Liquidity Stress Tests for Fixed-Income Mutual Funds[1]

5th CEMLA/Dallas Fed Financial Stability Workshop

Mexico City, Mexico, November 2026

[1]Tamara Gallardo, Fernando Martínez, Matías Muñoz, Félix Villatoro

The views expressed are those of the authors and do not necessarily reflect the views of the Central Bank of Chile or its board members.

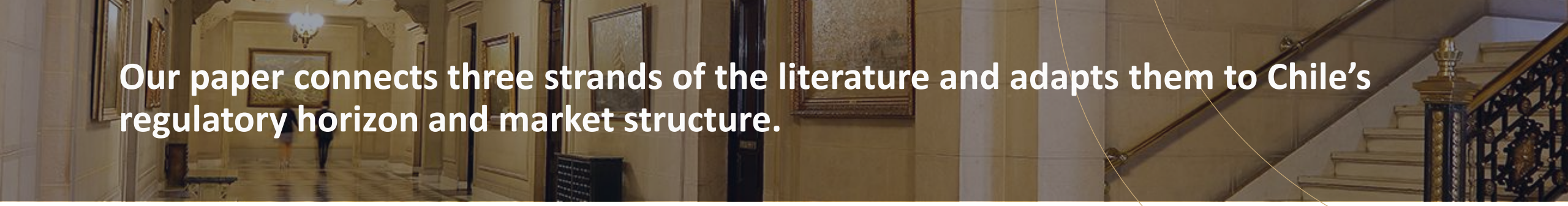
Agenda

1. Motivation
2. The data
3. Methodology and results
4. Final remarks

Motivation and Main Results

The mutual fund industry is one of the main institutional investors in the Chilean financial system, and it has gained a sizable share in key markets, such as bank bonds.

- Given its nature, open-ended funds are susceptible to episodes of large redemption requests, with possible implications for financial stability:
  - Fire sales and downward pressure on asset prices
  - Increased market volatility
  - Less financing available
  - Contagion to other markets and/or intermediaries
- Against this background, there is a need to develop tools to assess mutual funds' liquidity management, taking into account that asset managers do not have fixed-amount liabilities with their investors.



Our paper connects three strands of the literature and adapts them to Chile's regulatory horizon and market structure.

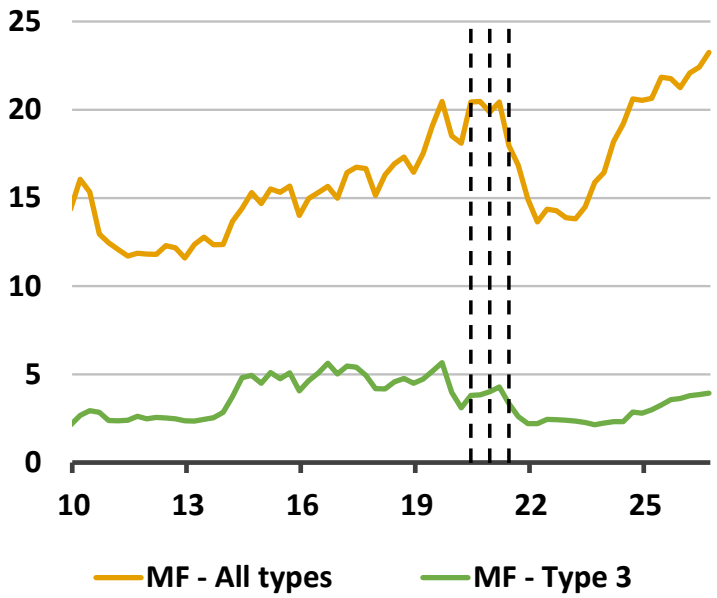
- **Liquidity stress testing:** we build on methodologies for calibrating redemption shocks, measuring liquid assets, and assessing the resilience of open-end funds (Bouveret, 2017; Bouveret and Yu, 2021).
- **Liquidation strategies:** our work relates to evidence on how fund managers meet redemptions through waterfall or pro-rata sales (Ben-Rephael, 2017; Jiang et al., 2021; Szabo, 2022).
- **Fire sales and financial stability:** we link stressed fund outflows and forced asset sales to price pressure (Goldstein et al., 2017; Falato et al., 2021; IMF, 2022).
- Our **main contribution** is to develop an integrated framework that calibrates redemption shocks with daily data over the regulatory 10-day horizon, combines econometric and historical stress scenarios, and uses fund-level evidence on observed liquidation behavior.
- **Main result 1:** Fund-level resilience: all funds pass the baseline stress test.
- **Main result 2:** However, liquidation needs may be large relative to market liquidity.

The Data

Mutual funds' assets fell sharply during the Covid-19 period. Fixed-income mutual funds have not recovered their previous peak.

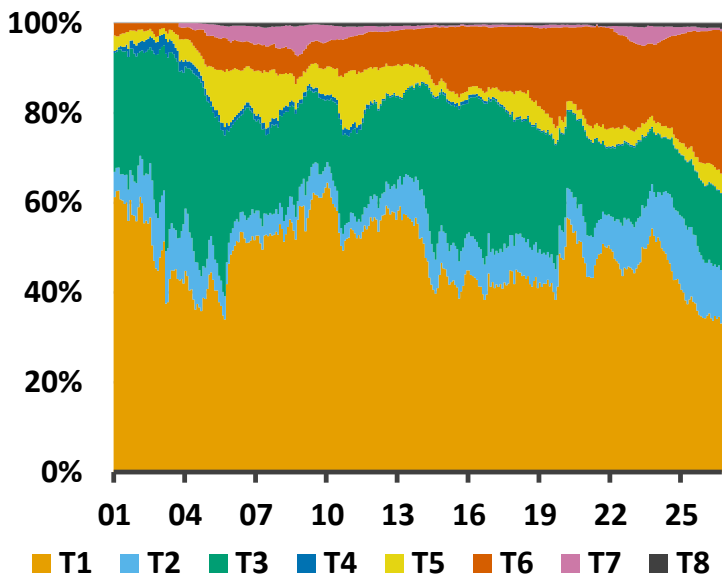
Mutual Funds AUM (1)

(percentage of GDP)



Mutual Fund Types (2)

(percentage of total)



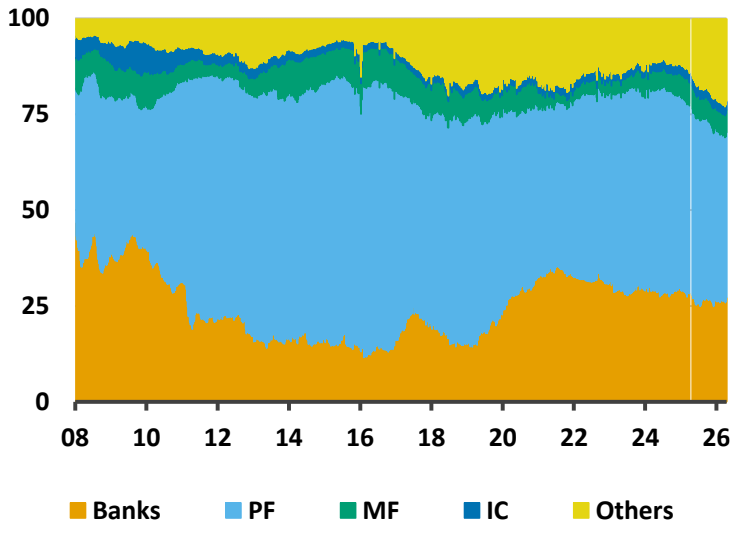
- Mutual funds' redemption requests must be fulfilled during the course of ten calendar days.
- If a mutual fund is not designed for qualified investors, its portfolio must hold less than 50% of "illiquid assets".
- Mutual funds are expected to develop and use risk management tools, such as stress tests.
- Currently, there is no guidance for the implementation of these tests.
- The financial market regulator (CMF) is developing new liquidity requirements.

(1) Black vertical lines denote quarters in which pension fund withdrawals occurred. (2) Fund categories: 1: short-term debt (<90 days); 2: medium-term debt (<365 days); **3: long-term debt (>365 days)**; 4: mixed (debt and equities); 5: equity; 6: unrestricted investment; 7: structured (target return); and 8: qualified investors. Data as of June 30, 2024.

Mutual funds' participation in the local government debt market stands at 4%. This figure is higher for corporate bonds: 12.6%. Market share for local bank bonds stands at 19.7%.

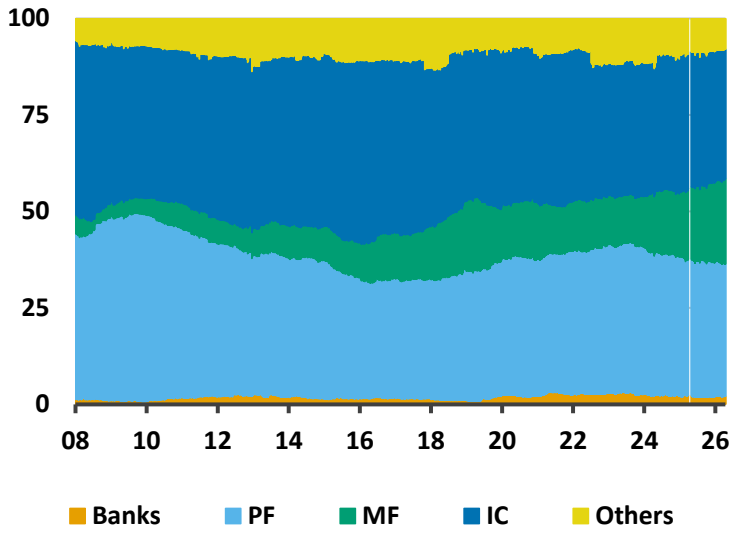
Institutional Investors and Government Bonds

(percentage of total)



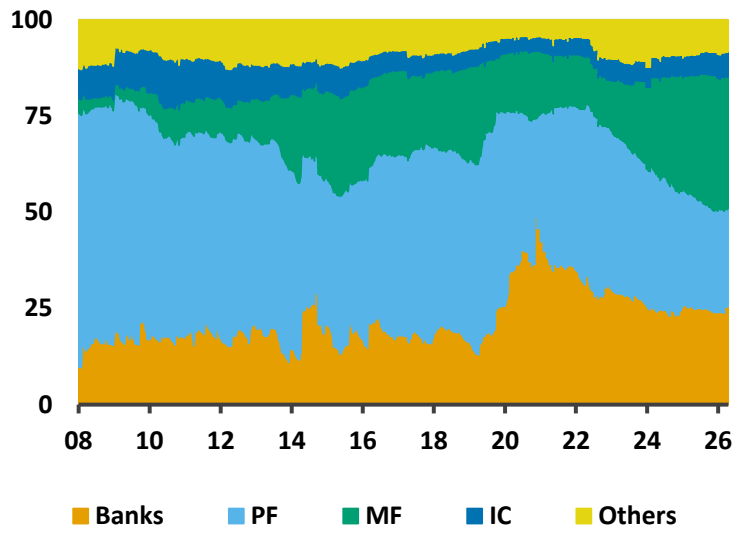
Institutional Investors and Corporate Bonds

(percentage of total)



Institutional Investors and Bank Bonds

(percentage of total)



PF: Pension Funds; MF: Mutual Funds; IC: Insurance Companies. The figures cover bonds in Chilean pesos (CLP) and Unidad de Fomento (UF), Chile's inflation-linked unit of account. Mutual fund holdings consider all types of mutual funds.
Source: authors' estimations based on Central Securities Depositary Data.

Sample selection

Methodology and Results

The first step in our exercise is to construct fund-level net flows over 10-day windows.

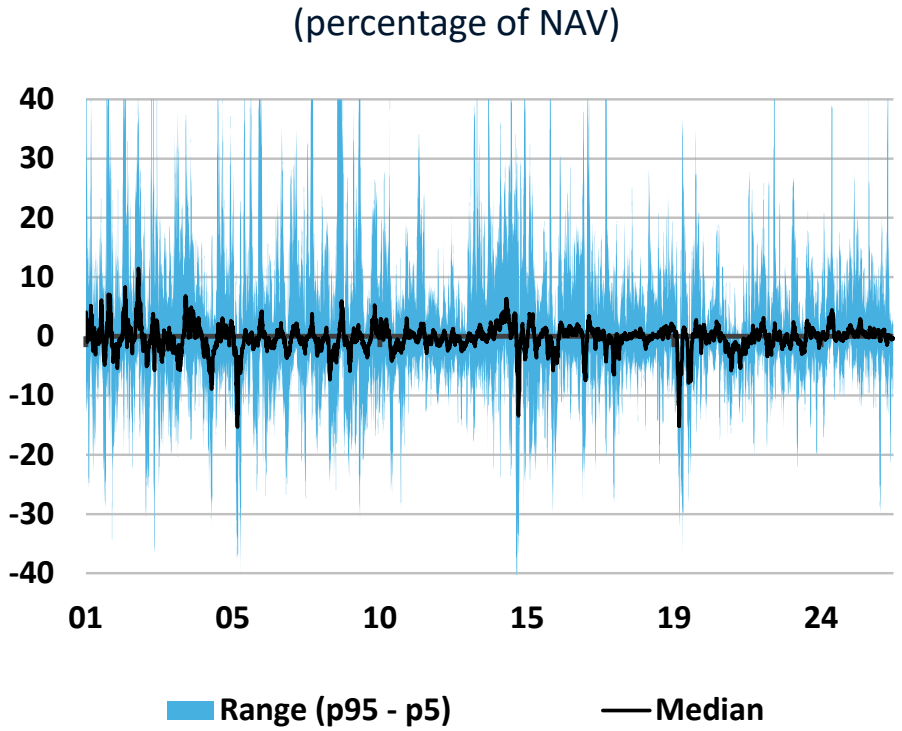
- For each fund i, and period t, net flows are given by:

$$NFd_{i,t} = NAV_{i,t+1}\left(1 + r_{t,i}\right) - NAV_{i,t}$$

- Where NFd is the net flow, NAV is the fund's net assets, and r is the fund's return (percentage change in NAV per share).
- For funds with multiple share series, the return is calculated at the share level and then the fund-level return is calculated as a weighted average.
- Net flows as a percentage of NAV are calculated as:

$$NF_{i,t} = \frac{\sum_{j=1}^{10} NFd_{i,t-j+1}}{\overline{NAV}_{i,t-10}}$$

Median and Net Flow Range for Type 3 Funds (1)



(1) The shaded area corresponds to the difference between the 95th and 5th percentiles of the fund-level net flow distributions. For expositional purposes, the vertical axis has been truncated at a 40% maximum value.

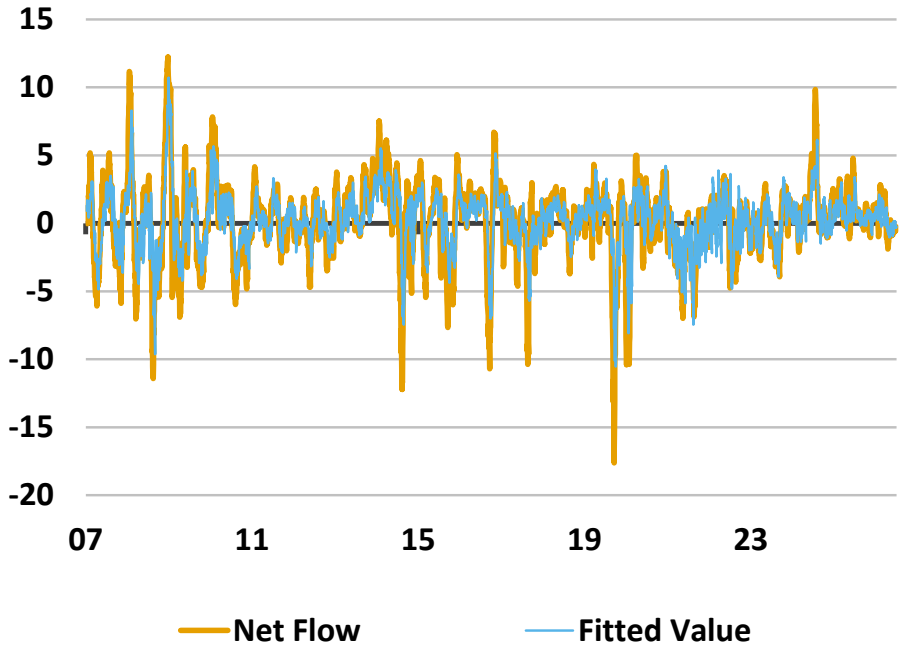
Following IMF (2017), we regress net flows on lagged net flows, changes in interest rates, as well as changes in standard financial market variables.

Net Flows Regression Results (1)

Variable	Coefficients	
NF_{t-10}	0.639	***
	(0.015)	
$\Delta r_{s.t.}$	-0.540	***
	(0.166)	
$\Delta r_{l.t.}$	-4.557	***
	(0.236)	
$\Delta slope_t$	1.520	***
	(0.155)	
Δvix_t	-0.069	***
	(0.010)	
$\Delta embi_{cl,t}$	0.008	***
	(0.003)	
α	0.072	**
	(0.031)	
R^2 (%)	29	
N	4,546	

Industry-level Net Flows Fitted Values

(percentage of NAV)

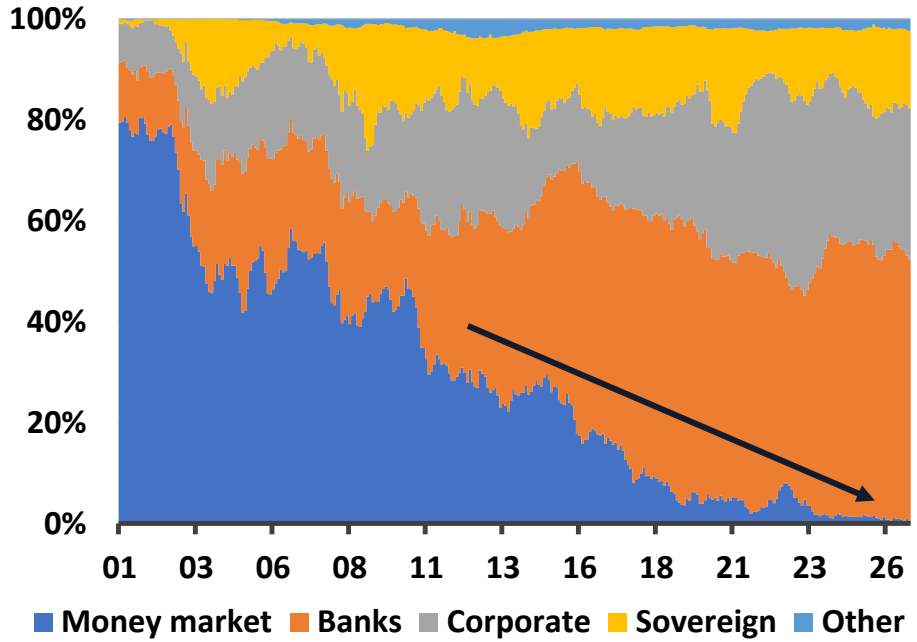


(1) Results correspond to the regression $NF_{i,t} = \alpha + \beta_1 NF_{i,t-10} + \beta_2 \Delta r_{st,t} + \beta_3 \Delta r_{lt,t} + \beta_4 \Delta vix_t + \beta_5 \Delta slope_t + \beta_6 \Delta embi_{cl,t} + u_{i,t}$. Standard errors in parentheses. Regression results at the industry level were obtained by OLS with robust standard errors. *, **, *** denote significance at the 10, 5 and 1% levels, respectively.

Following standard practice, we classify local and foreign government and central bank bonds and notes, as well as money market instruments, as liquid assets.

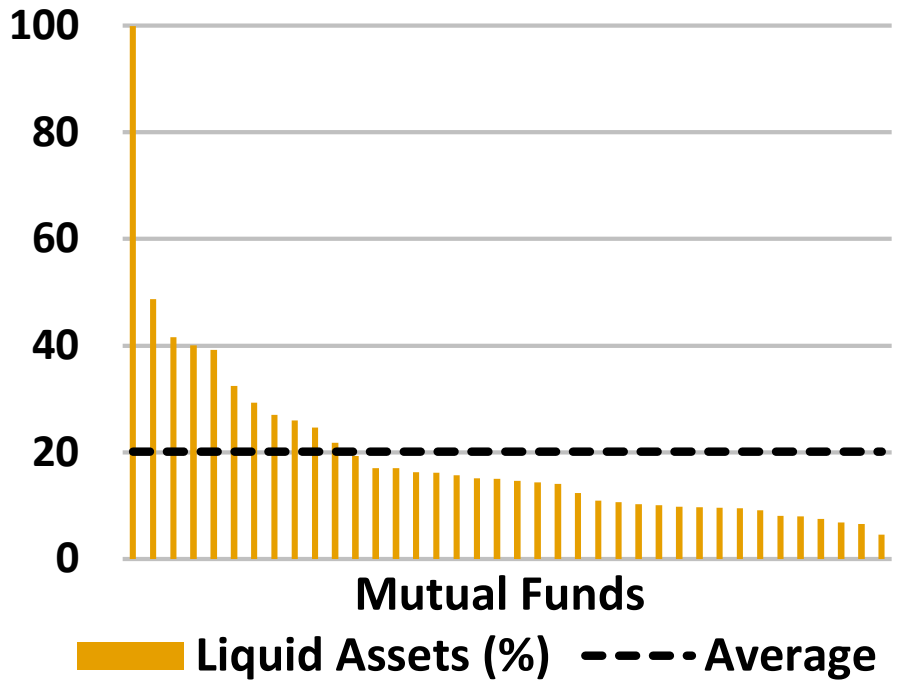
Mutual Fund Portfolio (1)

(percentage of AUM)



Mutual Fund Liquid Assets (2)

(percentage of AUM)

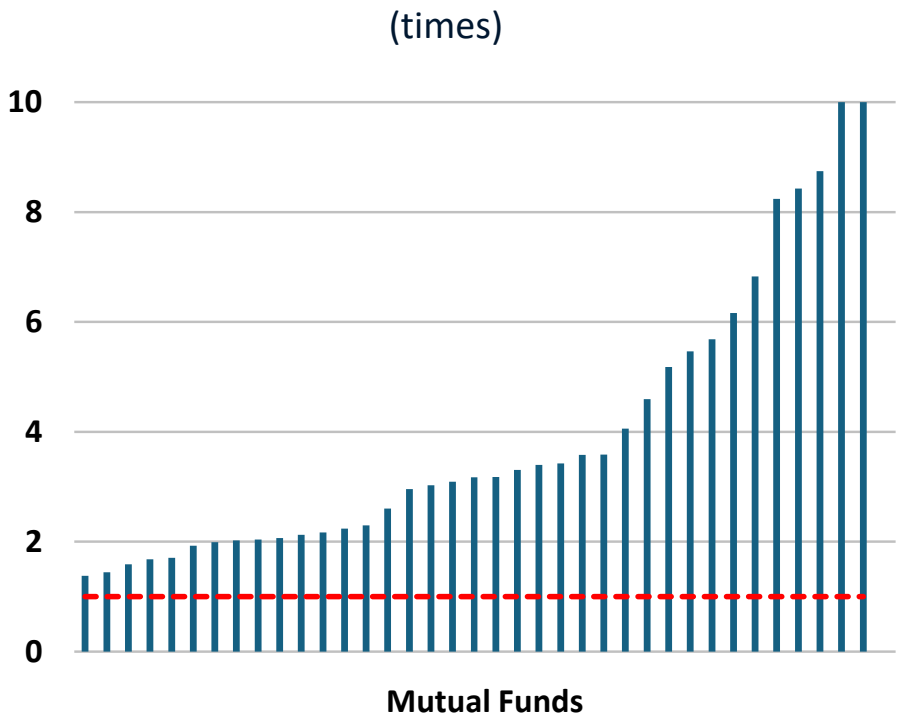


(1) Mutual funds' portfolios are classified in money market instruments (maturities up to 365 days), bank bonds, corporate (non-financial firms) bonds, sovereign bonds, and others (e.g. stocks, long-term deposits, etc.). (2) Data as of August 2026.

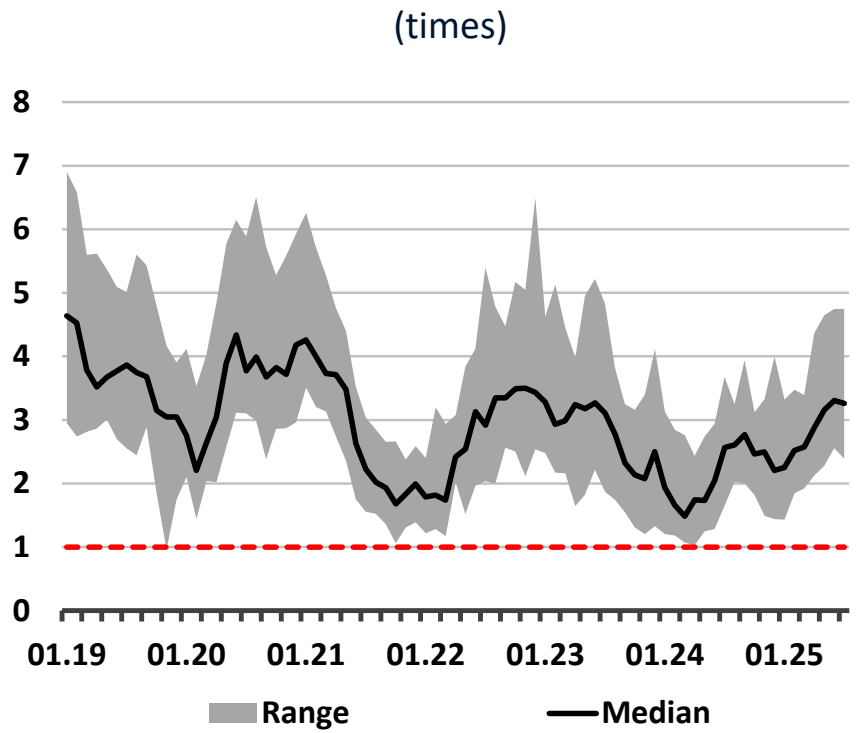
Results and Final Remarks

We evaluate the resilience of mutual funds using the Redemption Coverage Ratio (RCR): $RCR_{i,t} = Liquid\ Assets_{i,t}/Shock_{i,t}$. $Shock_{i,t}$ is calibrated at 6.9% of AUM.

RCR in Stress Scenario (1)(3)



Evolution of the RCR (2)(3)



(1) Vertical bars show the RCR for each mutual fund participating in the liquidity stress test for August 2026, as well as a black dotted line showing the RCR=1 level, which is not a normative requirement. For expositional purposes the vertical axis is truncated at 10. (2) The shaded area corresponds to the difference between the 75th and 25th percentiles of the RCR distribution. (3) The stress scenario considers the following shocks: $NF_{t-10} = 0$; $\Delta r_{s.t.} = 0.87\%$; $\Delta r_{l.t.} = 0.52\%$; $\Delta slope_t = -0.84\%$; $\Delta vix_t = 15$; $\Delta embi_{cl,t} = 41\ bps$. This results in a shock of 6.9% of AUM. This value is between the first and fifth percentiles of the historical 10-day net flow distribution.

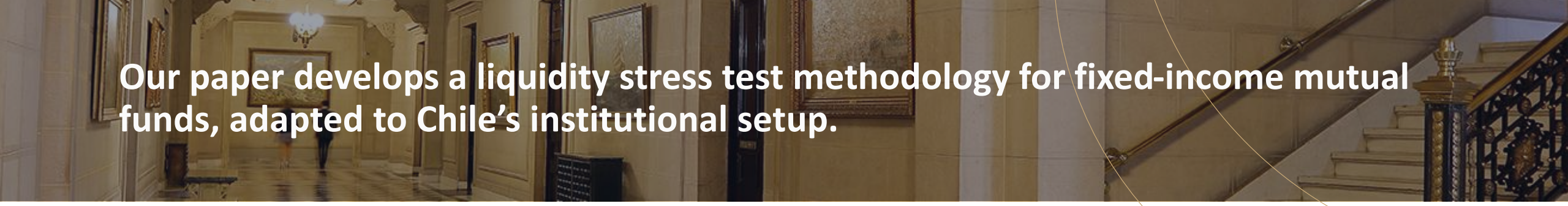
While all mutual funds have an RCR above 1, a common threshold in the literature, simultaneous liquidation could generate pressure in some markets.

Liquidation of Assets (1)

(USD million, percentage)

	Initial Potrfolio	% AUM	Liquidation	Transactions	% transactions	Final Portfolio	% AUM
a) Waterfall Strategy							
Money Market	137	1.0	137	17,124	0.8	-	0.0
Government	2,042	14.3	844	1,687	50.0	1,198	9.0
Bank	7,887	55.3	5	1,659	0.3	7,882	59.4
Corporate	4,184	29.4	-	305	0.0	4,184	31.5
Total	14,250	100	986			13,264	100
b) Prorata Strategy							
Money Market	137	1.0	9	17,124	0.1	128	1.0
Government	2,042	14.3	141	1,687	8.4	1,900	14.3
Bank	7,887	55.3	546	1,659	32.9	7,341	55.3
Corporate	4,184	29.4	289	305	94.9	3,895	29.4
Total	14,250	100	986			13,264	100

(1) Columns 2 and 3 show the initial industry-level holdings, in USD billion and as a percentage of AUM, respectively. The next three columns show the amount of each asset class that is sold to meet the stressed redemption requests, the average daily amount traded in each market during 2026, and the liquidation need for each type of bond, as a percentage of average transactions. The last two columns show the final industry-level holdings, in USD and as a percentage of AUM, respectively. In panel a) we assume a waterfall liquidation strategy with the following order: money market instruments, sovereign bonds, bank bonds, corporate bonds, and other instruments. In panel b), a pro-rata liquidation strategy is used.



Our paper develops a liquidity stress test methodology for fixed-income mutual funds, adapted to Chile's institutional setup.

- Our main result is that fund-level resilience is maintained under our stress test; all funds show sufficient liquid assets to meet stressed redemption requests.
- However, industry-level analysis shows that, depending on the liquidation strategy used by managers, local markets could experience selling pressure:
  - Under a waterfall strategy, sovereign-bond sales reach 50% of average daily transactions.
  - Under pro-rata sales, the ratios rise to 32.9% for bank bonds and 94.9% for corporate bonds.
- Our results highlight the importance of adequate liquidity management practices in the mutual fund industry.

Annex

Sample selection criteria

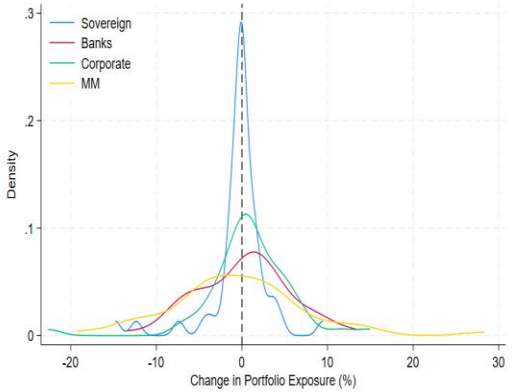
- We consider type 3 mutual funds (fixed-income funds), including both currently active and discontinued funds.
- We require a minimum operating history of five years, with each fund's first three years excluded from the analysis.
- We consider funds whose functional currency remained the Chilean peso throughout the sample period.
- A small number of funds were excluded because of unusual flow patterns.
- After applying these filters, the final sample comprises 72 mutual funds, including both active and discontinued funds.
- Of the 72 funds in the sample, 40 were operating as of June 2024 and 38 remained active as of August 2026.

Net flows statistics

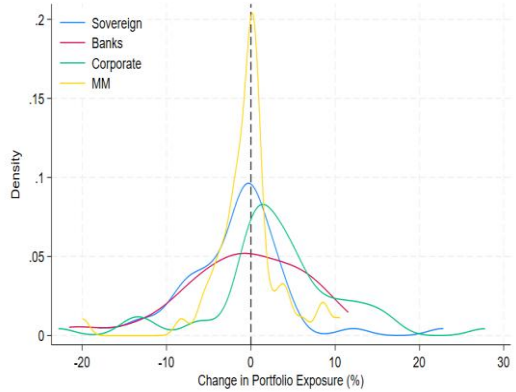
Statistic	Net Flows (% AUM)
Max	12.2
P99	7.9
P95	4.5
P75	1.9
Average	0.1
Median	0.5
P25	-1.4
P5	-5.2
P1	-10.4
Min	-23.7
SD	3.2
N	5,511

Our analysis demonstrates that mutual-fund liquidation strategies are neither uniform nor static. Managers dynamically balance waterfall and pro-rata approaches in response to asset class characteristics, market stress, volatility, and fund-specific constraints.

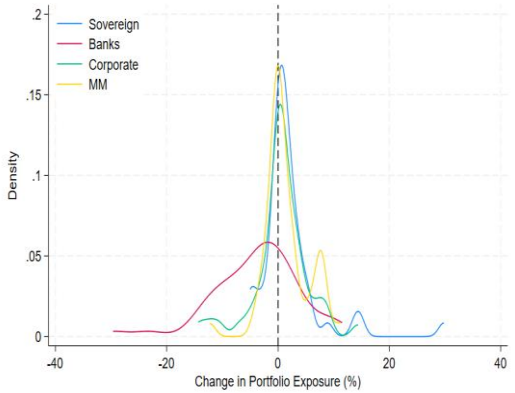
2005 Redemption episode



2019 Redemption episode



2020 Redemption episode



Regression Results for Liquidation Strategies (1)

Variables	(1) Most Liquid	(2) Banks Bond	(3) Sovereign Bond	(4) Corporate Bond
	November 2005			
*Stress Period * Outflow*	5.38	-1.89	-5.54***	-1.39
N	11,0270	10,952	10,637	11,160
R^2 (%)	15.3	16.0	8.7	24.0
	November 2019			
*Stress Period * Outflow*	-5.98***	5.65***	-7.21***	9.23***
N	11,027	10,952	10,637	11,160
R^2 (%)	16.7	17.3	8.8	29.1
	March 2020			
*Stress Period * Outflow*	-0.98	8.87*	5.23	-14.15***
N	11,027	10,952	10,637	11,160
R^2 (%)	15.3	16.1	8.7	24.2
Fund-Time FE	Yes	Yes	Yes	Yes

*, **, *** denote significance at the 10, 5 and 1% levels, respectively.

(1) Results correspond to the regression $\Delta Holding_{i,t} = \alpha_i + \alpha_1 Inflow_{i,t} \times Stress\ Period_{i,t} + \alpha_2 Outflow_{i,t} \times Stress\ Period_{i,t} + \gamma' X_{i,t-1} + e_{i,t}$. *, **, *** denote significance at the 10, 5 and 1% levels, respectively.

Asset liquidation strategies: empirical evidence

- Corporate bond mutual funds tend to follow a waterfall strategy during periods of low volatility, shifting toward pro rata liquidation as uncertainty increases (Jiang et al., 2021).
- Asset liquidation through a waterfall strategy may reduce portfolio liquidity for remaining investors, creating first-mover incentives to redeem (Zeng, 2017; Szabo, 2022).
- Equity mutual funds also tend to use a waterfall strategy to meet redemptions, although liquidation patterns vary depending on market volatility and fund liquidity (Popescu and Xu, 2023).
- More broadly, fund managers' liquidation strategies may have implications for financial-market liquidity and volatility (Ben-Rephael, 2017; Dick-Nielsen et al., 2012).

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