# Targeted monetary policy and risk

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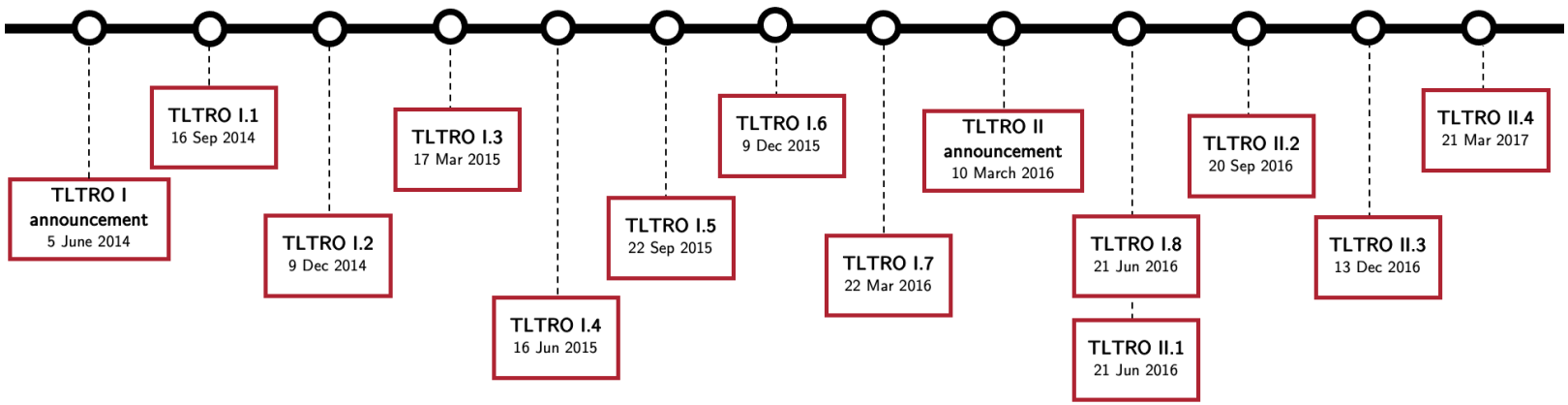
# Motivation

- Standard MP can be too blunt. Targeted tools, as the TLTRO, aim to steer credit to the real economy.
- By offering incentives to lend in an environment of low interest rates and ample liquidity, targeted monetary policy may create its own risk-taking channel.
- We use loan-level data and an IV identification to study the effects of targeted monetary policy on bank credit supply (in Portugal).
- We examine the effects on the recomposition of banks' loan portfolios.

# TLTRO

*"The TLTROs are designed to enhance the functioning of the monetary policy transmission mechanism by supporting bank lending to the real economy."*

Mario Draghi. Frankfurt am Main. 3 July 2014.



# Research questions

I. Were these operations effective in stimulating bank lending and reducing the cost of credit in Portugal?

II. Were the effects of TLTRO I different from TLTRO II?

III. Were the effects heterogeneous for different types of firms?

IV. Did the heterogeneous effects across firms lead to disproportionate increases in risk-taking? Is targeted monetary policy creating its own risk-taking channel?

# Main findings

- TLTRO have accomplished their main goal. Both TLTRO I and TLTRO II contributed to the pass-through of targeted monetary policy to loan rates and loan amounts.
- The results show that both TLTRO had heterogeneous effects across firms. Although riskier firms were able to borrow at lower rates, loan amounts increased more for safer firms.

# Relevant literature

- **Participating banks expanded credit and lowered loan rates.** (Micro) evidence shows higher lending and cheaper credit at treated banks. (Andreeva and Garcia-Posada, 2020; Balfoussia and Gibson, 2016; Afonso and Sousa-Leite, 2020; Benetton and Fantino, 2021; Laine, 2021; Da Silva et al., 2021)
- **Competition channel.** TLTRO compressed banks' funding costs, intensifying competition on the lending side and indirectly easing conditions for non-bidders, by adjusting pricing and credit standards. (Andreeva and Garcia-Posada, 2020; Barbiero et al., 2021)
- **Portfolio rebalancing vs. vLTRO.** The targeted design of the TLTRO reduced the incentives for sovereign bond rebalancing that had been seen in the earlier 3-year LTROs. (Crosignani et al., 2020)

# Contribution to the literature

- **Bank-firm lending relashionships.** Firm–time F.E. in a multiple-lender setting. We use the *borrowing allowance*, set before policy announcement, as an instrument for TLTRO take-up.
- **Distinction between TLTRO I and II.** We distinguish the effects of each TLTRO programme, given their different incentive structures.
- **New evidence on risk-taking.** We show that TLTRO had heterogeneous effects across firms with different risk profiles.

# Data

**CRC** Loan amounts (stock) at loan-level

**NL** Loan amounts, loan rates and maturity (new credit operations) at loan-level

**BSI** Assets and liabilities at bank-level

**IES** Assets and liabilities at firm-level

**SIAC** Rating level at firm-level

**BdP** TLTRO outstanding amounts and borrowing allowances at bank-level

# Empirical model

- Difference-in-differences model and an IV identification
- Period: 2013Q1-2018Q2
  - TLTRO I: 2014Q3 - 2016Q1
  - TLTRO II: 2016Q2 - 2018Q2
- Two groups of firms:
  - Treatment group: firms that borrow from a bidder bank
  - Control group: other firms
- Bank and firm-time fixed effects
- All standard errors are double clustered by firm and bank-quarter

# OLS estimation

- OLS regression:

$$L_{b,f,t} = \beta_1 TLTROI_{b,t} + \beta_2 TLTROII_{b,t} + \theta X_{b,t} + \delta Y_{b,f,t} + \lambda_{f,t} + \lambda_b + \epsilon_{b,f,t}$$

$L_{b,f,t}$ Loan rate or quarterly loan growth of credit from bank $b$ to firm $f$ in period $t$

$TLTRO_{b,t}$ Treatment variable: binary or continuous

$X_{b,t}$ Time-varying bank controls

$Y_{b,f,t}$ Loan controls (when $L$ is loan rate)

$\lambda_{f,t}$ Firm-time fixed effects

$\lambda_b$ Bank fixed effects

# IV identification

- IV specification (Benetton and Fantino, 2021):

$$L_{b,f,t} = \beta_1 \widehat{TLTROI}_{b,t} + \beta_2 \widehat{TLTROII}_{b,t} + \theta X_{b,t} + \delta Y_{b,f,t} + \lambda_{f,t} + \lambda_b + \epsilon_{b,f,t}$$

  - ▷ First stage:

$$TLTRO_{i,b,t} = \phi Allowance_{i,b} Post_{i,t} + \theta X_{b,t} + \delta Y_{b,f,t} + \lambda_{f,t} + \lambda_b + \epsilon_{b,y,f}$$

$Allowance_{i,b}$ Log of borrowing allowance for bank $b$ in $TLTRO_i$

$Post_{i,t}$ Dummy equal to 1 if $t$ corresponds to the $TLTRO_i$ period

# Loan growth

Table 2: TLTRO: loan growth OLS regressions

| | Binary | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| TLTRO I | 0.092*** | 0.100*** | 0.120*** |
| | (0.018) | (0.018) | (0.017) |
| TLTRO II | 0.097*** | 0.106*** | 0.120*** |
| | (0.021) | (0.020) | (0.019) |
| Bank controls | Yes | Yes | Yes |
| Firm F.E. | Yes | Yes | No |
| Time F.E. | Yes | Yes | No |
| Bank F.E. | Yes | Yes | Yes |
| Firm-time F.E. | No | No | Yes |
| ISLT F.E. | No | Yes | No |
| Sample | Full | Full | Multiple lenders |
| Observations | 8,675,196 | 7,677,276 | 5,159,403 |
| F test model | 31.01 | 37.90 | 38.05 |
| P-value | 0 | 0 | 0 |

Table 3: TLTRO: loan growth IV regressions

| | Binary | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| TLTRO I | 0.107*** | 0.119*** | 0.156*** |
| | (0.026) | (0.024) | (0.019) |
| TLTRO II | 0.152*** | 0.167*** | 0.219*** |
| | (0.033) | (0.031) | (0.026) |
| Bank controls | Yes | Yes | Yes |
| Firm F.E. | Yes | Yes | No |
| Time F.E. | Yes | Yes | No |
| Bank F.E. | Yes | Yes | Yes |
| Firm-time F.E. | No | No | Yes |
| ISLT F.E. | No | Yes | No |
| Sample | Full | Full | Multiple lenders |
| Observations | 8,675,196 | 7,677,276 | 5,159,403 |
| F test model | 31.48 | 38.81 | 42.32 |
| P-value | 0 | 0 | 0 |

# Heterogeneous effects: firms' risk

Table 4: TLTRO heterogeneous effects: firms' risk

| | High | Low |
|---|---|---|
| | (1) | (2) |
| TLTRO I | 0.163*** | 0.268*** |
| | (0.020) | (0.031) |
| TLTRO II | 0.197*** | 0.439*** |
| | (0.026) | (0.044) |
| Bank-time controls | Yes | Yes |
| Loan controls | No | No |
| Bank F.E. | Yes | Yes |
| Firm-time F.E. | Yes | Yes |
| Observations | 2,112,725 | 2,087,520 |
| F test model | 30.58 | 35.58 |
| P-value | 0 | 0 |

# Heterogeneous effects: firms' characteristics

Table 5: TLTRO heterogeneous effects: firms' characteristics

| | Size | | Profitability | | Liquidity | | Zombie Firm | |
|---|---|---|---|---|---|---|---|---|
| | Large | Small | High | Low | High | Low | Yes | No |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| TLTRO I | 0.236*** | 0.170*** | 0.261*** | 0.176*** | 0.229*** | 0.208*** | 0.113*** | 0.242*** |
| | (0.027) | (0.023) | (0.030) | (0.021) | (0.028) | (0.023) | (0.021) | (0.027) |
| TLTRO II | 0.306*** | 0.326*** | 0.433*** | 0.199*** | 0.393*** | 0.272*** | 0.161*** | 0.363*** |
| | (0.035) | (0.033) | (0.043) | (0.027) | (0.040) | (0.031) | (0.029) | (0.037) |
| Bank-time controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Loan controls | No | No | No | No | No | No | No | No |
| Bank F.E. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-time F.E. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 2,614,893 | 1,407,762 | 2,167,458 | 1,855,199 | 1,742,631 | 2,280,026 | 459,868 | 3,315,743 |
| F test model | 25.33 | 51.42 | 36.98 | 29.05 | 41.60 | 27.16 | 19.97 | 36.59 |
| P-value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Heterogeneous effects: firms' productivity

Table 6: TLTRO heterogeneous effects by market sector: firms' productivity

| | Tradable | | Non-tradable | |
|---|---|---|---|---|
| | High | Low | High | Low |
| | (1) | (2) | (3) | (4) |
| TLTRO I | 0.319*** | 0.179*** | 0.241*** | 0.120*** |
| | (0.035) | (0.025) | (0.030) | (0.021) |
| TLTRO II | 0.443*** | 0.328*** | 0.351*** | 0.186*** |
| | (0.047) | (0.036) | (0.041) | (0.029) |
| Bank-time controls | Yes | Yes | Yes | Yes |
| Loan controls | Yes | Yes | Yes | Yes |
| Bank F.E. | Yes | Yes | Yes | Yes |
| Firm-time F.E. | Yes | Yes | Yes | Yes |
| Observations | 938,275 | 521,516 | 1,493,917 | 824,719 |
| F test model | 25.22 | 34.80 | 27.78 | 26.14 |
| P-value | 0 | 0 | 0 | 0 |

# Heterogeneous effects: firms' default at t+2

Table 7: TLTRO heterogeneous effects: firms' default at year t+2

| | Default at t+2 | No default at t+2 |
|---|---|---|
| | (1) | (2) |
| TLTRO I | 0.036*** | 0.236*** |
| | (0.011) | (0.026) |
| TLTRO II | -0.004 | 0.351*** |
| | (0.017) | (0.036) |
| Bank-time controls | Yes | Yes |
| Loan controls | No | No |
| Bank F.E. | Yes | Yes |
| Firm-time F.E. | Yes | Yes |
| Observations | 1,551,903 | 3,514,291 |
| F test model | 39.27 | 38.34 |
| P-value | 0 | 0 |

# Loan rates

Table 8: TLTRO: loan interest rate OLS regressions

| | Binary | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| TLTRO I | -0.043** | -0.044*** | -0.046*** |
| | (0.018) | (0.016) | (0.012) |
| TLTRO II | -0.046*** | -0.045*** | -0.044*** |
| | (0.016) | (0.014) | (0.009) |
| Bank controls | Yes | Yes | Yes |
| Firm F.E. | Yes | Yes | No |
| Time F.E. | Yes | Yes | No |
| Bank F.E. | Yes | Yes | Yes |
| Firm-time F.E. | No | No | Yes |
| ISLT F.E. | No | Yes | No |
| Sample | Full | Full | Multi lenders |
| Observations | 1,592,430 | 1,093,806 | 633,328 |
| F test model | 247.3 | 181.7 | 139.2 |
| P-value | 0 | 0 | 0 |

Table 9: TLTRO: loan interest rate IV regressions

| | Binary | | |
|---|---|---|---|
| | (1) | (2) | (3) |
| TLTRO I | -0.097*** | -0.104*** | -0.109*** |
| | (0.028) | (0.024) | (0.018) |
| TLTRO II | -0.070*** | -0.079*** | -0.082*** |
| | (0.022) | (0.018) | (0.013) |
| Bank controls | Yes | Yes | Yes |
| Firm F.E. | Yes | Yes | No |
| Time F.E. | Yes | Yes | No |
| Bank F.E. | Yes | Yes | Yes |
| Firm-time F.E. | No | No | Yes |
| ISLT F.E. | No | Yes | No |
| Sample | Full | Full | Multi lenders |
| Observations | 1,592,430 | 1,093,806 | 633,328 |
| F test model | 292 | 203.9 | 145.9 |
| P-value | 0 | 0 | 0 |

# Heterogeneous effects: firms' risk

Table 10: TLTRO heterogeneous effects: firms' risk

| | High | Low |
|---|---|---|
| | (1) | (2) |
| TLTRO I | -0.163*** | -0.061*** |
| | (0.032) | (0.014) |
| TLTRO II | -0.124*** | -0.052*** |
| | (0.026) | (0.009) |
| Bank-time controls | Yes | Yes |
| Loan controls | No | No |
| Bank F.E. | Yes | Yes |
| Firm-time F.E. | Yes | Yes |
| Observations | 292,773 | 337,720 |
| F test model | 210.1 | 104.5 |
| P-value | 0 | 0 |

# Heterogeneous effects: firms' characteristics

Table 11: TLTRO heterogeneous effects: firms' characteristics

| | Size | | Profitability | | Liquidity | | Zombie Firm | |
|---|---|---|---|---|---|---|---|---|
| | Large | Small | High | Low | High | Low | Yes | No |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| TLTRO I | -0.086*** | -0.365*** | -0.072*** | -0.158*** | -0.078*** | -0.119*** | -0.315*** | -0.097*** |
| | (0.015) | (0.113) | (0.015) | (0.029) | (0.016) | (0.020) | (0.105) | (0.017) |
| TLTRO II | -0.064*** | -0.343*** | -0.055*** | -0.125*** | -0.062*** | -0.088*** | -0.284*** | -0.074*** |
| | (0.010) | (0.112) | (0.010) | (0.024) | (0.011) | (0.015) | (0.102) | (0.012) |
| Bank-time controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Loan controls | No | No | No | No | No | No | No | No |
| Bank F.E. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Firm-time F.E. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 526,193 | 101,438 | 372,591 | 255,038 | 224,782 | 402,847 | 32,116 | 583,301 |
| F test model | 100.6 | 273.1 | 116.3 | 179.9 | 125.4 | 138 | 195.9 | 131.8 |
| P-value | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Heterogeneous effects: firms' productivity

Table 12: TLTRO heterogeneous effects by market sector: firms' productivity

| | Tradable | | Non-tradable | |
|---|---|---|---|---|
| | High | Low | High | Low |
| | (1) | (2) | (3) | (4) |
| TLTRO I | -0.067*** | -0.316*** | -0.091*** | -0.365*** |
| | (0.015) | (0.086) | (0.018) | (0.113) |
| TLTRO II | -0.047*** | -0.287*** | -0.072*** | -0.335*** |
| | (0.009) | (0.084) | (0.012) | (0.110) |
| Bank-time controls | Yes | Yes | Yes | Yes |
| Loan controls | Yes | Yes | Yes | Yes |
| Bank F.E. | Yes | Yes | Yes | Yes |
| Firm-time F.E. | Yes | Yes | Yes | Yes |
| Observations | 229,230 | 48,996 | 274,850 | 62,521 |
| F test model | 63.48 | 197.6 | 125.5 | 219.7 |
| P-value | 0 | 0 | 0 | 0 |

# Heterogeneous effects: firms' default at t+2

Table 13: TLTRO heterogeneous effects by market sector: firms' default at year t+2

| | Default at t+2 | No default at t+2 |
|---|---|---|
| | (1) | (2) |
| TLTRO I | -0.203*** | -0.092*** |
| | (0.056) | (0.016) |
| TLTRO II | -0.155*** | -0.070*** |
| | (0.050) | (0.011) |
| Bank-time controls | Yes | Yes |
| Loan controls | No | No |
| Bank F.E. | Yes | Yes |
| Firm-time F.E. | Yes | Yes |
| Observations | 77,887 | 550,452 |
| F test model | 310.8 | 136.3 |
| P-value | 0 | 0 |

# Conclusions

- TLTRO did not disproportionally increase risk-taking. While high-risk firms benefited from a greater decrease in loan rates by bidder banks, low-risk firms experienced a higher increase in loan growth.
- The effects on loan growth were greater to firms with higher profitability and liquidity levels, more productive firms, mostly in the tradable sector, non-zombie firms and much stronger for firms that did not default after two years.
- The decrease in loan rates was stronger for smaller firms with lower profitability and liquidity levels, less productive firms, especially in the non-tradable sector, zombie firms, and stronger for firms that did default after two years in both TLTRO periods.

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# THANK YOU!

# Appendix

# TLTRO

- **TLTRO: September 2014 to June 2016 (8 operations)**
  - **Interest rate:** indexed to the MRO
  - **Maturity:** 2-4 years
- **TLTRO II: June 2016 to March 2017 (4 operations)**
  - **Interest rate:** between DFR and MRO rate
  - **Maturity:** 4 years

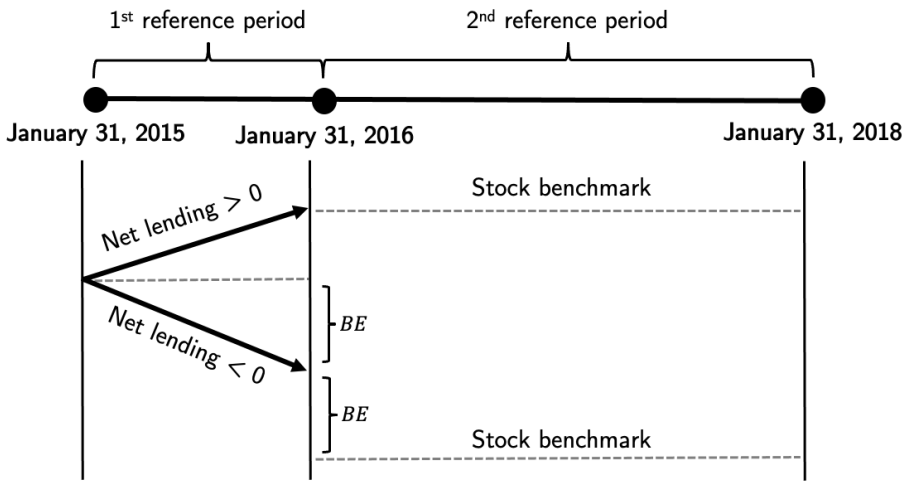


**Figure:** Lending benchmark for TLTRO II

# TLTRO

- **TLTRO: September 2014 to June 2016 (8 operations)**
  - **Interest rate:** indexed to the MRO
  - **Maturity:** 2-4 years
- **TLTRO II: June 2016 to March 2017 (4 operations)**
  - **Interest rate:** between DFR and MRO rate
  - **Maturity:** 4 years

**Eligible credit:**

- To non-financial corporations and households (excluding lending for house purchase)
- In all currencies
- To euro area residents

# Data

Table 1: Descriptive Statistics

| **Variable** | **Obs** | **Mean** | **Std. Dev.** | **Q1** | **Q2** (Median) | **Q3** |
|---|---|---|---|---|---|---|
| **Dependent Variables** | | | | | | |
| Loan rate (%) | 1,654,372 | 11.08 | 9.11 | 4.23 | 6.90 | 19.44 |
| Maturity (days) | 1,654,372 | 254 | 663 | 0 | 0 | 101 |
| Loan amount (new, million €) | 1,661,562 | 0.227 | 3.472 | 0.003 | 0.025 | 0.100 |
| Loan amount (stock, million €) | 9,507,309 | 0.243 | 4.679 | 0.001 | 0.013 | 0.058 |
| Loan growth | 8,685,372 | -0.03 | 0.68 | -0.17 | 0.00 | 0.22 |
| **Banks** | | | | | | |
| Total assets (million €) | 9,507,309 | 49,611 | 35,486 | 16,550 | 46,308 | 77,456 |
| Loans/Assets (%) | 9,507,309 | 59.7 | 12.1 | 51.6 | 55.7 | 62.8 |
| Gov. bonds/Assets (%) | 9,507,309 | 7.0 | 5.7 | 4.0 | 6.5 | 9.0 |
| Deposits/Assets (%) | 9,507,309 | 35.1 | 33.2 | 17.3 | 26.2 | 33.6 |
| NPLs/Loans (%) | 9,507,309 | 7.0 | 4.6 | 3.6 | 5.9 | 9.8 |
| **Firms** | | | | | | |
| Total assets (million €) | 6,728,973 | 0.9 | 1.0 | 0.1 | 0.4 | 1.3 |
| Sales (million €) | 6,728,973 | 0.6 | 0.6 | 0.1 | 0.3 | 1.0 |
| Equity/Assets (%) | 6,728,973 | -0.51 | 204.58 | 7.57 | 30.85 | 44.42 |
| Net income/Assets (%) | 6,728,973 | -4.28 | 54.85 | -1.40 | 1.21 | 3.99 |
| Cash/Deposits/Assets (%) | 6,728,973 | 12.68 | 18.45 | 1.59 | 6.39 | 14.86 |
| Debt/Assets (%) | 6,728,973 | 25.31 | 151.65 | 0.00 | 13.52 | 24.28 |
| EBITDA/Assets (%) | 6,728,973 | 2.58 | 53.03 | 0.00 | 5.85 | 10.96 |
| Sales/Employees (million €) | 6,741,463 | 0.82 | 10.80 | 0.02 | 0.08 | 0.28 |
| Credit rating | 6,939,264 | 15 | 3 | 13 | 15 | 18 |
| **TLTRO Data** | | | | | | |
| TLTRO-I Borrowing (million €) | 2,500,774 | 1,148 | 644 | 606 | 1,483 | 1,627 |
| TLTRO-II Borrowing (million €) | 3,146,049 | 1,421 | 1,614 | 221 | 630 | 2,517 |
| TLTRO-I Allowance (million €) | 3,054,635 | 741 | 580 | 264 | 476 | 1,458 |
| TLTRO-II Allowance (million €) | 3,665,464 | 2,924 | 1,999 | 1,186 | 3,077 | 5,131 |

# Loan growth

$$Loan\ growth_{i,,j,T} = \frac{loan_{i,j,t} - loan_{i,j,t-3}}{0.5 \times (loan_{i,j,t} + loan_{i,j,t-3})} \quad (1)$$

$loan_{i,j,t}$ stock of credit from bank $b$ to firm $f$ in month $t$

This symmetric growth rate is bounded between -2 and 2. As discussed by Haltiwanger et al., 2013, the symmetric growth rate is similar to a log first difference.