Negative Interest Rates, Bank Profitability and Risk-taking

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Motivation

Following the 2008-2009 Global Financial Crisis, several central banks implemented unconventional monetary policies:

- Quantitative Easing
- Credit Easing
- Forward Guidance
- Negative Interest Rates Policy (NIRP)

Since 2012, 7 major central banks in Europe and Japan have pushed their main policy rate to negative territory:

- Danmarks Nationalbank, Bank of Japan, Magyar Nemzeti Bank, Bulgarian National Bank, European Central Bank, Swiss National Bank & Sveriges Riksbank
Motivation

Figure 1: Main policy rates
Motivation

The motivation of NIRP:

- Tax banks’ liquidity excess to increase credit supply
- Lower financing costs (banks and borrowers)
- Increase supply and demand for loans
Motivation

The terms of the debate on NIRP effects:

- **Positive economic and financial effects**
  "By and large, our negative interest rate policy has been a success [...] We haven’t seen bank profitability go down as a matter of fact it’s ging up.” Mario Draghi (2017)

- **Financial stability concerns**
  In the medium and long term, the effects on profitability could encourage banks to “Search for yield” (Rajan, 2006; Taylor, 2009; Gambacorta, 2009; Coeuré, 2016).
Motivation

Why should there be any sort of asymmetry at zero?

- Banking is not a level business but rather a spread business.
  - Spread business: The difference between banks’ credit ($i_l$) and deposit interest rate ($i_d$).
Motivation

<table>
<thead>
<tr>
<th>Assets</th>
<th>Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Securities</td>
<td>Own funds</td>
</tr>
<tr>
<td>Loans($i_l$)</td>
<td>Retail deposits($i_d$)</td>
</tr>
<tr>
<td>CB Reserves</td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Simplified bank balance sheet

- Declining credit rates for new loans + re-pricing of the outstanding loans (mostly at variable-rate) compress banks’ net interest margins when the deposit rate cannot go below zero (Zero Lower Bound - ZLB).
This paper aims to document the effects of negative interest rates on the profitability and risk-taking of European banks.

3 research questions:

Q1: What are the effects of negative rates on European banks’ profitability?

Q2: Would negative interest rates encourage an increase in banks risk-taking?

Q3: In a negative interest rates environment, what are the effects of banks’ profitability on risk-taking?
What we do

We conduct a panel analysis on the 28 member countries of the EU with a sample of 2442 banks.

Using dynamic panel models (System GMM):

- We assess the impact of negative interest rates on the soundness of the European banking sector in terms of profitability and risk-taking.

- We compare the effects of positive and negative rates on banks.

- In the presence of negative interest rates, we determine the impact of profitability on risk-taking.
Contribution

- We use a wide range of data (2442 banks operating in the 28 countries of the European Union).

- Using a 3 NIRP variables (continuous, discrete and interaction), we assess the effects of negative interest rates on both bank profitability and risk-taking.

- To the best of our knowledge, this is the first paper to study the effects of bank profitability on risk-taking in presence of negative rates.
Related literature

Interest rates and banks’ profitability

- Low or negative interest rates could impact bank profitability:
  - Negative effects (Genay and Podjasek, 2014; Bush and Memmel, 2015; Dell’Ariccia et al., 2017; Kerbl and Sigmund, 2017; Eisenschmidt and Smets, 2018).
  - Positive (or moderate) effects (Scheiber et al, 2016; Jobst and Lin, 2017; Madaschid and Nuevo, 2017; Basten and Mariathasan, 2018).

- These effects depend on:
  - The impact of monetary policy on macroeconomic conditions (Borio et al, 2017; Altavilla et al, 2017).
  - Banks’ ability to diversify their sources of revenue and increase their banks fees (Artera et al, 2016; Scheiber et al, 2016).
Related literature

The risk-taking channel (Borio and Zhu, 2012; Adrian and Shin, 2014)

- Low rates encourage banks to take excessive risks
  - Low rate (Maddaloni and Peydro, 2011; Andries et al, 2016; Caselli, 2016; Bikker and Vervliet, 2017; Malovana et al, 2018)
  - Negative rate (Nucera et al, 2017; Jobst and Lin, 2017; Heider et al, 2018; Basten and Mariathasan, 2018)

- The effect would depend on:
  - Bank profitability (Keeley, 1990; Martynova et al, 2015)
  - Bank capitalization level (Dell’Ariccia et al, 2017; Delis and Kouretas, 2011; Rahman et al, 2015)
Negative interest rates have reduced the Net Interest Margins (NIM) of European banks.

The effects of negative rates on banks margins are greater than positive rates.

The decline in NIM has led to a reduction in banks’ risk-taking.
Data

- 2442 European banks
- 2011 – 2017 (annual frequency)
- 28 countries from the European Union
  → 19 EA countries
  Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia and Spain.
  → 9 non-EA countries
  Bulgaria, Croatia, Czech Republic, Denmark, Hungary, Poland, Romania, Sweden and UK.
- Sources: Orbis Bank Focus, central banks, OECD, DataStream
Data

Measures of bank profitability

- **Bank’s Margin**
  - Net Interest Margin (NIM): Net interest income to total assets

- **Bank’s Profit**
  - PROBTA: Profit before tax to total assets
  - Return on Assets (ROA): Net income to total assets
Data
Figure 2: Net Interest Margin
Data

Measures of bank risk-taking

- NPLs: Non-Performing Loans to gross loans
- Provisions: Loans loss provision to gross loans
- Log (Z-score): Measure based on equity capital and profit volatility
Data

Negative Interest Rate Policy (NIRP) variables

- $i$: the central bank main policy rate which became negative → continuous variable (annual average over all observations)

- $D_{NIRP}$: Dummy variable that takes the value of 1 when NIRP is implemented → year of adoption is categorized as 1 if after June.

- $i \cdot D_{NIRP}$: interaction term
Data

Bank-specific controls:

- Size: The natural logarithm of total assets
- Capitalization: Equity to asset ratio
- Liquidity: Liquid assets to total assets ratio
- Efficiency: Cost to income ratio

Country-specific controls:

- Herfindahl-Hirschman Index (HHI)
- Inflation rate
- Real GDP growth rate
- The yield curve slope
The empirical model

\[ Z_{i,k,t} = c + \alpha_0 Z_{i,k,t-1} + \alpha_1 MP_{k,t} + \alpha_2 X_{i,k,t} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t} \]

- \( Z_{i,k,t} \): profitability (or risk-taking) measures
- \( MP_{k,t} \): NIRP measures
- \( X_{i,k,t} \): bank-specific controls
- \( Y_{k,t} \): country-specific controls
- \( \theta_t \): time fixed-effects
- \( \lambda_k \): country fixed-effects
- for bank \( i \), country \( k \) and date \( t \)
Endogeneity issues

Potential sources:

- Reverse causality (between MP and Profit / Risk)
- The problem of omitted variables

Possible solutions:

- Lag structure: bank-specific controls introduced in t-1
- The dynamic System Generalized Method of Moments (SGMM) panel methodology (Blundell and Bond, 1998):
  - Endogenous variables: MP and bank-specific controls in t-1
  - Exogenous variables: country-specific controls
Estimates Q1

\[ \text{Profit}_{i,k,t} = c + \alpha_0 \text{Profit}_{i,k,t-1} + \alpha_1 M P_{k,t} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t} \]

<table>
<thead>
<tr>
<th></th>
<th>NIM</th>
<th>PROBTA</th>
<th>ROA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>SGMM</td>
<td>SGMM</td>
</tr>
<tr>
<td>( i )</td>
<td>0.122(^a)</td>
<td>0.429(^a)</td>
<td>0.420(^a)</td>
</tr>
<tr>
<td></td>
<td>[0.03]</td>
<td>[0.13]</td>
<td>[0.16]</td>
</tr>
<tr>
<td>( D_{NIRP} )</td>
<td>-2.097(^a)</td>
<td>0.582(^a)</td>
<td>0.033</td>
</tr>
<tr>
<td></td>
<td>[0.60]</td>
<td>[0.22]</td>
<td>[0.14]</td>
</tr>
<tr>
<td>( i \cdot D_{NIRP} )</td>
<td>0.603(^a)</td>
<td>2.508(^a)</td>
<td>-1.60(^c)</td>
</tr>
<tr>
<td></td>
<td>[0.22]</td>
<td>[1.06]</td>
<td>[0.94]</td>
</tr>
<tr>
<td>( i + (i \cdot D_{NIRP}) )</td>
<td>1.022(^a)</td>
<td>1.562(^b)</td>
<td>0.095</td>
</tr>
<tr>
<td></td>
<td>[0.28]</td>
<td>[0.56]</td>
<td>[0.26]</td>
</tr>
<tr>
<td>( \text{Profit}_{i,k,t-1} )</td>
<td>0.958(^a)</td>
<td>0.705(^a)</td>
<td>0.172</td>
</tr>
<tr>
<td></td>
<td>[0.01]</td>
<td>[0.18]</td>
<td>[0.13]</td>
</tr>
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<td></td>
<td></td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Country</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>4750</td>
<td>4750</td>
<td>4750</td>
</tr>
</tbody>
</table>

Robust standard errors in brackets. \(^a\) p<0.01, \(^b\) p<0.05, \(^c\) p<0.1
Discussion

- We find strong evidence that there is a threshold effect at zero.
- The implementation of negative rates in the EU has squeezed the banks’ NIMs.
- No effect on banks’ profit due to an increase in the non-interest income.
Estimates Q2

\[ \text{Risk}_{i,k,t} = c + \alpha_0 \text{Risk}_{i,k,t-1} + \alpha_1 MP_{k,t} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t} \]

<table>
<thead>
<tr>
<th></th>
<th>NPLs</th>
<th>Provisions</th>
<th>Log(z-score)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS</td>
<td>SGMM</td>
<td>SGMM</td>
</tr>
<tr>
<td>(i)</td>
<td>0.302 (^a) 2.358 (^a)</td>
<td>-1.733 (^b) 0.800</td>
<td>0.239 (^a) 0.978 (^a)</td>
</tr>
<tr>
<td></td>
<td>[0.11]</td>
<td>[0.77]</td>
<td>[0.80]</td>
</tr>
<tr>
<td>(D_{NIRP})</td>
<td></td>
<td>-2.883 (^a) 3.213 (^b)</td>
<td>-1.016 (^c) 0.716</td>
</tr>
<tr>
<td></td>
<td>[1.00]</td>
<td>[1.34]</td>
<td></td>
</tr>
<tr>
<td>(i \cdot D_{NIRP})</td>
<td>1.245 (^c) [0.74]</td>
<td></td>
<td>1.879 [2.51]</td>
</tr>
<tr>
<td>(i + (i \cdot D_{NIRP}))</td>
<td>-0.487 [0.544]</td>
<td></td>
<td>1.454 [1.28]</td>
</tr>
<tr>
<td>(\text{Risk}_{i,k,t-1})</td>
<td>0.922 (^a) 0.932 (^a) 0.936 (^a) 0.880 (^a)</td>
<td>0.627 (^a) 0.979 (^a) 0.726 (^a) -0.412</td>
<td>0.744 (^a) 0.553 (^a) 0.554 (^a) 0.949 (^a)</td>
</tr>
<tr>
<td></td>
<td>[0.01]</td>
<td>[0.07]</td>
<td>[0.04]</td>
</tr>
<tr>
<td>Bank</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Obs.</td>
<td>4750</td>
<td>4750</td>
<td>4750</td>
</tr>
<tr>
<td>Hansen p-val</td>
<td>0.14</td>
<td>0.112</td>
<td>0.598</td>
</tr>
</tbody>
</table>

Robust standard errors in brackets. \(^a\) \(p<0.01\), \(^b\) \(p<0.05\), \(^c\) \(p<0.1\)
During the period of implementation of negative interest rates, banks took less risk.

European banks have reduced non-performing loans and provisions on their balance sheets.
The issue of bank heterogeneity

- Interest rates (fixed or variable) on loans to households and non-financial corporations
- Banks’ size (small or large)
- Banks’ holding of liquid assets (low or high)
Sensibility analyses

- Last observation of the policy rate (31 December)
- Without Germany
- Without the UK
- Subsample of countries with negative rates (Bulgaria, Denmark, Hungary, Sweden and Euro Area)
- The overnight rate on the interbank market
How does profitability affect risk-taking because of negative interest rates?

\[ \text{Risk}_{i,k,t} = c + \alpha_0 \text{Risk}_{i,k,t-1} + \alpha_1 \overline{NIM}_{i,k,t} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t} \]

- \( \overline{NIM}_{i,k,t} \) is the fitted value of NIM predicted by NIRP
\[
Risk_{i,k,t} = c + \alpha_0 Risk_{i,k,t-1} + \alpha_1 \overline{NIM_{i,k,t}} + \alpha_2 X_{i,k,t-1} + \alpha_3 Y_{k,t} + \theta_t + \lambda_k + \epsilon_{i,k,t}
\]

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<th>Provisions</th>
<th>Log(z-score)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NIM_{i,k,t}</td>
<td>OLS: 0.791 (^a)</td>
<td>OLS: 0.559 (^a)</td>
<td>OLS: -0.520 (^a)</td>
</tr>
<tr>
<td></td>
<td>SGMM: 5.436 (^b)</td>
<td>SGMM: 0.749</td>
<td>SGMM: -1.775 (^b)</td>
</tr>
<tr>
<td></td>
<td>[0.26]</td>
<td>[0.06]</td>
<td>[0.11]</td>
</tr>
<tr>
<td>Risk_{i,k,t-1}</td>
<td>OLS: 0.921 (^a)</td>
<td>OLS: 0.632 (^a)</td>
<td>OLS: 0.750 (^a)</td>
</tr>
<tr>
<td></td>
<td>SGMM: 0.799 (^a)</td>
<td>SGMM: 0.413 (^b)</td>
<td>SGMM: 0.553 (^a)</td>
</tr>
<tr>
<td></td>
<td>[0.01]</td>
<td>[0.01]</td>
<td>[0.01]</td>
</tr>
</tbody>
</table>

- Bank: Yes, Yes, Yes, Yes, Yes, Yes
- Country: Yes, Yes, Yes, Yes, Yes, Yes
- Obs.: 4750, 4750, 4750, 4750, 4750, 4750
- Hansen p-val: 0.834, 0.842, 0.844

Robust standard errors in brackets. \(^a\) \(p<0.01\), \(^b\) \(p<0.05\), \(^c\) \(p<0.1\)
Main messages

- By focusing on period 2011-2017, we study the effects of negative interest rates on the profitability and risk-taking of banks in the European Union.
- We find evidence of a threshold effect when interest rates are below zero.
- During their implementation, negative rates reduced banks’ margins.
- In addition, banks compensated for the reduction in margins by increasing non-interest income.
- As a result, they took less risk.
Thank you for your attention