

The risk-taking channel of monetary policy - exploring all avenues

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- Risk-taking channel: when policy rates are low for a prolonged period of time, financial institutions adopt risk-taking strategies.
 - search for yield
 - risk shifting

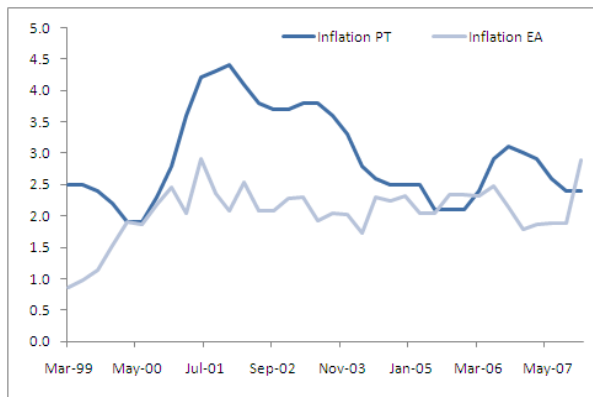
- Empirically, when interest rates are low there is more risk taking:
 - banks increase lending to riskier borrowers (Spain: Jiménez, Ongena, Peydró and Saurina, 2014; Bolivia: Ioannidou, Ongena and Peydró, 2015)
 - banks offer relatively lower spreads when lending to riskier borrowers (US: Paligorova and Santos, 2017)
 - banks soften lending standards (US and EA: Maddaloni and Peydró, 2011)
 - banks increase their portfolio risk (cross-country: Altunbas, Gambacorta and Marques-Ibanez, 2010; euro area: Delis and Kouretas, 2011)
 - smaller, non-traditional banks have a more aggressive behavior (Spain: Jiménez, Ongena, Peydró and Saurina, 2014)

- This literature has been growing quickly, leading to scattered evidence.
- We examine this channel through different angles, to gain a more encompassing understanding about how it works.

- 1 The risk-taking channel ex-ante:
 - 1 The intensive margin: Do riskier firms get more credit when policy rates are lower? → *Panel regression on firm loan growth*
 - 2 The extensive margin: Are riskier firms more likely than others to obtain a loan when interest rates decrease? → *Discrete choice models*
- 2 The risk-taking channel ex-post:
 - 1 Does the level of the policy rate when loans are granted influence the (ex-post) probability of default? → *Survival analysis*
 - 2 Are loans granted when policy rates are lower more likely to default when rates increase? → *Differences-in-differences*

Identification

- Monetary policy set by the ECB Governing Council since 1999 → monetary policy setting not dependent on Portuguese economic conditions.



Central Credit Register (CRC) has data on bank loans (type of loan, amount and debtor). We select:

- debtors: non-financial corporations
- period: 1999-2007

Supervisory balance sheet for data on banks balance sheet items:

- we select only banks with a market share of at least 0.1% in the corporate loan market

Firms' balance sheet data:

- Annual balance sheet data of non-financial corporations
- Survey data → data is provided voluntarily (until 2005)

① The risk-taking channel ex-ante:

- ① **The intensive margin: Do riskier firms get more credit when policy rates are lower? → Panel regression on firm loan growth**
- ② The extensive margin: Are riskier firms more likely than others to obtain a loan when interest rates decrease? → Discrete choice models

② The risk-taking channel ex-post:

- ① Does the level of the policy rate when loans are granted influence the (ex-post) probability of default? → Survival analysis
- ② Are loans granted when policy rates are lower more likely to default when rates increase? → Differences-in-differences

Do riskier firms get more credit when policy rates are lower?

$$\text{loan_growth}_{ijt} = c_{ij} + \alpha i_{t-1}^{ECB} \times \text{bad_hist}_{it-1} + \beta i_{t-1}^{ECB} + \gamma \text{bad_hist}_{it-1} + \delta' X_{ijt-1} + \varepsilon_{ijt}$$

Indices: i firm, j bank, t quarter.

X_{ijt} includes bank and loan characteristics and macro variables.

Do riskier firms get more credit when policy rates are lower?

$i^*bad\ hist_{it-1}$	-0.018 **	-0.018	0.001
$i\ ECB\ eq_{t-1}$	0.016	0.016	-0.006
$bad\ hist_{it-1}$	0.112 ***	0.112 ***	-0.026
bank and loan variables	yes	yes	yes
firm and macro variables	yes	yes	yes
unused credit lines	no	no	yes
fixed effects	relationship	relationship	relationship
cluster s.e.	quarter	quarter & bank	quarter & bank
N° obs.	6,427,685	6,427,685	6,927,838

Do riskier firms get more credit when policy rates are lower?

- No evidence in favor of the risk-taking channel at the intensive margin: when interest rates are lower, credit does not increase more for riskier firms (also when using Taylor residuals).
- No role for bank characteristics (triple interactions for liquidity, capital and size).
- No differences between small and large firms or small and large banks.

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Are riskier firms more likely than others to obtain a loan when interest rates decrease?

Probit model: Whenever there is a new loan granted, what is the probability that the borrower is considered to be risky?

$$\Pr(risky_{it} = 1 | new_loan_{ijt} = 1) = \Phi(\alpha i_{t-1}^{ECB} + \delta' X_{ijt-1} + \varepsilon_{ijt})$$

$\Phi(\cdot)$ is the normal cdf.

Are riskier firms more likely than others to obtain a loan when interest rates decrease?

i ECB eoq_{t-1}	-0.043 **	-0.043 **	-0.048 ***
bank and loan variables	yes	yes	yes
firm and macro variables	yes	yes	yes
unused credit lines	no	no	yes
cluster s.e.	quarter	quarter & bank	quarter & bank
N° obs.	2,655,604	2,655,604	2,479,691

Lower policy rates prior to loan concession increase the probability of banks granting a loan to a riskier borrower.

Are riskier firms more likely than others to obtain a loan when interest rates decrease?

i ECB eq $_{t-1}$	0.028	-0.152 ***	-0.157
i *liquidity $_{t-1}$	-0.004 *		
i *capital $_{t-1}$		0.024 ***	
i *assets $_{t-1}$			0.005
bank and loan variables	yes	yes	yes
firm and macro variables	yes	yes	yes
unused credit lines	yes	yes	yes
cluster s.e.	quarter & bank	quarter & bank	quarter & bank
N° obs.	2,479,691	2,479,691	2,479,691

Risk-taking behaviors are more relevant for banks with more liquidity and less capital.

Are riskier firms more likely than others to obtain a loan when interest rates decrease?

	Small firms	Large firms	Small banks	Large banks
$i \text{ ECB}_{t-1}$	-0.025	-0.094 ***	-0.062 ***	-0.091 ***
bank and loan variab.	yes	yes	yes	yes
firm and macro variab.	yes	yes	yes	yes
unused credit lines	yes	yes	yes	yes
cluster s.e.	quart. & bank	quart. & bank	quart. & bank	quart. & bank
N° obs.	835,022	387,385	845,868	1,633,823

Risk-taking behaviors at the extensive margin occur only for large firms (which are arguably less risky than smaller firms).

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Does the level of the policy rate when loans are granted influence the (ex-post) probability of default?

- Dependent variable: hazard rate
- Hazard function: instantaneous probability of a firm defaulting on the bank conditional on having no default up to time t
- Consider Weibull hazard function

$$h_{ij}(t) = p \exp\left(\alpha i_{\tau-1}^{ECB} + \gamma bad_hist_{i\tau-1} + \delta' X_{ij\tau-1}\right) t^{p-1}$$

- For $p > 1$ ($p < 1$), the hazard function is monotonically increasing (decreasing).
- Consider time invariant covariates (except macro controls)
 - at the time the loan is granted, banks do not know what will happen to the firm.

Does the level of the policy rate when loans are granted influence the (ex-post) probability of default?

i ECB eq $_{t-1}$	0.019		0.021		0.023	
bad_hist $_{t-1}$	2.350	***	1.770	***	2.013	***
i*bad_hist $_{t-1}$					-0.061	
bank and loan variables	yes		yes		yes	
sectoral variables	no		yes		no	
macro variables	yes		yes		yes	
cluster s.e.	quarter		quarter		quarter	
N° obs.	1,384,696		1,053,493		1,384,696	

The policy rate level at the moment the loan is granted is not a relevant determinant of the probability of default in the future.

Does the level of the policy rate when loans are granted influence the (ex-post) probability of default?

	Small firms	Large firms	Small banks	Large banks
$i ECB_{t-1}$	0.012	0.070	0.106 *	-0.115 ***
bank and loan variab.	yes	yes	yes	yes
firm and macro variab.	yes	yes	yes	yes
cluster s.e.	quarter	quarter	quarter	quarter
N° obs.	489,228	206,849	397,071	987,625

Ex-post, there are no different risk-taking strategies for small and large firms.

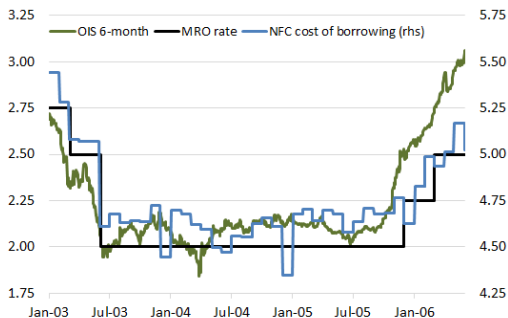
Loans granted by larger banks when rates are low are more likely to default later.

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Are loans granted when policy rates are lower more likely to default when rates increase?

- Interest rates were very low and stable for a long period: June 2003 – December 2005.
- Around October 2005, the ECB's communication changed, signaling a possible increase in interest rates.
- This led to a sharp revision of interest rate expectations.
- Monetary policy rates indeed increased in December 2005.



Are loans granted when policy rates are lower more likely to default when rates increase?

$$\Pr(\text{bad_hist}_{it} = 1) = \Phi(\alpha \text{Treatment}_{ijt} \times \text{After}_t + \gamma \text{Treatment}_{ijt} + \beta \text{After}_t + \delta' X_{ijt-1} + \varepsilon_{ijt})$$

- $\text{Treatment}_{i,t} = 1$ for new loans granted immediately before interest rates started to increase, when rate expectations were still anchored at low levels (January to September 2005).
- $\text{Treatment}_{i,t} = 0$ for new loans granted immediately before interest rates started to increase, **but when rate expectations had already increased markedly** (October 2005 to March 2006).
- The effective interest rate was similar for the two groups, but **expectations** were very different.

Do banks' expectations affect risk-taking?

- $\text{After}_t = 1$ for the period after interest rates start to increase.

Are loans granted when policy rates are lower more likely to default when rates increase?

treatment $_{i,t}$	-0.273	***	-0.273	***	-0.273	***
after $_t$	-0.164	***	-0.164		-0.164	
interaction $_{i,t}$	0.242	***	0.242	***	0.242	***
bank and firm variables	yes		yes		yes	
macro variables	yes		yes		yes	
clustered s.e.	quarter		quarter & bank		quarter, bank & firm	
Observations	1,640,137		1,640,137		1,640,137	

Loans granted in the period of low and stable interest rates are more likely to default when interest rates increase, compared to loans granted when policy rate rises were already expected.

Are loans granted when policy rates are lower more likely to default when rates increase?

interaction $_{i,t}$	0.199 ***	0.253 ***	-0.062
interaction $_{i,t}$ *liquidity $_{t-1}$	0.003 ***		
interaction $_{i,t}$ *capital $_{t-1}$		-0.002	
interaction $_{i,t}$ *assets $_{t-1}$			0.013 *
bank and firm variables	yes	yes	yes
macro variables	yes	yes	yes
clustered s.e.	quarter	quarter	quarter
Observations	1,640,137	1,640,137	1,640,137

There is more risk-taking for larger banks and, especially, for banks with larger liquidity ratios (risk-shifting due to poor managerial incentives, Acharya and Naqvi, 2012).

Are loans granted when policy rates are lower more likely to default when rates increase?

	Small firms	Large firms	Small banks	Large banks
interaction i,t	0.337 ***	0.101 *	0.256 ***	0.267 ***
bank and firm variables	yes	yes	yes	
macro variables	yes	yes	yes	
clustered s.e.	quarter	quarter	quarter	
Observations	692,727	189,480	605,002	1,035,135

This type of risk-taking is common for all firm and bank size categories (though somewhat stronger for smaller firms).

Main takeaways

- Evidence in favor of the risk-taking along different dimensions:
 - When policy rates are lower, Portuguese banks increase lending to ex-ante riskier borrowers (but only at the **extensive margin**).
 - When we track loans granted in these periods **over time**, risk-taking does not seem to affect the overall quality of the loan book.
 - However, when we zoom in on a period that allows to nail down the role of expectations, we see that loans granted when rates are expected to remain low are more likely to default than when rates are expected to increase soon, **once rates start to increase**.
- There is a role for bank and firm heterogeneity.
 - More risk-taking from **larger and less capitalized banks**, who are less likely to internalize the potential consequences of the risks taken (Jiménez et al, 2014, Diamond and Rajan, 2012).

- Interactions between **monetary policy** and **financial stability** should be especially taken into account when rates are too low for too long. Macroprudential policy might have a role in avoiding the building up of certain risks in these periods, most notably for less capitalized banks.
- This may be especially important after a decade of massive central bank intervention. This prolonged **environment** of abundant and cheap liquidity may have offered incentives for risk-taking strategies, which might become apparent only when rates increase.

THANK YOU!