Extent of SME Credit Rationing | EU 2013-14
EIF-LSE Capstone Project 2018

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Agenda

- **Introduction**
  - Objectives
  - Definitions
  - Previous European credit rationing studies

- **Methods**
  - Sample
  - Model

- **Results**
  - Partial credit rationing estimates
  - Heterogeneity analysis by SME size

- **Conclusion**
  - Relevance and limitations
Introduction
We complete the following objectives as set out in the Terms of Reference.

**Review Literature**
- Review equilibrium and disequilibrium credit rationing theories
- Review credit rationing empirical studies

**Estimate Credit Rationing**
- Follow Kremp and Sevestre (2013) approach
- Use firm-level financial data for EU SMEs

**Extend Kremp and Sevestre (2013)**
- Compare results with 2013-14 ECB SAFE surveys
- Estimate heterogeneity of partial credit rationing by SME size
The market clears at an equilibrium interest rate

Credit demand and supply clear at an equilibrium interest rate in each period

Interest rates serve as an efficient allocation mechanism

There is no excess demand

\[ Q^*_t \text{ = equilibrium quantity of loans} \]

\[ i^* \text{ = equilibrium interest rate} \]
The market does not clear under disequilibrium conditions

**Market Disequilibrium**

- Interest rates may not freely adjust
  - Rate ceiling
  - Rate stickiness

Excess demand results as the latent demand for loans exceeds supply

\[ Q_t = S_t \quad Q_t^* \quad D_t \]

- \( i^* \) = equilibrium interest rate
- \( i' \) = prevailing interest rate
- \( Q_t^* \) = equilibrium quantity of loans
- \( Q_t \) = observed quantity of loans
- \( S_t \) = supply of loans
- \( D_t \) = latent demand for loans
Country-level credit rationing studies

Key Findings

- 6 country-level studies
  - 4 use firm data
  - 2 use bank data
- Each study uses different explanatory variables
- The studies take different empirical approaches

United Kingdom – 1989 to 1999

Spain – 1994 to 2002
Carbo-Valverde et al. (2009)

France – 2000 to 2010
Kremp and Sevestre (2013)

Croatia – 2000 to 2009
Čeh et al. (2011)

Portugal – 2005 to 2012
Farinha and Felix (2015)

Greece – 2003 to 2011
European Central Bank (2015)

No studies consider EU-wide SME credit rationing using firm-level data
Methods
Orbis and SAFE survey data: 14,270 SMEs using five-year panel data

**Firm Size 2013-14**
- Micro, 34.54%
- Small, 41.70%
- Medium, 23.76%

**Loan Information 2013-14**
- Without a Loan, 63.54%
- With a Loan, 36.46%

**Other Sample Characteristics**
- 24 out of 28 EU countries, ex. Cyprus, Estonia, Lithuania, and Malta
- Industries: use 7 sub-groups of NACE rev.2 classification
  - Retail, Transportation, Tourism, and Other (41.10%)
  - Manufacturing (28.54%)
  - Real Estate, Education, and Admin (14.72%)
  - Other 4 sub-groups (15.64%)

Due to data availability issues, our sample is skewed towards bigger firms
Expected direction of explanatory variables in our model

Latent demand for loans

\[ D_t = X'_{1,t} \beta_1 + u_{1,t} \]

- (?) SME size
- (-) Interest rate
- (+) Short-term financing needs
- (+) Long-term financing needs
- (-) Internal resources available

Latent supply of loans

\[ S_t = X'_{2,t} \beta_2 + u_{2,t} \]

- (+) SME size
- (+) Age
- (+) Collateral
- (+) Liquidity on hand
- (-) Leverage
- (+) Credit rating

Control factors: Industry, country, year

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Introduction  | Methods  | Results  | Conclusion
Market disequilibrium condition

Disequilibrium Condition

\[ Q_t = \min(D_t, S_t) \]
Main results
Observed direction of explanatory variables in our model

**Latent demand for loans**

\[ D_t = X'_{1,t} \beta_1 + u_{1,t} \]

- (-) Small-size (relative to Micro-size)***
- (-) Medium-size (relative to Micro-size)***
- (+) Interest rate***
- (-) Short-term financing needs*
- (+) Long-term financing needs
- (-) Internal resources available***

Control factors: Industry, country, year

**Latent supply of loans**

\[ S_t = X'_{2,t} \beta_2 + u_{2,t} \]

- (-) Small-size (relative to Micro-size)***
- (-) Medium-size (relative to Micro-size)***
- (+) Age
- (+) Collateral
- (-) Liquidity on hand*
- (-) Leverage***
- (-) Credit rating**

Control factors: Industry, country, year

* Green font indicates alignment with our hypothesis for variable direction

* Statistically significant at the 10% level
** Statistically significant at the 5% level
*** Statistically significant at the 1% level
Probability of partial credit rationing

\[ Pr(D_t > S_t | Q_t) \]

- Only firms that have a loan can experience partial credit rationing
- We do not estimate full credit rationing
Orbis and SAFE survey data: 14,270 SMEs using five-year panel data

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Heterogeneity Analysis | Partial credit rationing by SME size

Probability that SMEs experience partial credit rationing

Key Findings

- On average, the probability of partial credit rationing for EU SMEs in our sample is 4.15%
- The probability of partial credit rationing is highest for micro-size firms, followed by small- and medium size-firms. This is consistent with SAFE survey results
- Our sample is not representative of EU SMEs after dropping firms with missing Orbis data; our results likely underestimate partial credit rationing

Self-reported SAFE results suggest greater extent of rationing than model estimates
Conclusion
Understanding the nature of credit rationing is key to inform policy

The model can be used to determine:

- Extent of credit rationing at an aggregate level
- Differential probabilities of credit rationing for subgroupings including, but not limited to, by firm size and country group

Limitations:

- Non-bank SME financing options not evaluated
- Bank characteristics
  - Individual lending capacity of banks
  - Market power of a bank in local markets
- Availability of EU-wide data
- Technical challenges
Appendix Items

- Other European credit rationing studies (detail)
- Demand-side variable details
- Supply-side variable details
- Altman and Sabato (2007) Z-score
- Sample 1 | Summary statistics
- References
- Acknowledgements
Country-level credit rationing studies

**United Kingdom – 1989 to 1999**  
42.7% of the firms are constrained

**Spain – 1994 to 2002**  
Carbo-Valverde et al. (2009)  
33.93% of firms are financially constrained

**France – 2000 to 2010**  
Kremp and Sevestre (2013)  
6.4% of firms are partially constrained and 4.6% of firms are fully constrained

**Croatia – 2000 to 2009**  
Čeh et al. (2011)  
Identifies three distinct sub-periods of bank credit activity

**Portugal – 2005 to 2012**  
Farinha and Felix (2015)  
15% of firms are partially constrained and 32% firms are fully constrained

**Greece – 2003 to 2011**  
European Central Bank (2015)  
Demand constraints for short-term business loans; Supply constraints for long-term business loans, consumer loans and mortgages
Demand-side financial indicator variables

1. We use Noncurrent Liabilities when Loans + Long Term Debt data are not available
2. We use EBITDA when Cashflow data are not available
Supply-side financial indicator variables

1. We use Noncurrent Liabilities when Loans + Long Term Debt data are not available
2. We use EBITDA when Cashflow data are not available
3. Z-score based on Altman and Sabato (2007) model

- Physical non-cash collateral
- Liquidity on hand
- Leverage
- Credit rating
- Age category

Altman Z-score categories:
- Relatively Safe Zone: \( Z-score > \bar{x} + 1\sigma \)
- Relatively Grey Zone: \( \bar{x} - 1\sigma < Z-score < \bar{x} + 1\sigma \)
- Relatively Distressed Zone: \( Z-score < \bar{x} - 1\sigma \)

SAFE (2013-14) Size Categories:
- < 2 yrs.
- 2-5 yrs.
- 5-10 yrs.
- > 10 yrs.
Altman and Sabato (2007) Z-score model

Source

Sample
Financial data for 2,010 SMEs from the United States between 1994 and 2002

Rationale
Sample consists of SMEs from a well-diversified economy, which may serve as a valid proxy for the EU economy

Adapted Model

Relative Credit Rating Method

Diagram showing the distribution of credit ratings with categories for "Safe", "Grey Zone", and "Dissolved".
Sample 1 | Summary Statistics

Firm size proportions

- With loans:
  - Micro: 26.90%
  - Small: 30.37%
  - Medium: 42.73%

- Without loans:
  - Micro: 21.97%
  - Small: 36.93%
  - Medium: 41.10%

Main variable averages (over total assets)

- With loans
- Without loans

25th, 50th, 75th percentiles and mean

Total Assets (th euros)

Interest Rate (observed / imputed)
References


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