MFSA MALTA FINANCIAL SERVICES AUTHORITY

Liquidity Stress Testing of Maltese Retail Investment Funds: Update 2022

by

Stephanie Gauci

with contributions from

Tony Farrugia, Francesco Meglioli and Joseph Agius

FINANCIAL STABILITY

January 2023

Ref No 23/01

Disclaimer

The report is principally based on data submitted to the Malta Financial Services Authority (MFSA) by the managers of the investment funds under analysis. While every effort has been made in order to ensure that the information contained in this report is reliable and accurate at the time of publishing, no express or implied guarantees, representations or warranties are being made regarding the accuracy and/or completeness of the information contained in this report and any other material referred to in this report. The views expressed in this report are those of the authors and do not necessarily reflect the views of the MFSA. The MFSA and the authors of this report do not accept any liability: (i) for any loss or damage whatsoever which may arise in any way out of the use of any of the material contained in this report; (ii) for any errors in, or omissions from, the material contained in this report; or (iii) for any inaccuracy in any information contained in this report. The findings of the report are of a general nature and should not be taken as applicable to any individual fund. The contents of this report are not to be relied upon as professional, legal and/or investment advice. The MFSA shall have no liability for any loss or damage as a result of the use of, or reliance on, any of the information contained in this report. If you have any doubt about a legal or other provision, or your rights and responsibilities, or other relevant requirements, you should seek appropriate advice from your legal or financial advisers.

Table of Contents

List of Figures

List of Tables

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

The Maltese investment funds industry continued to grow, in terms of aggregate Net Asset Value, during 2021. Although investment funds have proved to be resilient in times of market stress, with the most recent economic shock caused by the COVID-19 pandemic, monitoring liquidity risk in open-ended funds has remained high on regulators' agendas as they play an increasingly important role in the financial sector. Open-ended investment funds can experience difficulties if they face a sudden increase in redemptions while being significantly invested in assets which are either illiquid or otherwise with limited liquidity. In such situations, fund managers may be constrained to undertake fire sales of investments at material realised capital losses. Moreover, fund managers may not be able to generate sufficient cash/liquidity in a timely manner to settle investors' redemption requests possibly leading to suspension of redemptions and the adoption of other liquidity management tools.

The purpose of this micro-level stress testing exercise is to assess the resilience of Maltese retail investment funds to extreme but plausible weekly redemption shocks by assessing the liquidity of their underlying investment portfolio and their ability to service redemptions in such adverse situations. While fund managers can make use of a wide range of liquidity management tools to mitigate redemption risks, these are not taken into account in this stress testing exercise as the aim is to assess the resilience of investment funds without considering any mitigating measures.

This stress testing exercise follows the same methodology adopted in the 2021 study, with the four main steps being estimating the redemption shock using the historical approach, calculating the liquidity of a fund's portfolio, simulating the liquidation of assets under two different liquidation approaches, and finally incorporating second-round effects.

The main findings of this update using data up to end 2021 show that, while some of the retail funds reduced their cash buffers compared to end 2020, causing them to experience a liquidity shortfall under at least the 1% worst case scenario, an equal number of funds increased their cash buffers. Similar to what was observed in the 2021 STIFF, two funds are not able to meet the redemption requests under the 1% worst case scenario after liquidating their portfolio. One of these funds was not flagged as having liquidity issues in previous stress testing exercises, while the other fund was flagged in all previous stress testing exercises.[1] Moreover, the expected second round redemptions remain generally limited, both in terms of redemptions and costs of liquidation.

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

[1] One fund which was flagged as having liquidity issues in previous stress testing exercises has surrendered its licence during 2022 and thus was excluded from the exercise.

Funds Sample Composition

A total of 67[2] Malta domiciled retail investment funds licensed as UCITS form part of the sample, covering a total net asset value of €2.9 billion or 49%[3] of the total NAV of the Maltese retail funds as at end 2021.

In terms of investment fund strategy, bond funds occupy the largest share (51.9%) of the sample NAV, followed by equity funds (16.4%), diversified funds[4] (16%), mixed funds[5] (12.2%), and other funds[6] (3.5%).

Table 1: NAV and number of funds in the sample

Type of fund	NAV (€ bn)	% share	Number of funds	% share
Bond	1.51	51.9%	21	31.3%
Diversified	0.46	16.0%	11	16.4%
Equity	0.48	16.4%	18	26.9%
Mixed	0.36	12.2%	11	16.4%
Other	0.10	3.5%	6	9.0%
Total	**2.91**	**100%**	**67**	**100%**

The number of weekly redemption observations for the selected funds range from 94 to 784, with an average of 417 weekly redemption observations. The average weekly redemption as a percentage of the funds' NAV varies between 0.01% and 1.43%, with the mean average weekly redemption equal to 0.34% of NAV. Summary statistics for the weekly redemptions and weekly net flows of the funds in our sample can be found in Table A.1 in the appendix.

Updating the STIFF with 2021 Data

The methodology for the micro-level stress testing follows four main steps as outlined in the 2021 STIFF. No changes to this framework have been made in this year's stress testing exercise.

Calibration of the redemption shock using the historical approach

The first step consists of estimating the redemption shock using the historical approach. For each fund in our sample, a Generalised Pareto Distribution (GPD) is fit to the historical

[2] Only investment funds which have been in operation for at least two years are included in the sample.
[3] This coverage reduced from 88% in the previous stress testing exercise to 49% due to an increase in the NAV of retail funds as a result of a few large newly licensed retail AIFs which have been excluded from this exercise.
[4] Diversified funds invest in a broad set of assets.
[5] Mixed funds invest in both equity and bonds.
[6] Other funds is a residual category.

redemptions[7] exceeding the 90th percentile (referred to as the threshold parameter μ) and three extreme redemption shocks are calibrated on the 10th, 5th and 1st percentiles of the historical redemptions.[8]

In line with previous stress testing exercises, the threshold parameter μ is less than 1% for the majority of the funds and is equal to or higher than 1% for only 15 funds (or 22% of our sample), indicating that historically Maltese retail funds have experienced low redemption requests as a percentage of their NAV.

For the first moment of the GPD to be finite, the shape parameter ξ has to be statistically lower than one. For 36 out of 67 funds (54%), the expected worst 10% redemption could be estimated as the expected value of the GPD while for the remaining funds the redemption shock is estimated using the composite trapezoidal rule. The estimated GPD parameters for each of the funds in our sample can be found in Table A.2 in the appendix.

As shown in Figure 1, the estimated redemption requests for both the 10% worst case scenario and the 5% worst case scenario are contained for most of the funds, as 90% and 81% of the sample would suffer redemption requests lower than 5% of their NAV, respectively. No funds would experience any outflows higher than 10% for the 10% worst case scenario while only one fund would experience a redemption request of up to 14% for the 5% worst case scenario. On the other hand, for the 1% worst case scenario, 45% of the sample would suffer redemption requests lower than 5% of their NAV, while 52% of the sample would experience redemption requests between 5% and 20% of their NAV. Only two funds (or 3% of the sample) would expect redemption requests higher than 20% of their NAV. The maximum redemption for the 1% worst case scenario is of 40%.

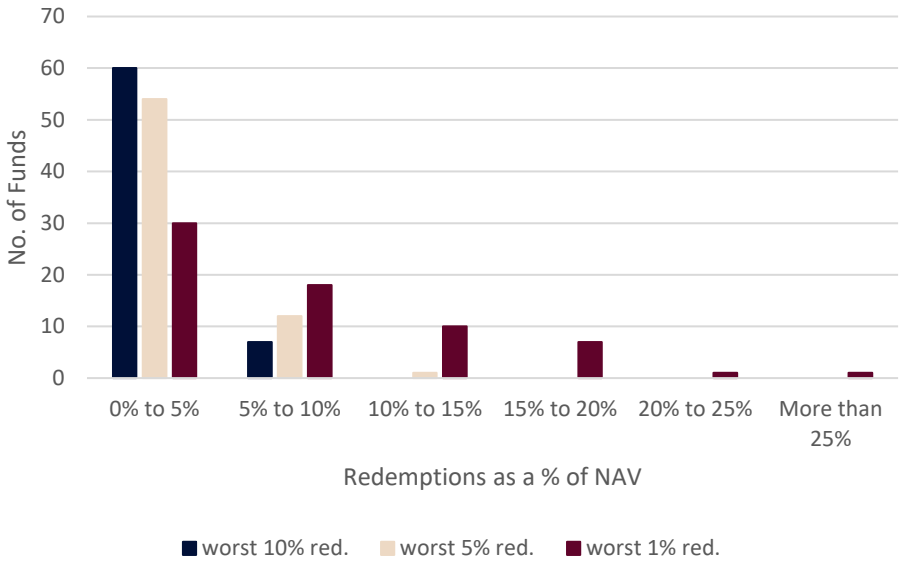

Figure 1: Extreme redemption shocks at the 10%, 5% and 1% level as a % of NAV

[7] Redemptions are expressed as a percentage of NAV.
[8] Further details on the calibration of the extreme redemptions can be found in the 2020 STIFF report (Meglioli & Gauci, 2020)

When aggregating the expected redemptions for the 1% worst case scenario at a fund strategy level, most of the funds falling within each strategy would experience an expected 1% worst redemption in the range of 0% to 10%. 67% of the funds classified in the 'other' category and 62% of the bond funds would expect a 1% worst redemption in the range of 0% to 5%, with only one bond fund expecting a 1% worst redemption higher than 35%. Similarly, 36% of the funds categorised as 'diversified' would suffer a 1% worst case redemption in the range of 0% to 5%. For equity funds, 44% would experience a 1% worst case redemption between 5% and 10%.

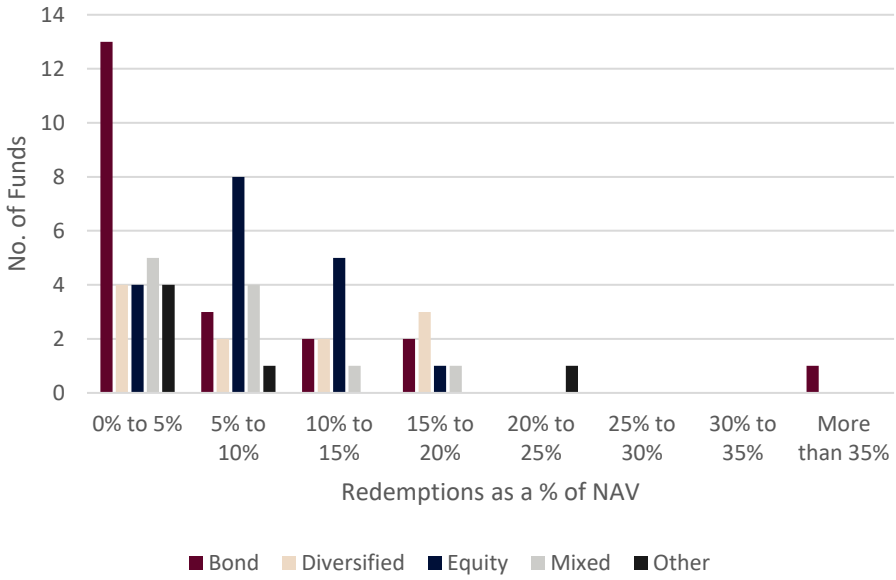

Figure 2: Extreme redemption shock at the 1% level by strategy

Measuring Asset Liquidity and Liquidation of Assets[9]

The liquidity of the funds' assets is assessed using a tiered approach, by assigning the securities held by the funds different liquidity weights[10] based on an adjusted high quality liquid assets (HQLA) approach[11]. Cash and short-term deposits are included in the liquidity buffers in full or in part depending on the liquidation method used. The two main liquidation methods are the waterfall approach and the slicing approach.

Under the waterfall approach, cash and short-term deposits (highly liquid assets) are first used by the fund manager to fulfil the redemption requests. Thus, we first compute the liquidity shortfall for each of the funds in our sample as follows:

$$\text{Liquidity Shortfall} = \text{Expected Redemptions}_{\alpha} - \text{Highly Liquid Assets}$$

[9] Only securities reported on a security-by-security basis have been considered. The minimum portfolio coverage is equal to 72% of total assets.
[10] Also known as cash conversion factors since they determine how easily an asset can be converted into cash.
[11] The assigned liquidity weights can be found in the 2021 STIFF report, Table 2 (Meglioli & Gauci, 2021).

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. Assets are then liquidated only for those funds experiencing a liquidity shortfall. In this way, when a fund manager only uses its cash position to repay redeeming investors without liquidating any portfolio holdings, the NAV of the fund is not negatively impacted, as such redemption should not give rise to any realised capital losses arising from sale of non-cash securities. That said, this may increase the risk of a run since it creates first-mover advantages. In fact, as long as the fund has sufficient cash to meet redemption requests, the investors have incentives to be the first to redeem their shares, since they will not bear any liquidation costs. The investment fund, however, may decide to suspend redemptions in the interest of treating investors fairly and adopt a stance of not leaving the last man standing having to bear all the investor losses.

Table A.3 in the appendix presents the highly liquid assets as a percentage of NAV for each of the funds as well as the computed liquidity shortfall. Compared to end 2020, 31 funds registered a decline in the amount of highly liquid assets they hold as a percentage of NAV as at end 2021, while another 31 funds registered an increase in highly liquid assets as a percentage of NAV. A reason for this can be that investment funds may have deemed the liquidity issues induced by the pandemic to have passed and did not consider it necessary to maintain an ultra-defensive investment portfolio but gradually started to deploy part of their cash buffer to generate yield/ capital gains. The number of funds experiencing a liquidity shortfall remained in line with the previous exercise, although there were seven funds which did not experience a liquidity shortfall before, five of which would now experience a liquidity shortfall under the 1% worst case scenario only, and two of which would now experience a liquidity shortfall under the 1% and 5% worst case scenarios. On the other hand, nine funds which in the previous exercise had a liquidity shortfall under the 1% worst case scenario, now hold enough highly liquid assets to meet the redemption requests under all the three worst redemption scenarios. In total, for the 10% worst case redemption, 10 funds would experience a liquidity shortfall. This number increases to 16 funds for the 5% worst case redemption and 27 funds for the 1% worst case redemption. At a fund strategy level, a large portion of equity funds have a liquidity shortfall for all the three scenarios, with more than half of the equity funds having a liquidity shortfall for the 1% worst case redemption, as shown in Table 2.

Table 2: Funds with a liquidity shortfall

	Average redemption shock (% NAV)			**% of funds with a liquidity shortfall**		
	worst 10% red.	**worst 5% red.**	**worst 1% red.**	**worst 10% red.**	**worst 5% red.**	**worst 1% red.**
Bond	1.69	2.72	7.58	4.76	23.81	38.10
Diversified	3.07	4.58	9.42	9.09	9.09	27.27
Equity	2.48	3.60	7.86	38.89	44.44	61.11
Mixed	1.84	2.89	6.69	9.09	9.09	27.27
Other	1.87	2.74	6.66	0.00	16.67	33.33

Figure 3 plots the redemption coverage ratio (RCR), which is the ratio of highly liquid assets[12] to expected redemptions[13], against the liquidity shortfall for the 1% worst case scenario. For all these funds, if the redemption shock had to materialise, fund managers would need to start liquidating their portfolio of assets to meet the redemption requests. Figure 3 shows that 26% of the funds with a redemption coverage ratio of less than 1 under the 1% worst case scenario, have a liquidity shortfall higher than 10%.

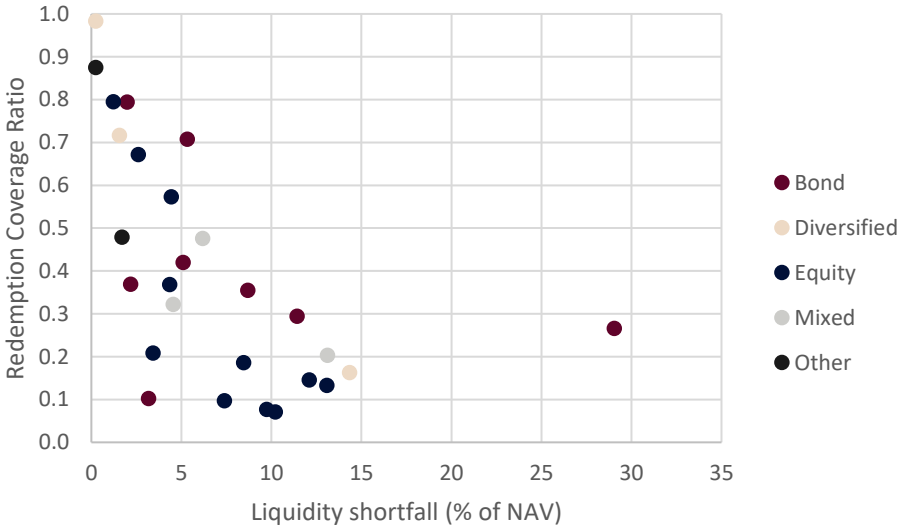

Figure 3: Liquidity shortfall and redemption coverage ratio for the 1% worst case scenario

Under the slicing approach, cash and short-term deposits are sliced proportionately similar to the rest of the portfolio. In this manner, all funds are expected to have to liquidate part of their portfolio to meet redemption requests to keep the composition of the portfolio unchanged. This means that, similar to what we found in the previous stress testing exercise, under the slicing approach more funds are expected to incur liquidation losses compared to the waterfall approach. In fact, under the slicing approach only two funds would not incur any liquidation losses due to the composition of their investment portfolio at the end of 2021. One of these funds[14] holds 51% of its assets in the form of short-term deposits with the remaining assets split between government bonds and other instruments[15]. The other fund[16] has almost all of its assets in the form of corporate bonds of a low credit rating which are assigned a liquidity weight of zero (C4).

Two funds are not able to meet redemption requests under the 1% worst case scenario after liquidating their portfolio under both liquidation approaches. One of these funds[17] experienced a reduction in the percentage of highly liquid assets it holds of 10.1 percentage points over the period December 2020 to December 2021 causing it to experience a liquidity shortfall

[12] Cash and short-term deposits.
[13] A redemption coverage ratio less than one would imply a liquidity shortfall.
[14] Fund 29
[15] 'Other' instruments are assigned a liquidity weight of zero under the HQLA approach and hence are considered to be illiquid and are not used to meet redemption requests.
[16] Fund 55
[17] Fund 11

under the 1% worst case scenario. Moreover, its portfolio of assets is mainly composed of corporate bonds with a liquidity weight of zero (C4) under the HQLA approach. The other fund[18] was found to not be able to meet the redemption requests under the 1% worst case scenario in all the previous stress testing exercises as well.

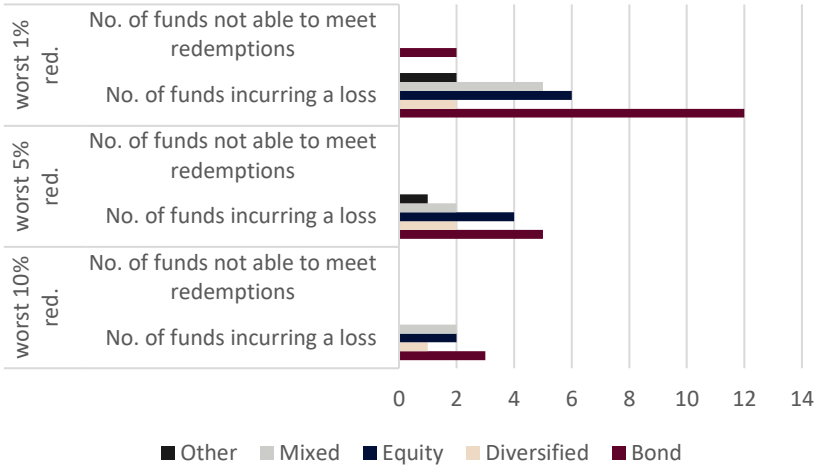

Figure 4: Liquidation of assets under the Waterfall approach

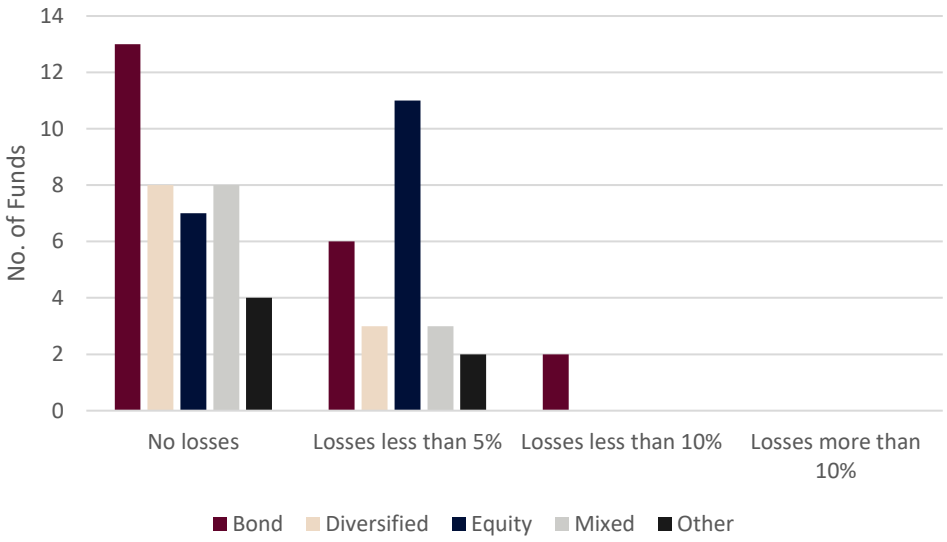

Figure 5: Losses suffered to meet the 1% worst redemption under the Waterfall approach

[18] Fund 35

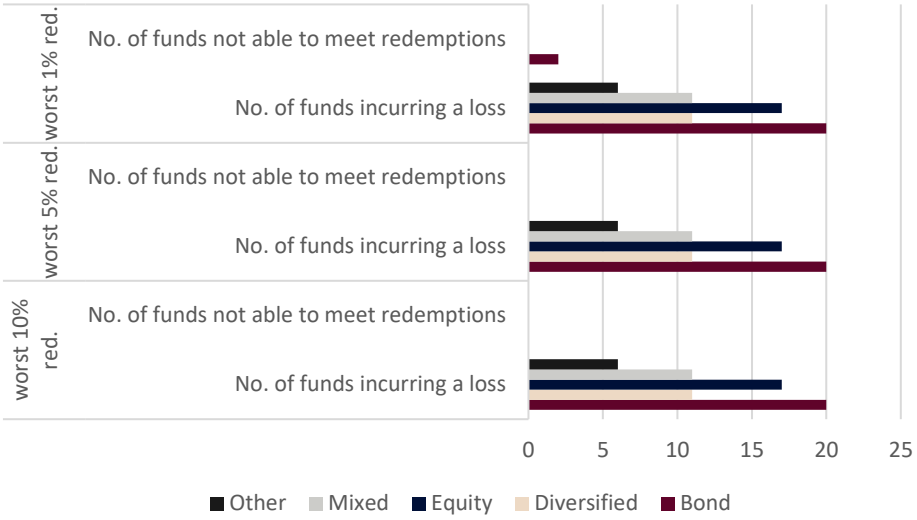

Figure 6: Liquidation of assets using the Slicing approach

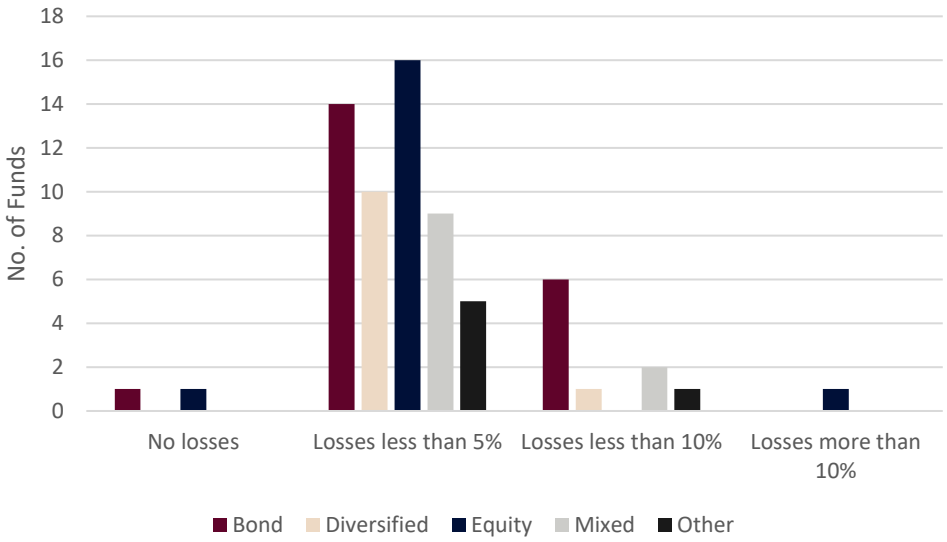

Figure 7: Losses suffered to meet the 1% worst redemption using the Slicing approach

Figure 8 shows that at a strategy level, consistent with the results obtained in previous stress testing exercises, equity funds suffer the most in all of the three worst redemption scenarios. In particular, if the 1% worst redemption request had to occur simultaneously in all of the equity funds, the total NAV of equity funds would shrink by 8.7%. Liquidation losses under the waterfall approach would further shrink the NAV by 1.6% while under the slicing approach the NAV would decline by a further 1.6%.

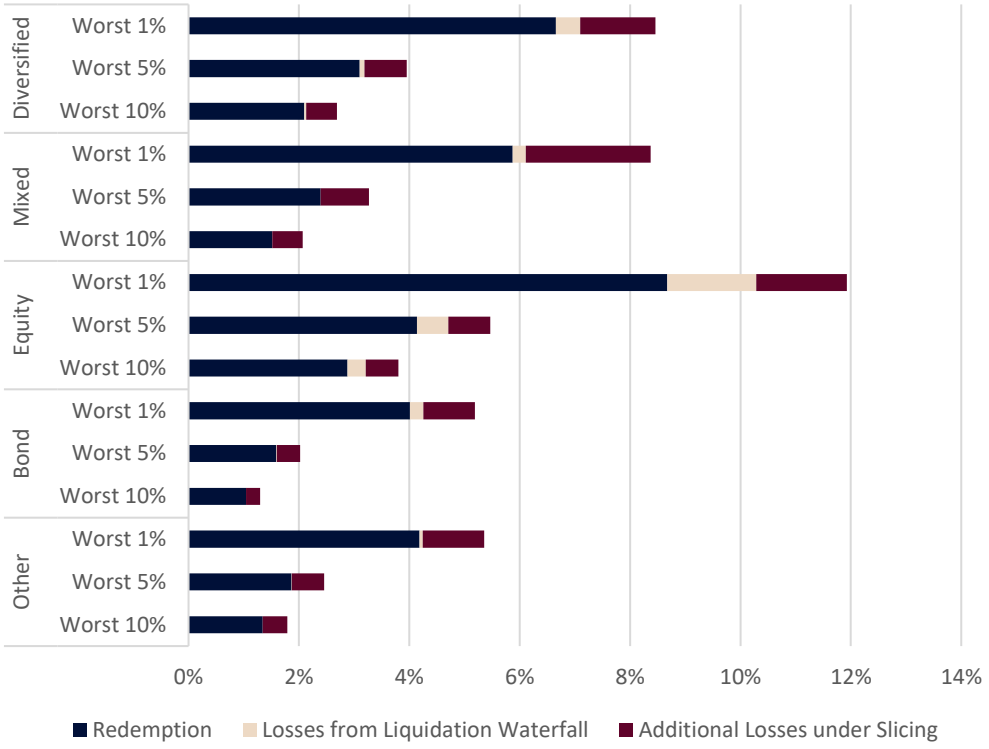

Figure 8: Impact of extreme redemptions on the strategy NAV

Second-round Effects

Second-round redemptions are estimated using a Bayesian approach. An OLS regression of lagged net flows and lagged log returns is run on current net flows for each of the funds. The estimated coefficients are grouped by strategy and the mean and standard deviation of the coefficients is computed for each strategy which are then used for the prior distributions of the Bayesian regression. Table 3 shows the calculated mean and standard deviation for each parameter at a strategy level. The negative but insignificant coefficient for β_2 of equity funds could be linked to the fact that such funds, which suffered the most in terms of performance during the onset of the pandemic, did not experience huge redemptions during these times while when their performance started to recover, they did not experience comparable strong inflows.

Table 3: Bayesian coefficients' prior distribution parameters

	Mean			**Standard Deviation**		
	α	β_1	β_2	α	β_1	β_2
Bond	0.0622	0.1025	0.0199	0.2599	0.1628	0.0531
Equity	0.1594	0.1015	-0.0042	0.3765	0.1524	0.0547
Mixed	-0.0359	0.0706	0.0382	0.2413	0.0919	0.0530
Other	0.0980	0.0462	-0.0765	0.3711	0.0759	0.2160

Once we fit a Bayesian model for each fund, the first-round redemptions and liquidation losses are plugged into the regression equation to forecast the expected second-round redemptions. We only present the chart for the waterfall approach (Figure 10) since the expected second-

round redemptions following the first round of liquidation under both the waterfall and slicing approaches are very similar. In line with previous stress testing exercises, the expected second-round redemptions would mostly be below 2% in all the three worst redemption scenarios, with only one fund expected to experience a second-round redemption of around 4.1% of NAV under the 1% worst case scenario. The number of funds incurring liquidation losses from the selling of assets due to second round redemptions once again depends on the liquidation method used, however, under both liquidation methods losses would be contained. The only two funds which will not be able to meet the second-round redemptions under the 1% worst case scenario are the same two funds that were not able to meet the first round of 1% extreme redemptions[19].

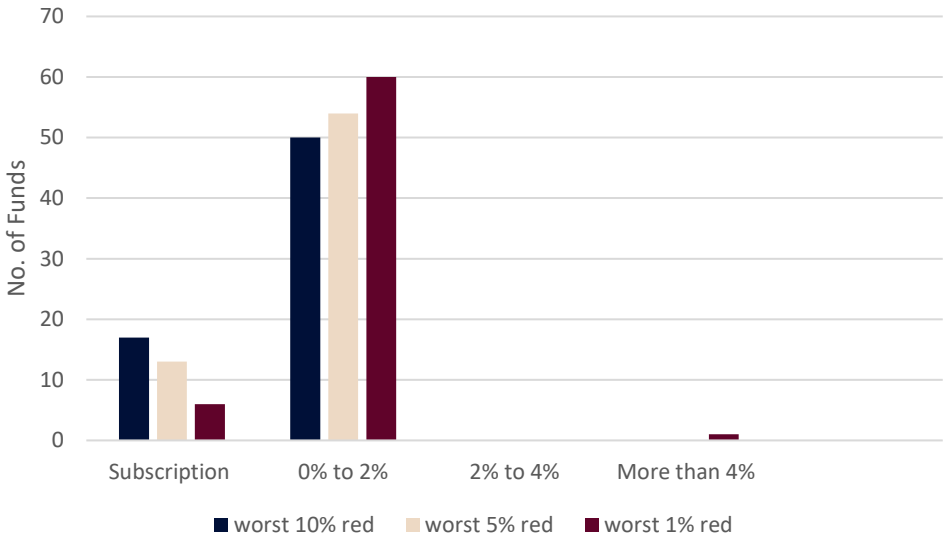

Figure 9: Second-round redemptions following liquidation under the Waterfall approach

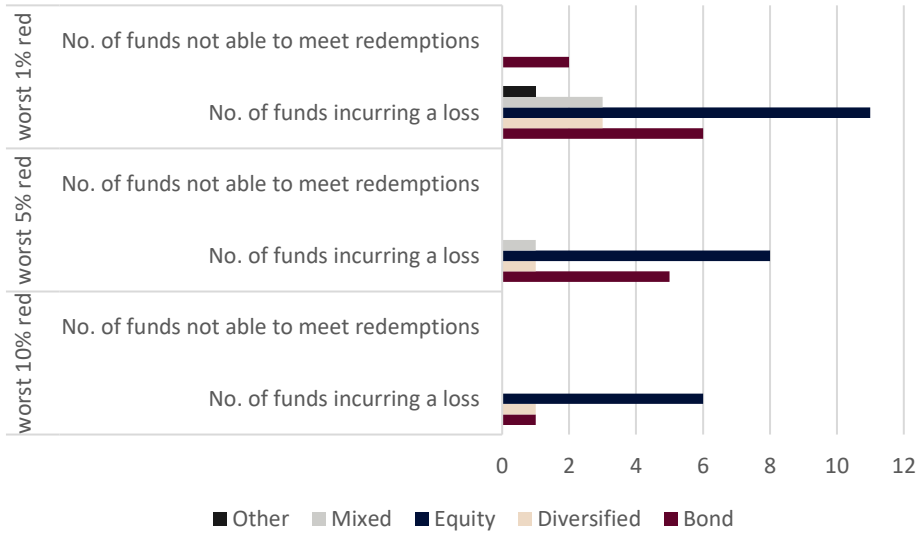

Figure 10: Liquidation of assets due to second-round redemptions under the Waterfall approach

[19] Fund 11 and Fund 35

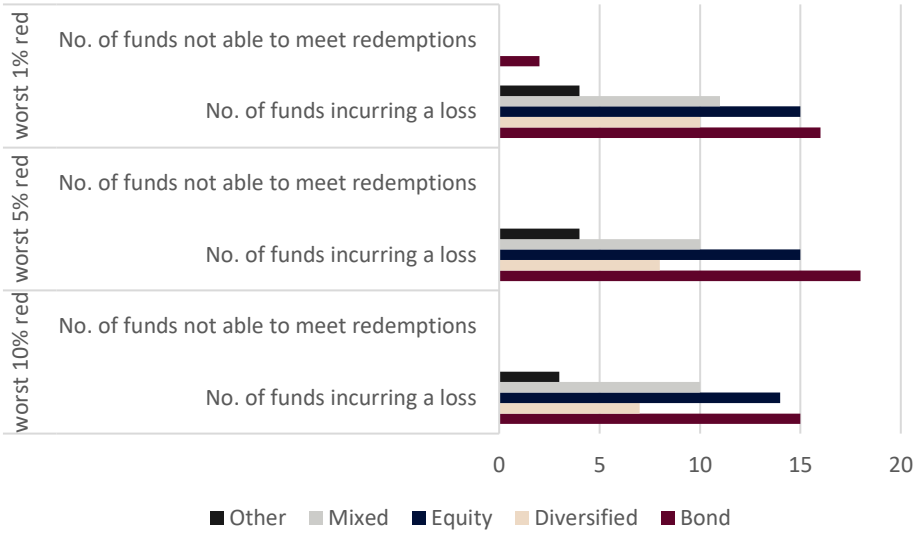

Figure 11: Liquidation of assets due to second-round redemptions under the Slicing approach

The waterfall and slicing approaches give very similar results when aggregating the second-round redemptions and losses at strategy level. Similar to the first round of redemptions, equity funds suffer the most in all of the three worst redemption scenarios, although the reduction in NAV due to second-round redemptions and liquidation losses is less, at around 1%.

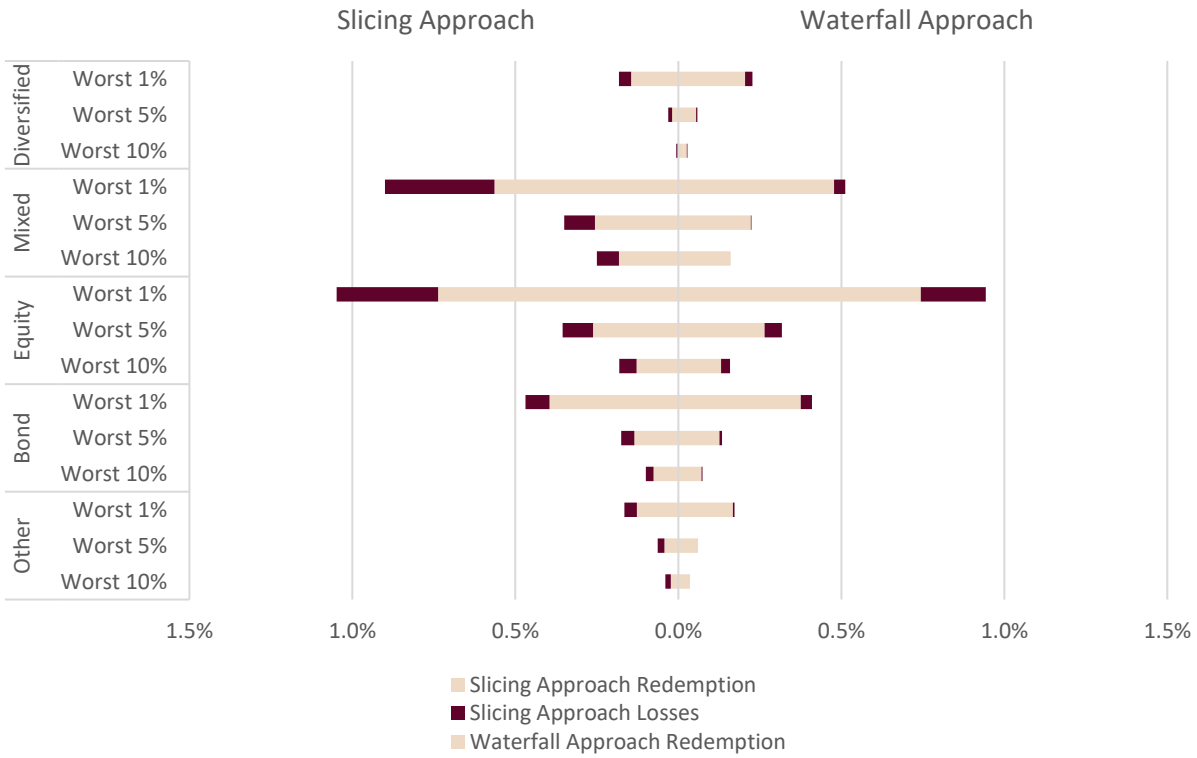

Figure 12: Impact of the second-round extreme redemptions on the strategy NAV

Conclusion

This report presents an update of the stress testing results for Maltese retail investment funds covering data up to end 2021, using the methodology for the micro-level stress testing adopted in 2021.

From our analysis, it seems that the liquidity constraints brought about by the pandemic in 2020 have not morphed into more serious liquidity issues in 2021 in the Maltese retail fund sector. Indeed, our stress testing results show that whilst some Maltese retail funds are no longer maintaining high cash and near cash assets as a defensive strategy, in case of a spate of unexpected redemptions, there does not seem to be any material change in the ability to service such redemptions.

The main results of this update indicate that no funds would fail the stress test under the 10% and 5% worst case scenarios while two out of 67 retail funds would face liquidity issues in meeting redemption requests under the 1% worst case scenario. One of these funds was not identified as having liquidity issues in previous stress testing exercises under any of the three scenarios while the second fund was found to not be able to meet redemption requests under the 1% worst case scenario in all previous stress testing exercises. Additionally, the expected second-round redemptions seem to be generally limited both in terms of redemptions and losses due to liquidation.

Bibliography

Bouveret, A., 2017. Liquidity Stress Testing for Investment Funds: A Practical Guide. *IMF Working Paper*.

ESMA, 2019. Stress simulation for investment funds. *Economic Report*.

ESMA, 2020. Recommendation of the European Systemic Risk Board (ESRB) on liquidity risk in investment funds.

Meglioli, F. & Gauci, S., 2020. Liquidity Stress Testing for Maltese Retail Investment Funds. *MFSA Financial Stability Working Paper Series,* Issue 6.

Meglioli, F. & Gauci, S., 2021. Liquidity Stress Testing for Maltese Retail Investment Funds: 2021 Update. *MFSA Financial Stability Working Paper Series,* Issue 4.

Appendix

Table A.1: Summary statistics

		% of NAV				
Fund	**No. of Weekly Obs.**	**Average Red.**	**Average Net Flow**	**Max Red.**	**Max Net Outflow**	**Max Net Inflow**
Fund 1	264	0.27	-0.18	11.19	11.19	5.94
Fund 2	336	0.36	0.43	18.54	18.54	104.33
Fund 3	217	0.01	37.98	0.52	0.50	8099.22
Fund 4	493	0.06	0.31	1.95	1.90	7.00
Fund 5	717	0.07	5.88	2.22	1.54	3930.82
Fund 6	152	0.33	0.64	10.48	10.35	43.93
Fund 7	274	0.08	1.06	4.56	4.15	221.60
Fund 8	261	0.40	0.42	8.19	7.99	39.53
Fund 9	345	0.26	0.30	9.15	8.17	26.94
Fund 10	307	0.17	1.24	8.93	8.92	121.33
Fund 11	301	0.20	0.39	12.76	7.86	80.39
Fund 12	158	1.12	1.69	11.31	11.09	27.04
Fund 13	161	1.11	0.48	11.63	7.46	12.40
Fund 14	218	0.66	0.53	11.50	11.50	39.74
Fund 15	255	0.26	1.16	1.98	1.43	54.50
Fund 16	255	0.21	1.45	1.41	1.16	99.62
Fund 17	255	0.24	1.54	3.30	2.56	120.80
Fund 18	539	0.16	0.79	9.22	1.06	77.00
Fund 19	427	0.53	0.53	15.92	5.98	105.07
Fund 20	218	0.27	1.27	13.45	4.52	110.72
Fund 21	330	0.30	0.15	2.84	2.25	7.70
Fund 22	246	0.13	2.40	12.07	11.08	100.00
Fund 23	195	0.13	1.53	3.03	2.68	18.44
Fund 24	308	0.73	0.48	7.96	7.96	16.00
Fund 25	308	0.84	-0.21	20.64	20.47	4.19
Fund 26	308	0.76	0.52	20.32	15.14	19.88
Fund 27	235	0.86	0.88	34.87	11.06	29.99
Fund 28	171	0.47	1.44	7.91	7.91	100.00
Fund 29	181	0.11	0.96	4.28	1.59	100.25
Fund 30	784	0.18	0.11	4.50	4.34	56.40
Fund 31	784	0.21	0.11	4.63	4.60	53.02
Fund 32	784	0.23	-0.11	3.93	3.68	1.77
Fund 33	784	0.25	-0.10	5.27	5.22	0.68
Fund 34	784	0.31	-0.20	5.61	5.51	0.66
Fund 35	531	1.15	1.73	66.86	66.86	477.81
Fund 36	94	0.03	1.65	0.52	0.39	98.56

Fund 37	144	0.36	0.81	7.41	6.97	14.33
Fund 38	269	0.31	0.80	5.97	5.97	37.45
Fund 39	382	0.16	0.67	5.61	2.30	13.06
Fund 40	446	0.17	0.77	3.33	2.25	13.32
Fund 41	285	0.05	0.13	3.62	3.62	33.33
Fund 42	248	0.07	0.60	1.47	1.27	22.90
Fund 43	248	0.09	0.75	1.65	1.34	18.65
Fund 44	307	0.05	0.25	3.41	3.31	5.90
Fund 45	228	0.65	1.07	15.46	15.46	56.81
Fund 46	358	0.50	-0.16	16.27	16.27	8.01
Fund 47	358	0.26	-0.09	23.84	23.84	9.76
Fund 48	209	0.22	-0.19	18.34	18.34	1.52
Fund 49	208	0.67	-0.12	21.83	21.83	5.88
Fund 50	531	0.35	0.13	18.00	17.99	35.95
Fund 51	531	0.31	0.30	32.55	29.50	35.91
Fund 52	734	0.30	0.01	19.26	19.26	116.40
Fund 53	736	0.43	0.00	20.28	20.25	68.65
Fund 54	720	0.36	-0.09	14.63	14.07	4.76
Fund 55	720	0.16	0.26	3.45	3.43	2.84
Fund 56	649	1.43	-0.31	21.99	21.99	22.16
Fund 57	649	0.25	0.12	11.13	2.79	7.68
Fund 58	649	0.22	-0.09	10.27	10.24	1.95
Fund 59	649	0.30	-0.12	11.68	11.68	3.05
Fund 60	649	0.13	0.08	0.89	0.80	3.03
Fund 61	720	0.41	0.07	11.83	10.88	35.88
Fund 62	408	0.24	0.51	2.61	2.59	17.81
Fund 63	649	0.24	0.07	4.35	4.07	2.40
Fund 64	649	0.23	0.17	2.03	1.51	2.82
Fund 65	649	0.32	0.08	12.29	11.78	23.34
Fund 66	649	0.27	-0.06	11.23	11.10	11.88
Fund 67	311	0.13	0.05	5.24	5.24	5.17

Table A.2: GPD parameter estimates

Fund	**μ**	**σ**	**ξ**	**Fund**	**μ**	**σ**	**ξ**
Fund 1	0.26	1.16	0.51	**Fund 35**	2.11	2.41	0.88
Fund 2	0.49	1.65	0.51	**Fund 36**	0.06	0.16	-0.04
Fund 3	0.03	0.05	0.58	**Fund 37**	0.86	2.31	-0.21
Fund 4	0.14	0.10	0.68	**Fund 38**	0.78	0.80	0.32
Fund 5	0.16	0.07	0.82	**Fund 39**	0.47	0.16	0.89
Fund 6	0.52	0.59	1.22	**Fund 40**	0.37	0.28	0.41
Fund 7	0.00	1.31	-0.01	**Fund 41**	0.04	1.75	-0.36
Fund 8	1.10	1.74	0.14	**Fund 42**	0.17	0.48	-0.18
Fund 9	0.58	1.13	0.37	**Fund 43**	0.24	0.28	0.12
Fund 10	0.17	0.80	0.50	**Fund 44**	0.11	0.10	0.60

Fund 11	0.16	0.58	0.97	**Fund 45**	1.66	3.95	-0.04
Fund 12	2.64	2.66	-0.03	**Fund 46**	1.41	1.14	0.41
Fund 13	2.91	3.13	-0.20	**Fund 47**	0.47	0.37	0.69
Fund 14	1.84	1.47	0.12	**Fund 48**	0.09	5.27	0.05
Fund 15	0.91	0.42	-0.22	**Fund 49**	1.41	1.07	0.73
Fund 16	0.65	0.17	0.07	**Fund 50**	0.94	1.30	0.27
Fund 17	0.77	0.37	0.33	**Fund 51**	0.76	0.86	0.44
Fund 18	0.33	0.16	0.64	**Fund 52**	0.46	0.44	1.03
Fund 19	1.24	0.69	0.50	**Fund 53**	0.98	1.05	0.58
Fund 20	0.47	0.39	0.83	**Fund 54**	0.81	0.35	0.69
Fund 21	0.96	0.65	-0.16	**Fund 55**	0.30	0.24	0.32
Fund 22	0.00	0.04	1.93	**Fund 56**	3.18	2.11	0.09
Fund 23	0.29	0.31	0.47	**Fund 57**	0.44	0.30	0.45
Fund 24	1.60	2.10	-0.14	**Fund 58**	0.34	0.21	0.90
Fund 25	1.62	0.70	0.87	**Fund 59**	0.54	0.16	0.70
Fund 26	1.95	1.49	0.43	**Fund 60**	0.27	0.14	0.01
Fund 27	2.29	2.16	0.41	**Fund 61**	0.82	0.32	0.52
Fund 28	1.23	1.76	0.15	**Fund 62**	0.46	0.18	0.27
Fund 29	0.27	0.39	0.52	**Fund 63**	0.42	0.15	0.79
Fund 30	0.38	0.30	0.73	**Fund 64**	0.44	0.17	0.36
Fund 31	0.50	0.28	0.40	**Fund 65**	0.56	0.25	0.89
Fund 32	0.48	0.18	0.40	**Fund 66**	0.42	0.30	0.98
Fund 33	0.48	0.23	0.64	**Fund 67**	0.21	0.86	0.17
Fund 34	0.65	0.32	0.44				

Table A.3: Simulated worst redemptions at the 10%, 5% and 1% levels[20]

Fund	Worst 10% Red.	Worst 5% Red.	Worst 1% Red.	Liquid Assets	Shortfall Worst 10%	Shortfall Worst 5%	Shortfall Worst 1%
Fund 1	2.49	4.33	11.76	5.59	-3.10	-1.26	6.17
Fund 2	3.62	6.20	16.45	3.34	0.29	2.86	13.12
Fund 3	0.15	0.26	0.73	1.45	-1.30	-1.19	-0.71
Fund 4	0.45	0.70	2.01	6.73	-6.28	-6.03	-4.73
Fund 5	0.47	0.72	2.20	4.61	-4.13	-3.89	-2.40
Fund 6	3.59	6.59	24.13	33.89	-30.30	-27.30	-9.76
Fund 7	1.29	2.18	4.20	4.98	-3.69	-2.81	-0.78
Fund 8	3.13	4.60	8.65	11.69	-8.57	-7.09	-3.04
Fund 9	2.37	3.76	8.76	3.67	-1.30	0.09	5.09
Fund 10	1.70	2.97	8.13	9.82	-8.12	-6.85	-1.69
Fund 11	2.47	4.60	16.18	4.76	-2.29	-0.16	11.42
Fund 12	5.23	7.00	10.99	0.77	4.45	6.23	10.21
Fund 13	5.53	7.22	10.36	1.92	3.60	5.30	8.44

[20] Red figures indicate a liquidity shortfall.

Fund 14	3.51	4.71	7.92	33.45	-29.94	-28.73	-25.52
Fund 15	1.25	1.47	1.87	1.63	-0.38	-0.16	0.23
Fund 16	0.84	0.99	1.32	1.36	-0.52	-0.37	-0.03
Fund 17	1.32	1.76	3.24	1.55	-0.23	0.20	1.69
Fund 18	0.77	1.13	2.90	8.53	-7.77	-7.40	-5.63
Fund 19	2.62	3.68	8.18	0.79	1.82	2.89	7.39
Fund 20	1.85	3.08	9.63	7.65	-5.80	-4.57	1.98
Fund 21	1.52	1.88	2.60	7.09	-5.58	-5.21	-4.50
Fund 22	1.34	2.74	13.55	22.67	-21.33	-19.94	-9.13
Fund 23	0.87	1.35	3.25	11.36	-10.49	-10.02	-8.11
Fund 24	3.44	4.66	7.07	8.91	-5.47	-4.25	-1.84
Fund 25	3.98	6.12	17.12	2.79	1.19	3.33	14.33
Fund 26	4.55	6.53	14.15	2.05	2.50	4.47	12.09
Fund 27	5.94	8.63	18.82	51.89	-45.95	-43.25	-33.06
Fund 28	3.29	4.80	8.94	51.32	-48.03	-46.53	-42.39
Fund 29	1.06	1.72	4.49	51.02	-49.97	-49.31	-46.53
Fund 30	1.31	2.12	6.26	9.34	-8.03	-7.22	-3.08
Fund 31	0.98	1.36	2.76	8.93	-7.96	-7.58	-6.18
Fund 32	0.78	1.03	1.90	5.46	-4.68	-4.44	-3.57
Fund 33	1.12	1.59	4.04	4.87	-3.75	-3.28	-0.83
Fund 34	1.21	1.67	3.44	1.27	-0.05	0.40	2.17
Fund 35	8.24	13.93	39.55	10.51	-2.27	3.42	29.04
Fund 36	0.22	0.32	0.56	14.77	-14.55	-14.44	-14.21
Fund 37	2.78	4.01	6.29	12.01	-9.23	-7.99	-5.72
Fund 38	1.95	2.85	5.91	4.70	-2.75	-1.84	1.21
Fund 39	1.19	1.81	5.47	3.92	-2.73	-2.11	1.55
Fund 40	0.86	1.24	2.69	4.76	-3.91	-3.52	-2.07
Fund 41	1.33	2.11	3.33	7.23	-5.90	-5.11	-3.90
Fund 42	0.58	0.84	1.35	8.42	-7.85	-7.58	-7.07
Fund 43	0.55	0.79	1.40	6.79	-6.23	-6.00	-5.38
Fund 44	0.36	0.58	1.57	2.59	-2.23	-2.01	-1.02
Fund 45	5.47	8.08	13.90	13.67	-8.20	-5.59	0.23
Fund 46	3.35	4.85	10.54	0.81	2.54	4.04	9.73
Fund 47	1.49	2.38	6.72	8.67	-7.18	-6.29	-1.95
Fund 48	5.62	9.51	19.07	50.46	-44.85	-40.95	-31.40
Fund 49	4.22	6.69	18.19	12.86	-8.64	-6.17	5.33
Fund 50	2.71	4.05	8.30	17.71	-15.00	-13.66	-9.41
Fund 51	2.27	3.46	8.09	10.86	-8.59	-7.40	-2.77
Fund 52	2.48	4.38	15.08	2.00	0.48	2.38	13.08
Fund 53	3.50	5.17	13.44	4.76	-1.26	0.41	8.67
Fund 54	1.80	2.66	6.89	2.54	-0.73	0.13	4.35
Fund 55	0.65	0.92	1.84	3.97	-3.32	-3.04	-2.13
Fund 56	5.50	7.16	11.45	57.19	-51.69	-50.03	-45.74
Fund 57	0.98	1.42	3.15	3.77	-2.79	-2.35	-0.63

Fund 58	1.24	2.06	6.70	2.15	-0.91	-0.10	4.54
Fund 59	1.04	1.44	3.53	0.36	0.68	1.08	3.17
Fund 60	0.41	0.52	0.75	2.57	-2.16	-2.05	-1.82
Fund 61	1.48	2.02	4.30	0.89	0.59	1.12	3.41
Fund 62	0.70	0.89	1.47	2.79	-2.10	-1.90	-1.32
Fund 63	0.98	1.45	4.08	6.07	-5.09	-4.62	-2.00
Fund 64	0.71	0.93	1.68	11.81	-11.10	-10.88	-10.13
Fund 65	1.62	2.57	7.94	5.33	-3.71	-2.76	2.61
Fund 66	1.80	3.08	10.38	5.94	-4.14	-2.86	4.44
Fund 67	1.24	2.01	4.19	15.62	-14.37	-13.61	-11.43

Table A.4: Expected second-round redemptions

	2nd Round Redemptions - Waterfall Approach			**2nd 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	0.26	0.38	0.98	0.29	0.44	1.04
Fund 2	0.32	0.50	1.34	0.37	0.58	1.44
Fund 3	-0.10	-0.09	-0.03	-0.10	-0.09	-0.02
Fund 4	-0.06	-0.04	0.05	-0.06	-0.03	0.08
Fund 5	-0.01	0.02	0.18	0.00	0.03	0.20
Fund 6	0.02	0.16	0.99	-0.02	0.08	0.70
Fund 7	0.13	0.19	0.34	0.16	0.24	0.43
Fund 8	0.25	0.36	0.64	0.30	0.42	0.76
Fund 9	0.19	0.32	0.87	0.20	0.35	0.90
Fund 10	0.09	0.20	0.65	0.10	0.22	0.71
Fund 11	0.19	0.38	1.58	0.19	0.41	1.58
Fund 12	0.44	0.65	1.12	0.44	0.64	1.11
Fund 13	0.41	0.60	0.95	0.41	0.60	0.95
Fund 14	0.45	0.51	0.66	0.43	0.48	0.62
Fund 15	-0.09	-0.08	-0.07	-0.11	-0.10	-0.09
Fund 16	0.04	0.05	0.06	0.03	0.04	0.05
Fund 17	-0.11	-0.09	-0.03	-0.11	-0.10	-0.04
Fund 18	0.05	0.08	0.25	0.06	0.09	0.28
Fund 19	0.27	0.37	0.78	0.27	0.37	0.78
Fund 20	0.08	0.24	1.09	0.10	0.28	1.20
Fund 21	0.21	0.24	0.29	0.23	0.26	0.32
Fund 22	0.00	0.11	1.02	0.00	0.12	1.06
Fund 23	-0.21	-0.16	0.04	-0.18	-0.11	0.16
Fund 24	0.23	0.37	0.64	0.23	0.36	0.63
Fund 25	0.09	0.15	0.49	0.05	0.11	0.45
Fund 26	-0.03	0.18	0.98	-0.03	0.18	0.97
Fund 27	0.07	0.19	0.67	0.03	0.14	0.54

Fund 28	0.10	0.24	0.61	0.10	0.23	0.60
Fund 29	-0.14	-0.08	0.18	-0.14	-0.08	0.18
Fund 30	0.13	0.21	0.60	0.13	0.20	0.59
Fund 31	0.06	0.10	0.21	0.07	0.10	0.22
Fund 32	-0.03	-0.02	0.03	-0.01	0.01	0.07
Fund 33	0.14	0.21	0.56	0.15	0.22	0.57
Fund 34	0.25	0.31	0.54	0.26	0.32	0.54
Fund 35	0.78	1.36	4.09	0.83	1.47	4.09
Fund 36	-0.33	-0.33	-0.32	-0.33	-0.33	-0.32
Fund 37	0.21	0.30	0.46	0.24	0.34	0.53
Fund 38	0.21	0.30	0.60	0.21	0.30	0.59
Fund 39	-0.10	-0.08	0.10	-0.10	-0.07	0.10
Fund 40	-0.06	-0.04	0.03	-0.06	-0.05	0.01
Fund 41	0.09	0.13	0.19	0.08	0.11	0.15
Fund 42	-0.23	-0.20	-0.15	-0.23	-0.20	-0.15
Fund 43	-0.02	0.01	0.09	-0.02	0.01	0.09
Fund 44	-0.10	-0.09	-0.04	-0.10	-0.09	-0.05
Fund 45	0.14	0.27	0.53	0.02	0.08	0.22
Fund 46	0.42	0.58	1.20	0.42	0.58	1.20
Fund 47	0.26	0.32	0.63	0.28	0.35	0.71
Fund 48	0.28	0.46	0.89	0.26	0.42	0.83
Fund 49	0.33	0.56	1.63	0.35	0.60	1.79
Fund 50	0.12	0.18	0.38	0.06	0.09	0.19
Fund 51	0.13	0.24	0.67	0.12	0.23	0.66
Fund 52	0.31	0.56	1.97	0.31	0.56	1.97
Fund 53	0.40	0.61	1.64	0.42	0.62	1.66
Fund 54	0.21	0.30	0.70	0.21	0.29	0.70
Fund 55	-0.10	-0.07	0.02	-0.10	-0.07	0.02
Fund 56	0.24	0.31	0.51	0.06	0.08	0.14
Fund 57	0.09	0.13	0.29	0.09	0.13	0.30
Fund 58	0.14	0.19	0.54	0.17	0.25	0.85
Fund 59	0.15	0.18	0.38	0.15	0.19	0.38
Fund 60	0.05	0.06	0.09	0.05	0.06	0.09
Fund 61	0.17	0.22	0.42	0.17	0.22	0.42
Fund 62	0.17	0.18	0.20	0.18	0.19	0.22
Fund 63	0.09	0.12	0.31	0.11	0.15	0.42
Fund 64	0.05	0.07	0.16	0.05	0.08	0.16
Fund 65	0.12	0.21	0.71	0.12	0.21	0.71
Fund 66	0.14	0.26	0.96	0.14	0.25	0.88
Fund 67	0.08	0.14	0.29	0.09	0.15	0.32

Malta Financial Services Authority

Triq L-Imdina, Zone 1

Central Business District, Birkirkara, CBD 1010, Malta

communications@mfsa.mt

www.mfsa.mt