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Do negative interest rates make banks less safe?

Federico Nucera[1]
Andre Lucas[2]
Julia Schaumburg[2]
Bernd Schwaab[3]

[1] *LUISS Guido Carli University, Rome*
[2] *Vrije Universiteit Amsterdam and Tinbergen Institute*
[3] *European Central Bank, Financial Research*

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Federico Nucera[a], André Lucas[b], Julia Schaumburg[b], Bernd Schwaab[c]

[a] *LUISS Guido Carli University*
[b] *Vrije Universiteit Amsterdam and Tinbergen Institute*
[c] *European Central Bank, Financial Research*

Abstract

We study the impact of increasingly negative central bank policy rates on banks' propensity to become undercapitalized in a financial crisis ('SRisk'). We find that the risk impact of negative rates depends on banks' business models: Large banks with diversified income streams are perceived as less risky, while smaller and more traditional banks are perceived as more risky. Policy rate cuts below zero trigger different SRisk responses than an equally-sized cut to zero.

Keywords: negative interest rates, bank business model, systemic risk, unconventional monetary policy measures.

JEL: G20, G21

1. Introduction

Exceptional times can require exceptional policy measures. Since the onset of the financial crisis in 2007, many central banks have implemented unprecedented standard and non-standard monetary policy measures, lowering key interest rates to approximately zero. To stimulate post-crisis economies characterized by low growth and low inflation, some central banks, including the European Central Bank (ECB) and the central banks of Denmark, Switzerland, Sweden, and Japan, have even adopted negative policy rates. The rationale for negative rates is that they provide additional monetary stimulus, giving banks an incentive to lend to the real sector, and in this way support growth and a return to target inflation; see e.g. Coeuré (2014).

At least two main concerns have been voiced by critics of negative policy rates; see e.g. Hannoun (2015) and Dombret (2017). First, negative rates put pressure on the profitability of financial institutions (Brunnermeier and Koby, 2016). As a result, banks might lend to riskier borrowers without being fully compensated for it ('risk shifting'). Indeed, Heider et al. (2017) find evidence for such effects in the euro area. Second, a 'search for yield' among institutional investors can lead to a disproportional demand for high-yielding risky assets; see Rajan (2013). The implied asset price inflation can undermine financial stability (Reinhart and Rogoff, 2009), and crowd out private investment (Acharya and Plantin, 2017).

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Email addresses: fnucera@luiss.it (Federico Nucera), a.lucas@vu.nl (André Lucas), j.schaumburg@vu.nl (Julia Schaumburg), bernd.schwaab@ecb.int (Bernd Schwaab)

On the one hand, banks might benefit from the additional monetary stimulus implied by negative policy rates, e.g., via fewer non-performing loans, or via increases in asset prices. On the other hand, banks can also suffer from negative rates via squeezed net interest rate margins for new business. Which types of banks benefit and which suffer is as yet unclear. In addition, it is currently unknown whether cuts to negative rates are 'special,' for example because they imply a different financial stability response than comparable cuts to non-negative rates. In this paper we contribute to answering these questions. To do so, we study the risk impact of three successive deposit facility rate (DFR) cuts by the ECB to negative values, each by 10 basis points (bps). Specifically, we study the rate cuts on June 5, 2014, September 4, 2014, and December 3, 2015. Furthermore, we examine whether the impact of these cuts is qualitatively different from a 10 bps cut of the DFR to zero on July 5, 2012.

We measure a bank's risk using 'SRisk'. SRisk is a measure for a bank's propensity to become undercapitalized in a crisis; see Brownlees and Engle (2017). We interpret SRisk as a bank-specific risk measure that captures forward-looking market perceptions.[1] Using difference-in-differences regressions we find that after a cut to an increasingly negative interest rate, the majority of banks are perceived as more risky, i.e., more prone to become undercapitalized in a crisis. This is not the case for all banks, however. The risk impact depends on banks' business models. Large banks with sufficiently diversified income streams are perceived to be less (systemically) risky. Such banks appear to benefit in net terms from negative rates. By contrast, smaller banks that follow a more traditional business model and rely predominantly on deposit funding, are perceived as more risky. The documented heterogeneity supports the key result of Heider et al. (2017) that bank characteristics become an important determinant of bank behavior and monetary policy transmission at negative rates. Finally, we find that a 'placebo' DFR cut from +10 bps to zero in July 2012 triggers different SRisk responses than the equally-sized cuts below zero. This suggests that cuts to negative rates have a different financial stability impact than more conventional cuts to non-negative rates.

We proceed as follows. Section 2 presents our empirical methodology, including the data. Section 3 summarizes the empirical findings.

2. Data and empirical methodology

2.1. Business model classification

Based on balance sheet variables from SNL Financial, $N = 111$ banks located in the euro area are allocated to six business model groups. The balance sheet variables as well as business model groups coincide with the ones identified and described in detail in Lucas et al. (2016). Our classification sample ranges from 2012Q2 to 2014Q2. As a result, the business model classification is less influenced by the severe euro area sovereign debt crisis between 2010 and 2011, and predetermined with respect to the DFR cuts

[1] SRisk is often interpreted as a 'systemic' risk measure. In the conditioning event of a financial crisis, many banks will be undercapitalized simultaneously. This situation would make it very costly for undercapitalized banks to raise equity from the private sector, giving them a strong incentive to turn to the government (the taxpayer) and demand a bailout. The 'systemic' interpretation of SRisk is optional for the purposes of this paper, but lends additional urgency to our questions.

in 2014 and 2015. Banks that underwent distressed mergers, were acquired, or ceased to operate for other reasons between 2012 and 2014, are excluded from the analysis.

We proceed in two steps. First, we allocate 'clear-cut' cases based on threshold rules. These rules are described below. 'Clear-cut' cases identify the cluster labels. Second, we use the finite mixture model introduced in Lucas et al. (2016) to allocate the remaining banks. Allocating clear-cut cases in a first step helps us to interpret the clustering outcomes.

We distinguish six business model groups:

(A) **Large universal banks, including G-SIBs** (15.3% of banks). Banks with total assets of more than €800 bn [large], and a share of net interest income of less than 70% of operating revenue [universal], are allocated to this group with probability one.

(B) **Corporate/wholesale-focused banks** (19.8%). Banks with total assets of at least €50 bn, and a share of retail loans to total loans of less than 20% [corporate-focused], are in this group with probability one.

(C) **Fee-focused banks/asset managers** (16.2%). Banks with a share of net fee & commission income to operating revenue of at least 50% [fee-focused] are in this group with probability one.

(D) **Small diversified lenders** (28.8%). Banks with total assets of less than €50 bn [small], a share or retail loans to total loans between 40–60% [diversified across borrowers], and a loan to assets ratio of at least 60% [predominantly a lender] are in this group with probability one.

(E) **Domestic retail lenders** (11.7%). Banks with a share of domestic loans to total loans of at least 90% [domestic] and a share of retail loans to total loans of at least 70% [retail] are in this group with probability one.

(F) **Mutual/co-operative-type banks** (8.1%). Banks with total assets of less than €100 bn, a loans to assets ratio of at least 70%, and a deposits to total assets ratio of at least 50% are in this group with probability one. Banks in this cluster turn out to often be organized as a local savings bank or co-operative bank; thus the label.

2.2. SRisk for listed and non-listed banks

SRisk is the estimated capital shortfall of a bank, conditional on a 40% drop in a world equity index over a six months-ahead horizon; see Brownlees and Engle (2017). The measure is modelled as a function of a bank's equity market valuation, leverage ratio, the volatility of its stock price, and the correlation of its stock price with the world index. Estimates are publicly available for euro area financial firms at a monthly frequency on https://vlab.stern.nyu.edu.

We observe SRisk for 44 listed euro area banks, together with quarterly balance sheet data from the SNL Financial database. For 67 non-listed euro area banks, however, we observe only the accounting data. To ensure a representative sample, and thus to include all banks in our analysis, we apply a matching procedure to infer SRisk for non-listed banks. Specifically, we match non-listed banks to the 'nearest neighboring' banks for which market data are available.

The details of the matching procedure are as follows. For any unlisted bank i with average accounting data $\bar{y}_{i\cdot}$, we compute the J_i nearest listed neighbors based on the Mahalanobis distance, $\hat{\mathrm{D}}(\bar{y}_{i\cdot}, \bar{y}_{j\cdot})^2 = (\bar{y}_{i\cdot} - \bar{y}_{j\cdot})'\hat{\Omega}^{-1}(\bar{y}_{i\cdot} - \bar{y}_{j\cdot})$ for $i \neq j = 1, \ldots, J_i$. To safeguard interpretability, we require that all listed nearest neighbors come from the same business model group as bank i. The Mahalanobis distance scales the data by their unconditional covariance matrix $\hat{\Omega} = N^{-1}\sum_{i=1}^{N}(\bar{y}_{i\cdot} - \bar{y}_{\cdot\cdot})(\bar{y}_{i\cdot} - \bar{y}_{\cdot\cdot})'$ with $\bar{y}_{\cdot\cdot} = N^{-1}\sum_{i=1}^{N}\bar{y}_{i\cdot}$. The nearest neighbors are ordered from close to far, i.e., $\hat{\mathrm{D}}(\bar{y}_{i\cdot}, \bar{y}_{j\cdot}) \leq \hat{\mathrm{D}}(\bar{y}_{i\cdot}, \bar{y}_{j+1,\cdot})$. Using the J_i nearest listed neighbors for an unlisted bank i, we impute bank i's SRisk by $\mathrm{SRisk}_{it} = \sum_{j=1}^{J_i}\mathrm{SRisk}_{jt}\cdot w_j$, where the kernel weights are given by $w_j = j^{-1}/\sum_{j=1}^{J_i} j^{-1}$. Note that banks that are closer in term of Mahalanobis distance receive a larger weight.

2.3. *Difference-in-Differences regressions*

We study group means based on a difference-in-differences regression on dummy variables,

$$\mathrm{SRisk}_{it} = \alpha + \beta\mathrm{P}_t + \sum_{k=1}^{K-1}\gamma_k\mathrm{BM}_{ik} + \sum_{k=1}^{K-1}\delta_k\mathrm{P}_t\cdot\mathrm{BM}_{ik} + \epsilon_{it}, \tag{1}$$

where P_t is a dummy variable equal to zero before an ECB DFR cut and equal to one thereafter, BM_{ik} is a dummy variable equal to one if bank i belongs to business model group k and zero otherwise, α, β, γ_k, and δ_k, $k = 1, \ldots, K-1$ are unknown coefficients, and ϵ_{it} is a zero mean error term that is uncorrelated with the regressors. For inference, we cluster error terms at the bank level.

The regression equation (1) allows us to benchmark the time differences to a reference group. We select the fee-focused banks (C) as our reference group. A high share of net fees & commissions income implies that these banks should be less affected by squeezed net interest margins for new business. Instead, fee-focused banks could be exposed to the beneficial aspects of negative rates.

We identify the impact of the rate cuts based on a narrow window. For example, for the cut on June 05, 2014, regression (1) implicitly compares the end-of-May 2014 with the end-of-June 2014 (T=2) cross-sections of SRisk.

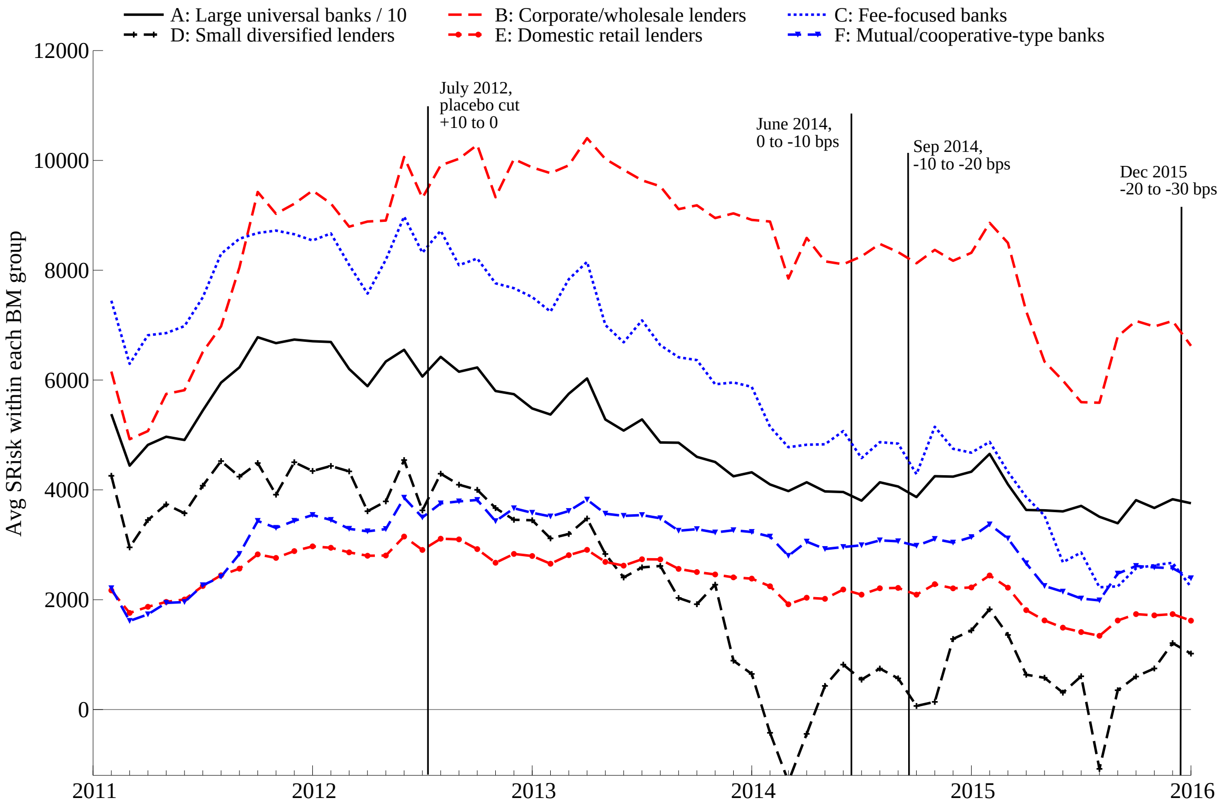
3. Main findings

Figure 1 plots the average SRisk_{it} within each business model group over time. Vertical lines indicate the ECB's DFR cuts into negative territory in 2014 and 2015, and the 'placebo cut' from 10 bps to zero in July 2012.

Overall, SRisk within each group increases during the euro area sovereign debt crisis between 2011 and early 2012, before reaching a peak around mid-2012. SRisk falls between mid-2012 and mid-2014, possibly initially sparked by the ECB's announcement of Outright Monetary Transactions (OMT) in August 2012 and subsequently driven by the gradual recovery in economic growth and improving bank capital buffers.

Figure 1: Average SRisk per firm across six business model groups

Average SRisk in USD million at the group level. The SRisk of group A is scaled down by a factor of 1/10 to allow a visual comparison. The sample ranges from 31 January 2011 until 31 December 2015.



Large universal banks (group A) exhibit by far the highest SRisk levels. Figure 1 scales this group's average by a factor of 1/10 to allow for a better visual comparison. Groups B and C are third and second in terms of average SRisk in 2011, and switch positions thereafter. Again, banks in group C rely on net fees and commissions as the dominant income source. By contrast, banks in group B rely more heavily on net interest income. Cuts to negative rates have been criticized for squeezing net interest income.

Differences across business models are also apparent for the smaller banks in D to F. The evolution of SRisk is quite similar for these banks until mid-2012. Post-2012, however, banks in D are perceived as less prone to being undercapitalized in a crisis compared to banks in groups E and F. In 2014 and 2015, average SRisk in group D even turns negative. Banks in D are more diversified across borrowers (less retail) and across borders (less domestic). As a result, they appear to be less 'stuck,' and better able to adjust to negative rates.

Table 1 presents the parameter estimates for a pooled regression (top panel) and the difference-in-differences specification (1) (bottom panel). The columns correspond to the four policy rate cuts indicated in Figure 1. We draw two main conclusions from Table 1. First, business models play an important role in capturing the cross-sectional variation in SRisk measures around rate cuts. The three cuts to negative values

Table 1: Estimation results

Parameter estimates for panel regression specification (1). The regressions are centered around three cuts of the ECB DFR into negative territory, and one placebo cut to zero on July 5, 2012. The dependent variable *SRisk* measures the USD amount a bank would be undercapitalized in a severe financial crisis. P_t is a dummy variable which is equal to one following a DFR cut. A, B, C, D, E, F indicate business model groups: A: large universal banks, B: corporate/wholesale-focused lenders, C: fee-focused banks/asset managers, D: small diversified lenders, E: domestic retail lenders, F: mutual/co-operative-type banks. Group C is the reference group. *T*-statistics are in parentheses.

	cut 1	cut 2	cut 3	'placebo'
Date	Jun 5, 2014	Sep 4, 2014	Dec 3, 2015	Jul 5, 2012
Cut in bps	0 → -10	-10 → -20	-20 → -30	+10 → 0
P_t	**-378.93**	**-592.41**	**-353.53**	**968.05**
	(-4.19)	(-6.50)	(-2.76)	(5.81)
const.	**9226.90**	**9328.24**	**8447.32**	**14152.36**
	(5.19)	(5.21)	(5.09)	(5.91)
R-squared	<0.01	<0.01	<0.01	<0.01
Obs	222	222	222	222
$P_t \cdot$ A	**-1078.08**	**-1375.45**	-280.34	**3179.24**
	(-2.34)	(-4.44)	(-0.53)	(5.90)
$P_t \cdot$ B	**636.53**	353.48	-13.09	191.91
	(2.91)	(1.41)	(-0.05)	(0.81)
$P_t \cdot$ D	220.52	52.84	255.50	267.03
	(1.00)	(0.21)	(0.61)	(0.65)
$P_t \cdot$ E	399.25	**434.24**	319.55	-197.15
	(1.72)	(2.02)	(1.31)	(-0.88)
$P_t \cdot$ F	**523.87**	**474.53**	255.22	-145.33
	(2.48)	(2.33)	(1.06)	(-0.65)
P_t	**-492.79**	**-556.38**	-439.78	401.00
	(-2.34)	(-2.73)	(-1.82)	(1.81)
A	**34535.02**	**35776.39**	**35618.44**	**52320.52**
	(5.74)	(5.86)	(6.68)	(7.61)
B	3038.13	3488.95	4405.35	998.66
	(0.67)	(0.82)	(1.11)	(0.18)
D	**-4254.36**	**-4273.91**	-1509.68	**-4692.20**
	(-2.66)	(-2.72)	(-1.62)	(-2.09)
E	**-2886.48**	**-2627.60**	-933.94	**-5412.66**
	(-2.09)	(-1.97)	(-1.24)	(-2.61)
F	-2111.61	-1778.59	-96.67	**-4821.00**
	(-1.57)	(-1.38)	(-0.14)	(-2.35)
const.	**5071.36**	**4841.54**	**2671.56**	**8318.89**
	(3.79)	(3.77)	(3.85)	(4.06)
R-squared	0.50	0.52	0.56	0.64
Obs	222	222	222	222

lead, overall, to a lower level of SRisk; see the top panel of Table 1. This total effect, however, averages over substantially heterogeneous group-specific effects, see the bottom panel of Table 1. In addition, it mainly reflects the impact on the largest banks with the highest SRisk measures.

Large universal banks (A) and fee-focused banks (C, the reference group) appear to have benefited rather than suffered from the cuts to negative values in terms of reductions in SRisk. By contrast, relatively smaller banks that follow more traditional business models do not decrease their SRisk around the rate cuts, i.e., increase their SRisk relative to the decreasing level of the reference group (C). The interaction terms are significant on the first two cut dates for group F, and on the second cut date for group E. Domestic retail lenders and mutual/co-operative-type banks do not appear to benefit in net terms from negative central bank deposit rates.

Second, rate cuts to negative values lead to different SRisk responses than the July 2012 cut; see the right column in Table 1. For example, SRisk for smaller deposit-taking banks in groups E and F decreases in 2012 relative to reference group C, and in absolute terms shows an (insignificant) increase, contrary to what is observed for the later cuts. Large universal banks (A) are perceived as more risky around the July 2012 cut, possibly reflecting less dramatic valuation gains from increasing asset prices. Again, the 2012 impact is different from what is observed for the later cuts. We conclude that cuts to negative rates appear to be different ('special') in terms of their financial stability impact.

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