.30	0.14	0.19	0.37	
Fund 35	0.04	0.08	0.19	0.05	0.09	0.22	
Fund 36	0.4/	0.64	1.62	0.48	0.65	1.64	

Fund 37	0.60	0.78	1.46	0.60	0.78	1.47
Fund 38	0.28	0.65	4.45	0.29	0.66	4.45
Fund 39	0.35	0.51	0.78	0.36	0.52	0.79
Fund 40	0.02	0.13	0.57	0.03	0.15	0.62
Fund 41	0.28	0.44	0.86	0.31	0.47	0.94
Fund 42	0.25	0.35	0.64	0.26	0.37	0.66
Fund 43	0.05	0.13	0.58	0.04	0.12	0.57
Fund 44	0.17	0.24	0.44	0.16	0.23	0.43
Fund 45	0.16	0.21	0.30	0.16	0.22	0.31
Fund 46	-0.08	-0.03	0.13	-0.08	-0.02	0.14
Fund 47	0.18	0.26	0.59	0.19	0.26	0.59
Fund 48	-0.04	0.00	0.16	-0.04	-0.01	0.15
Fund 49	0.80	1.21	2.63	0.74	1.11	2.41
Fund 50	0.31	0.52	1.23	0.32	0.53	1.24
Fund 51	-0.07	0.03	0.80	-0.07	0.03	0.80
Fund 52	0.14	0.16	0.21	0.14	0.16	0.21
Fund 53	0.25	0.33	0.45	0.25	0.33	0.45
Fund 54	0.25	0.36	0.89	0.27	0.38	0.97
Fund 55	0.24	0.31	0.47	0.24	0.31	0.47
Fund 56	0.20	0.25	0.40	0.20	0.25	0.40
Fund 57	0.54	0.60	0.69	0.54	0.60	0.69
Fund 58	0.62	0.86	1.45	0.62	0.86	1.45
Fund 59	0.33	0.61	1.90	0.32	0.61	1.88
Fund 60	0.19	0.30	0.66	0.15	0.23	0.52
Fund 61	0.13	0.27	0.84	0.14	0.29	0.87
Fund 62	0.37	0.59	1.67	0.41	0.64	1.74
Fund 63	0.11	0.16	0.44	0.11	0.16	0.44
Fund 64	0.79	1.06	1.87	0.70	0.95	1.67
Fund 65	0.21	0.28	0.62	0.21	0.28	0.62
Fund 66	0.23	0.28	0.41	0.23	0.28	0.41
Fund 67	0.09	0.22	0.95	0.10	0.23	0.96
Fund 68	-0.03	0.01	0.12	-0.02	0.01	0.12
Fund 69	0.15	0.22	0.52	0.16	0.23	0.55
Fund 70	0.15	0.20	0.50	0.18	0.24	0.61
Fund 71	0.30	0.39	0.77	0.30	0.39	0.77
Fund 72	0.13	0.21	0.70	0.18	0.29	0.95
Fund 73	0.06	0.07	0.11	0.06	0.08	0.11
Fund 74	0.11	0.18	0.39	0.12	0.19	0.42

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