

# The solvency and funding cost nexus – the role of market stigma for buffer usability

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THE MACROPRUDENTIAL/ MONETARY  
POLICY NEXUS AND BANK BEHAVIOUR

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# AGENDA

01 MOTIVATION

02 DATA

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## MOTIVATION

- During the onset of the COVID-19 crisis, concerns with higher funding costs can be one of the reasons why banks did not dip into their buffers despite a large release of regulatory capital buffers.
- Understanding the relationship between banks' solvency and funding costs is crucial for prudential policy and implications to the maintenance of an adequate flow of credit in moments of stress.
- Increasing capital requirements might imply a change in funding composition towards more expensive sources of funding.
- Higher solvency levels lower the risk premiums being demanded.
- The analysis studies the empirical relationship between solvency and funding costs, controlling for bank-specific idiosyncrasies and common factors.



## OUR CONTRIBUTION

- The goal is to empirically test for Portuguese banks some findings from the literature:
  - i. The relationship between solvency and funding costs is negative, and statistically significant, but of a small magnitude. (Aldasoro et al. 2022; Arnould et al. 2021; Aymanns et al. 2016)
  - ii. State-dependency: the economic and financial cycle position affect the relationship causing it to be different in normal times versus crisis times. (Elyasiani and Keegan, 2017)
  - iii. Different funding sources have different sensitivities to changes in the solvency level. (BoE Arnould et al. 2020, IMF WP Aymanns et al 2016)
  - iv. Non-linearity: the relationship depends on the level of solvency. (Aymanns et al. (2016), Schmitz et al. (2017) and Arnould et al. (2021))



## OUR CONTRIBUTION

- Our contribution to the literature is:
  - Data: high-quality supervisory data, detailed variables for funding costs.
  - Methodology: use of breakpoint analysis, use of a new instrumental variable.
  - Results: confirms the four results of the literature.



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## DATA

- Quarterly time series data for 21 Portuguese banking groups from Q12006 to Q42020.
- Macroeconomic and financial variables from public data sources.
- Composite measure that captures overall funding costs calculated as the average price the bank pays for each liability class:
  - Deposit Funding Cost for deposits from HH, NFC, GOV, and OFC;
  - Central Bank Funding Cost, Interbank Funding Cost, and Debt Funding.

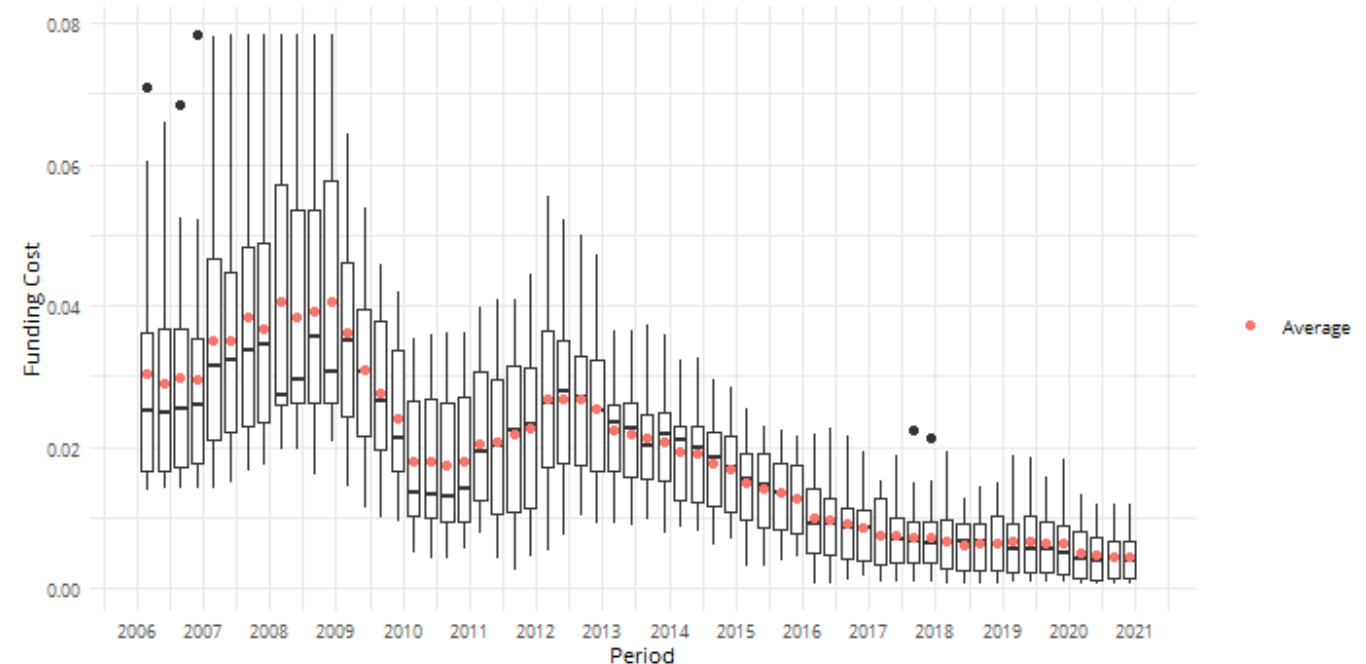




## FUNDING COSTS

- Decreased from an average funding cost of 3% 1Q2006 to 0.5% 4Q2020.
- 4 stages:
  - From 2006 to 2008-09, funding costs were rising and significant heterogeneity;
  - From 2009-10 marked decrease;
  - Sovereign debt crisis (2010-12) increase;
  - From 2012 onwards, a continuous decrease.

## EVOLUTION OF FUNDING COSTS



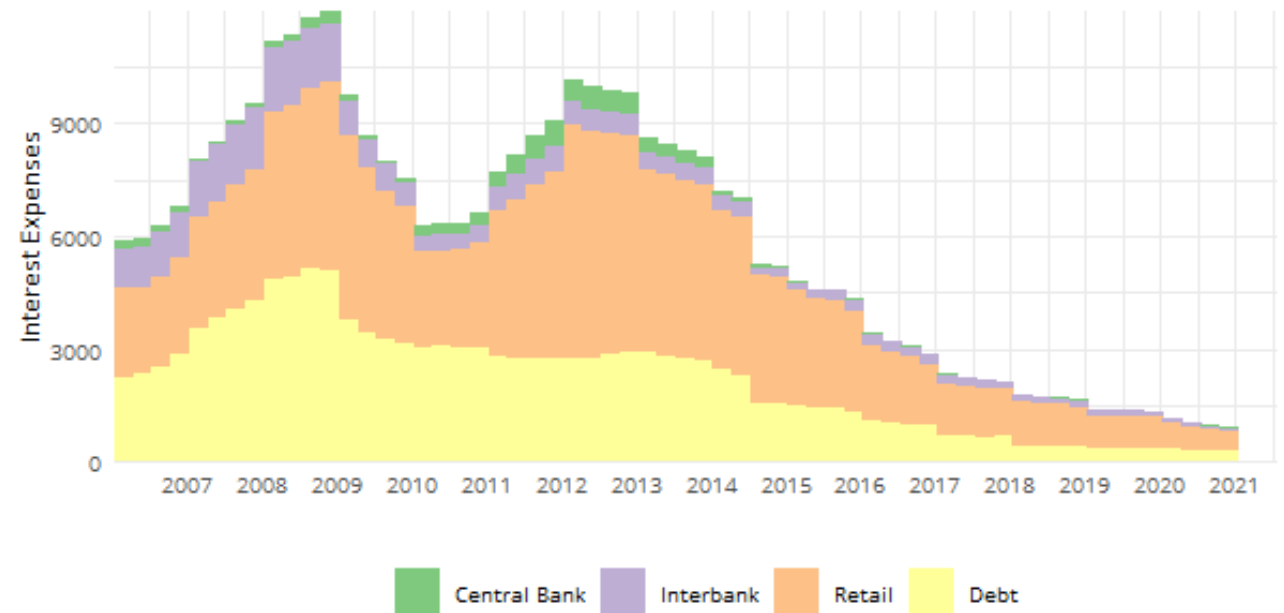
Funding Cost is computed as annualized interest and other similar charges divided by total interest bearing liabilities. The graph shows a boxplot for the distribution of Funding cost for the banks in the sample in each quarter. The lower and upper hinges correspond to the 25th and 75th percentiles, the lower/upper whisker extends 1.5 \* inter-quartile range from the hinge. Data beyond the whisker are plotted individually



## DECOMPOSITION OF FUNDING COSTS

- Banks have several sources of funding (deposits, interbank, central banks or debt) with prices that react differently to changes in fundamentals.
- The financial crisis changed the funding model of Portuguese banks:
  - Crisis period: increase in interbank and central funding;
  - Decrease in debt;
  - Higher share of deposit funding.

## EVOLUTION OF THE COMPOSITION OF FUNDING COSTS



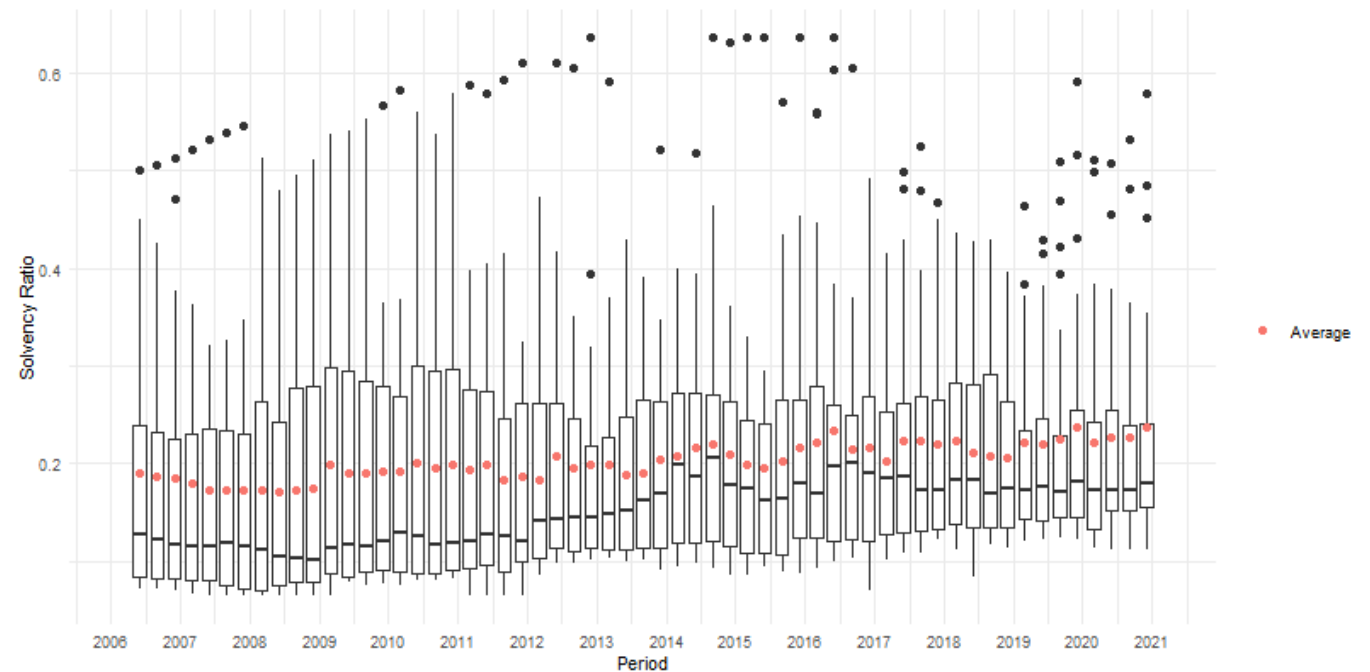
Composition of funding liabilities (in M€). The non-equity funding sources considered were Deposits from households, non-financial corporations, government, other financial corporations, deposits from Central Banks, Interbank deposits from credit institutions, Debt securities



## SOLVENCY RATIO

- Over the sample period, the Solvency Ratio increased from 19% (median 13%) in 1Q2006 to 24% (median 18%) 4Q2020.

### EVOLUTION OF THE SOLVENCY RATIO



Solvency Ratio is computed as Tier 1 Capital divided by total risk-weighted assets. The graph shows a boxplot for the distribution of Solvency Ratio for the banks in the sample in each quarter. The lower and upper hinges correspond to the 25th and 75th percentiles, the lower/upper whisker extends 1.5 \* inter-quartile range from the hinge. Data beyond the whisker are plotted individually.



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THE RELATIONSHIP BETWEEN SOLVENCY AND FUNDING COSTS IS NEGATIVE, STATISTICALLY SIGNIFICANT, BUT OF A SMALL MAGNITUDE

(1)

$$FC_{it} = \beta_0 + \beta_1 solv_{it} + \beta X_{it} + \gamma Y_t + \varepsilon_{it}$$

(2)

$$FC_{it} = \beta_0 + \beta_1 solv_{it} + \beta X_{it} + b_i + f_t + \varepsilon_{it}$$

(3)

$$solv_{it} = \beta_0 + \beta_1 RW_{it} + \beta X_{it} + b_i + f_t + \varepsilon_{it}$$

$$FC_{it} = \beta_0 + \beta_1 \widehat{solv}_{it} + \beta X_{it} + b_i + f_t + \varepsilon_{it}$$



## THE RELATIONSHIP BETWEEN SOLVENCY AND FUNDING COSTS IS NEGATIVE, STATISTICALLY SIGNIFICANT, BUT OF A SMALL MAGNITUDE

	(1)	(2)	(3)
Solvency ratio	<b>-0.016*</b> (0.002)	<b>-0.004</b> (0.004)	<b>-0.099*</b> (0.017)
Bank-specific controls (size, asset quality, liquidity, profitability)	Yes	Yes	Yes
Additional controls (EONIA, Dow Jones, V2TX)	Yes	No	No
Bank fixed effects	No	Yes	Yes
Time fixed effects	No	Yes	Yes
Num. Obs.	1138	1138	1138
R2	0.654	0.786	0.692
R2 Adj.	0.651	0.770	0.667

\*  $p < 0.1$  | Standard errors in brackets (in all tables)



## STATE-DEPENDENCY, THE ECONOMIC AND FINANCIAL CYCLE POSITION AFFECTS THE RELATION CAUSING IT TO BE DIFFERENT IN NORMAL TIMES VERSUS CRISIS TIMES

	(1)	(2)	(3)
Solvency Ratio	-0.008** (0.003)	0.004 (0.004)	-0.039* (0.020)
Crisis	0.004** (0.001)		
Solvency × Crisis	<b>-0.024***</b> (0.005)	<b>-0.022***</b> (0.004)	<b>-0.151***</b> (0.045)
Bank-specific controls (size, asset quality, liquidity, profitability)	Yes	Yes	Yes
Additional controls (EONIA, Dow Jones, V2TX)	Yes	No	No
Bank fixed effects	No	Yes	Yes
Time fixed effects	No	Yes	Yes
Num. Obs.	1138	1138	1138
R2	0.662	0.793	0.505
R2 Adj.	0.659	0.777	0.465

Where:

- $crisis_t = \{1 \text{ from Q4/07 to Q2/09 and from Q3/10 to Q2/13 ; } 0 \text{ otherwise}\}$

Crisis definition following Rua (2017)

+ p < 0.1, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001 | Standard errors in brackets (in all tables)



## DIFFERENT FUNDING SOURCES HAVE DIFFERENT SENSITIVITIES TO CHANGES IN THE SOLVENCY LEVEL

	Deposits			Central Bank			Interbank			Debt		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
Solvency Ratio	-0.017*** (0.002)	-0.001 (0.002)	0.022* (0.011)	-0.003 (0.012)	0.031 (0.019)	0.208 (0.168)	-0.019** (0.007)	-0.029* (0.014)	-0.159** (0.058)	-0.078*** (0.014)	-0.010 (0.014)	0.047 (0.088)
Crisis	0.002+ (0.001)			0.000 (0.003)			0.010** (0.003)			0.002 (0.003)		
Solvency Ratio × Crisis	-0.007* (0.003)	-0.009*** (0.002)	-0.100*** (0.026)	-0.023 (0.015)	-0.056*** (0.017)	-0.365* (0.149)	-0.033*** (0.008)	-0.025*** (0.009)	-0.121 (0.075)	-0.006 (0.020)	-0.020 (0.014)	-0.143* (0.060)
Bank-specific controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls	Yes	No	No	Yes	No	No	Yes	No	No	Yes	No	No
Bank fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Time fixed effects	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Num.Obs.	1141	1141	1141	694	694	694	1098	1098	1098	685	685	685
R2	0.642	0.871	0.635	0.276	0.446	0.257	0.172	0.335	0.194	0.205	0.550	0.509
R2 Adj.	0.639	0.861	0.606	0.266	0.376	0.162	0.164	0.281	0.127	0.1943	0.492	0.449

+ p < 0.1, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001 | Standard errors in brackets (in all tables)





## NON-LINEARITY DEPENDING ON THE LEVEL OF SOLVENCY

	(1)	(2)
Solvency ratio below Breakpoint	<b>-0.220***</b> (0.028)	<b>-0.160***</b> (0.018)
Solvency ratio above Breakpoint	<b>-0.009*</b> (0.003)	<b>0.008+</b> (0.004)
Breakpoint Estimation	0.125 (0.005)	0.157 (0.006)
Bank-specific controls (size, asset quality, liquidity, profitability)	Yes	Yes
Additional controls (EONIA, Dow Jones, V2TX)	Yes	No
Bank fixed effects	No	Yes
Time fixed effects	No	Yes
Num. Obs.	1138	1138
R2	0.6784	0.8062
R2 Adj.	0.6756	0.7906
** Davies Test for a change in the slope	0	0



## NON-LINEARITY DEPENDING ON THE LEVEL OF SOLVENCY

	Solvency ratio below Breakpoint	Solvency ratio above Breakpoint
Solvency ratio	-0.585+ (0.351)	<b>-0.054***</b> (0.011)
Breakpoint Estimation	0.11	0.11
Bank-specific controls (size, asset quality, liquidity, profitability)	Yes	Yes
Additional controls (EONIA, Dow Jones, V2TX)	No	No
Bank fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
Num. Obs.	259	879
R2	0,824	0,710
R2 Adj.	0,768	0,680

+ p < 0.1, \* p < 0.05, \*\* p < 0.01, \*\*\* p < 0.001 | Standard errors in brackets (in all tables)



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# CONCLUSION

## Research Question

- Is the relationship between solvency and funding costs empirically significant?

## Results

- We have confirmed the four results of the literature for the case of Portuguese banks and conclude:
  - The relationship between solvency and funding costs is negative, and statistically significant, but of a small magnitude.
  - State dependency: the economic and financial cycle position affects the relationship causing it to be different in normal times versus crisis times.
  - Different funding sources have different sensitivities to changes in the solvency level.
  - Non-linearity depends on the level of solvency.



# ANNEX



## SUMMARY STATISTICS

<b>Variable</b>	<b>Num. Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Pctl. 25</b>	<b>Pctl. 75</b>
Funding Cost	1155	0,018	0,015	0,008	0,025
Deposits Funding Cost	1159	0,014	0,01	0,005	0,021
Central Bank Funding Cost	699	0,011	0,021	0,001	0,011
Interbank Funding Cost	1114	0,016	0,022	0,001	0,021
Debt Funding Cost	697	0,03	0,019	0,016	0,043
Solvency Ratio	1147	0,203	0,123	0,112	0,269
Provisions to Assets	1164	0,003	0,005	0	0,005
Loan Loss Reserves Ratio	1162	0,057	0,05	0,025	0,077
Average Risk Weight (RW)	1147	0,581	0,161	0,473	0,663
Liquidity Ratio	1164	0,038	0,043	0,014	0,043
Return on Equity (ROE)	1164	0,024	0,079	0,006	0,058
Total assets (€10 <sup>9</sup> )	1164	19,001	30,459	0,264	31,055
Size	1164	7,56	2,526	5,575	10,343
EONIA	1185	0,006	0,014	-0,004	0,008
Dow Jones Euro Stoxx 50 Price Index	1185	3,255	0,582	2,718	3,733
V2TX	1185	0,228	0,08	0,168	0,263
Deposits Annualized Agreed Rate	1168	0,017	0,014	0,004	0,027