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OESTERREICHISCHE NATIONALBANK
EUROSYSTEM

From Low to Negative Rates: an Asymmetric Dilemma

26th January 2017,

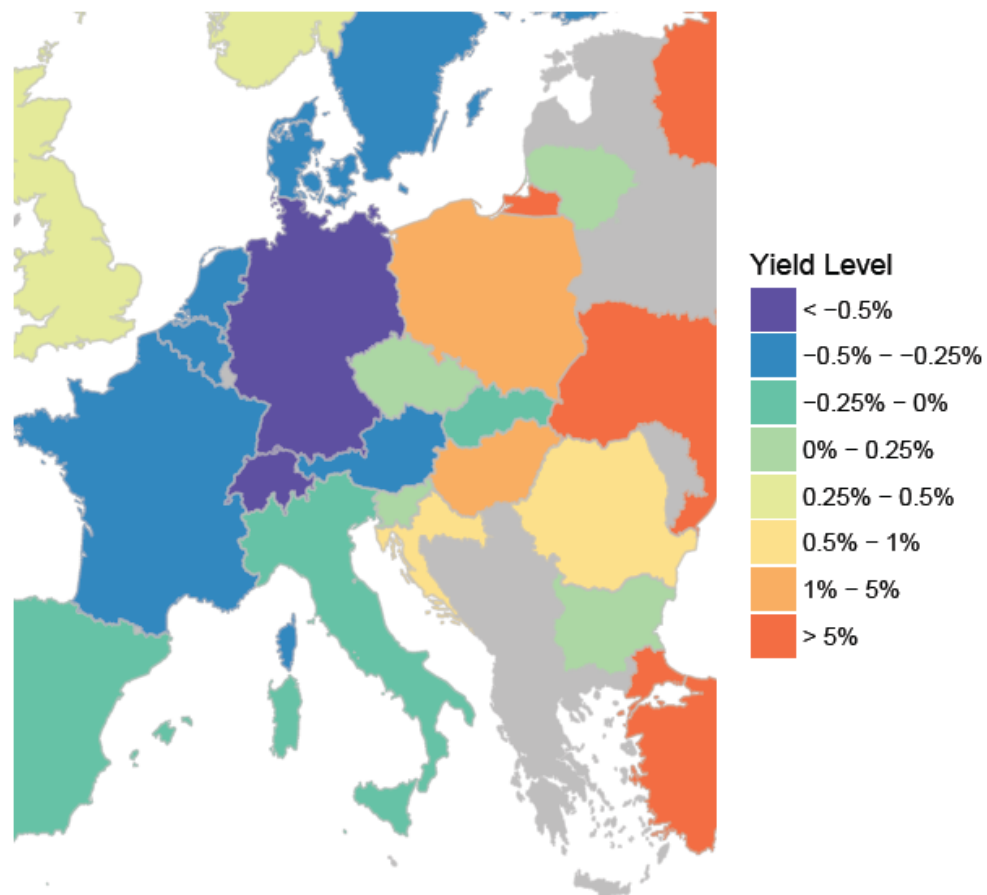
4th Research Workshop of the MPC Task Force on Banking Analysis for Monetary Policy

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The opinions expressed by the authors of this study do not necessarily reflect the official viewpoints of the Eurosystem or the Oesterreichische Nationalbank.

Motivation



Source: OeNB.

Sovereign bond yields (1y) in Europe April 2016.

Motivation

- Central research question:

What is the impact of the interest rate level on banks' interest rate margins?

Does the relation also hold if rates move to negative territory?

- Why is this of interest?

→ Global rates are at a record low and several bonds trade at negative yield.

→ Net interest income is the central source of income for banks.

→ Financial stability is crucially affected as profits are always first line of defense against losses.

→ All banks are affected by this relationship at the same time, ie. systemic scope.

A Panel Model Approach

Fixed effects panel model

$$y_{i,t} = \alpha + \beta' X_{i,t} + u_i + e_{i,t}$$

$y_{i,t}$ Net interest margin of bank i at time t (NIM)

$X_{i,t}$ bank-specific and macroeconomic control variables, including the interest rate level

Data:

Quarterly observations from 1998 to 2016 for each bank operating in Austria,

$T=73$, $N=946$, unbalanced, ~48,000 observations

Results

Key results (other control variables omitted):

	Coefficients	(Standard Errors)
<i>Euribor</i>	0.164	(0.005) ^{***}
<i>Euribor</i> ²	-0.003	(0.001) ^{**}
Term spread	0.115	(0.003) ^{***}
Interaction: Euribor x RBD	0.017	(0.003) ^{***}
RBD	0.098	(0.010) ^{***}

1. Linear effect:

A drop of 100 basis points (bps) in the reference rate is associated with a drop of 16bps in NIM.

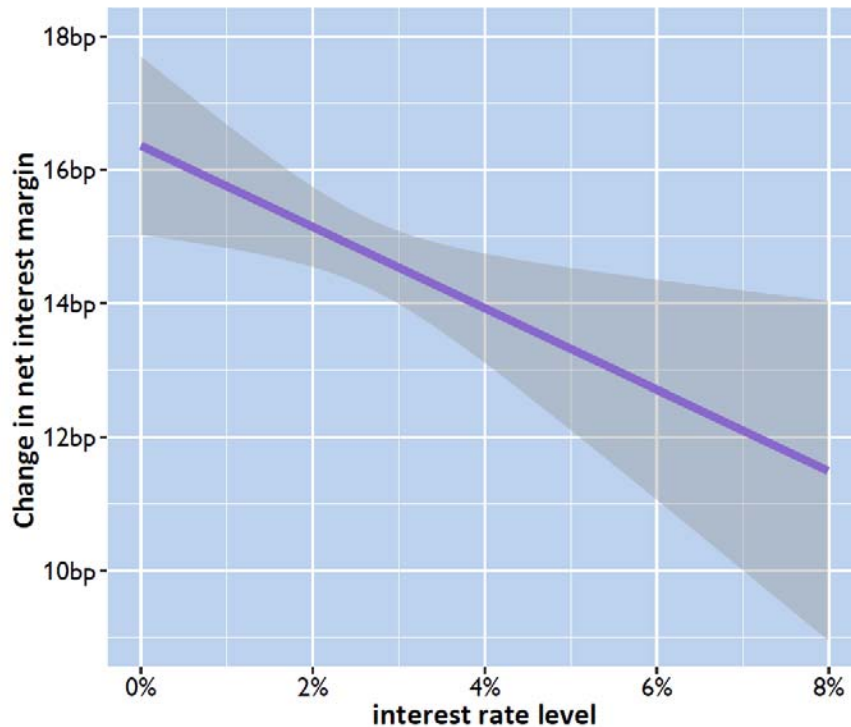
2. Non-linear effect:

The above mentioned effect is smaller the larger the reference rate is.

3. Term spread: As banks lend long and refinance short, a lower term spread also lowers NIM.

4. RBD (regional bank dummy) shows that regional banks have a higher NIM but also that their NIM reacts more sensitively to changes in the reference rate.

Results



Similar results found by Busch and Memmel (2015), Borio et al. (2015), Claessens et al. (2016) and Genay and Podjasek (2014).

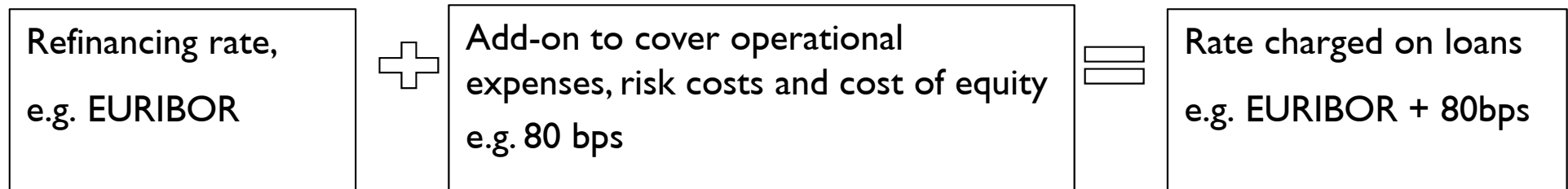
Does the relationship also hold if rates move to negative territory?

The negative interest rate environment

Does the relationship also hold if rates move to negative territory?

We are skeptical of this.

A simple credit pricing model:



However, as deposits cannot go below zero, the true refinancing rate becomes detached from the reference rate once the reference rates move to negative territory.

E.g. EURIBOR moves from -0.2 to -0.5 but rate on deposits cannot follow: they stick at 0.

→ If market rates drop the asset side potentially follows suit while the bank still pays for its refinancing.

→ A negative interest rate environment causes the reference rate to be unrepresentative of the true refinancing rate of a bank.

→ Banks experience a systemic mispricing of assets, not because the risk has been incorrectly assessed, but because the refinancing rate does not reflect the true conditions the bank faces.

An ARIMA model approach

We estimate a separate ARIMA model for each P&L item of each bank.

$$(1 - B)^{d_{i,j}}(y_{t,i,j} - \mu_{i,j}) = \gamma'_{i,j} (Euribor_t Exp_{t,i,j}) + \gamma''_{i,j} (Euribor_{t-1} Exp_{t,i,j}) + \eta_{t,i,j}$$

$$\phi(B)\eta_{t,i,j} = \theta(B)\epsilon_{t,i,j}.$$

In words: the approach models each P&L item of each bank as a function of its past and the interest rate level times the exposure to that item.

Once the model is fitted, we can generate forecasts by plugging in hypothetical reference rates.

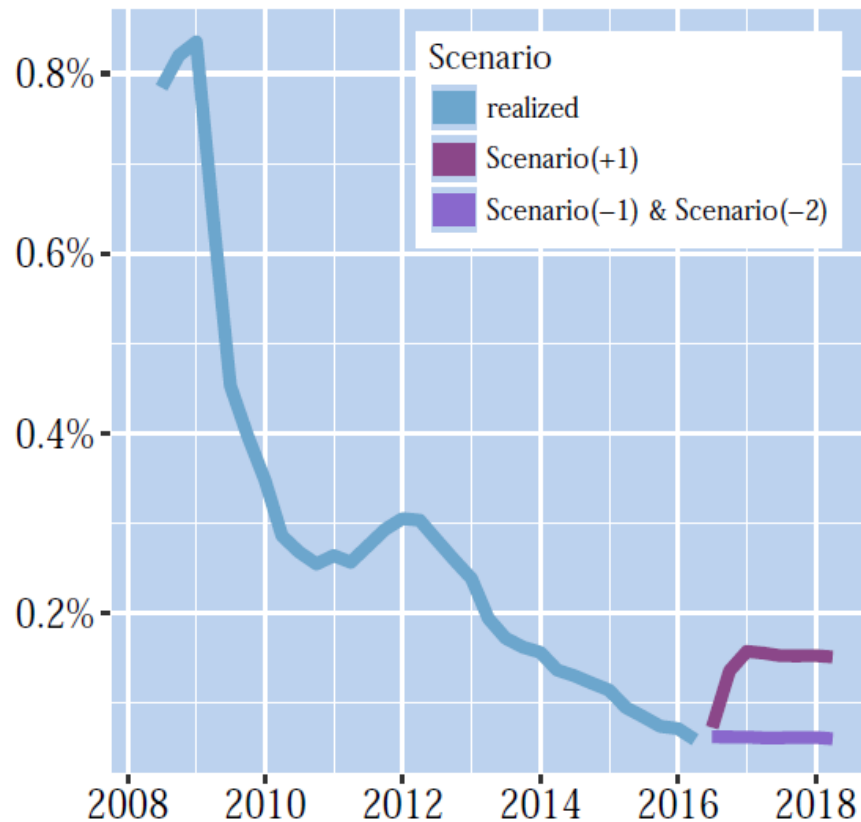
- Importantly, we floor the forecasts at zero for the P&L item “interest expenses on deposits”.
- The order of the polynomials is chosen by following Hyndman and Khandakar (2008).
- We use the model for forecasting eight quarters into the future while holding the exposure constant (“constant balance sheet assumption”) but varying the reference rates.
- Scenario(-1) assumes a drop in the reference rate to -1%, Scenario(-2) explores the consequences of an extremely negative reference rate of -2%. Scenario(+1), used for comparison purposes.

P&L items used in the ARIMA approach

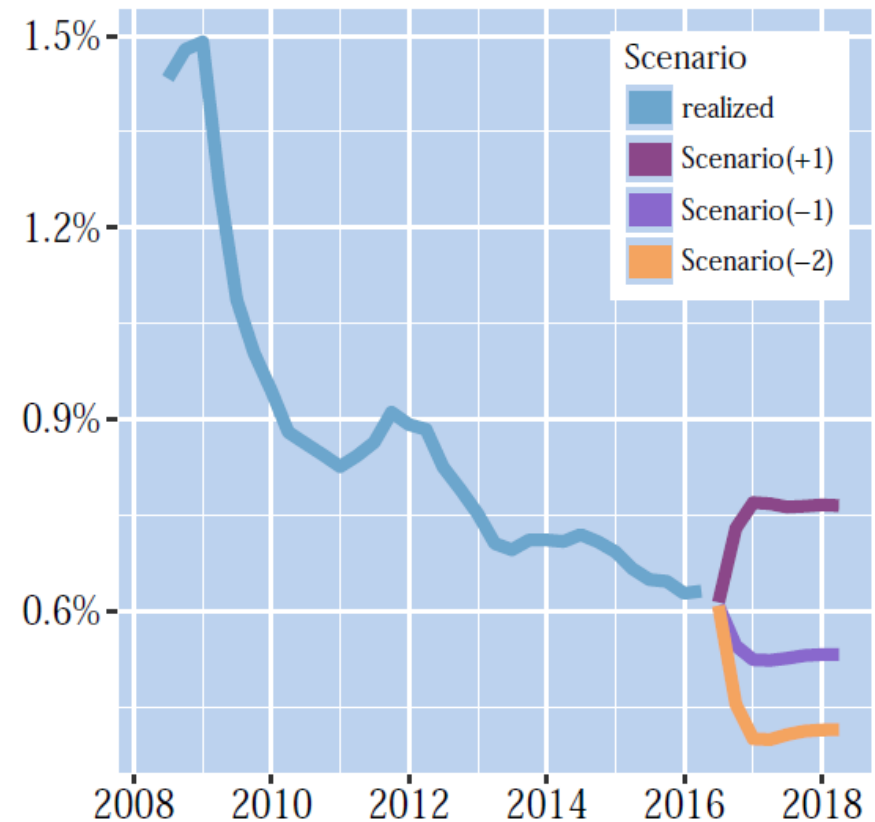
P&L item	Separate ARIMA model	Interest rate-sensitive	Floored at zero
1. Interest income			
Interest income from interbank loans	yes	yes	
Interest income from nonbank customer loans	yes	yes	
Interest income from bonds	yes	yes	
Interest income from other	yes	yes	
2. Interest expenses			
Interest expenses from interbank loans	yes	yes	
Interest expenses from nonbank customer deposits	yes	yes	yes
Interest expenses from bonds issued	yes	yes	
Interest expenses from other	yes	yes	
3. Net interest income (1+2)			
4. Income from equity positions	yes	yes	
5. Fee and commission income	yes		
6. Fee and commission expenses	yes		
7. Net income from other financial transactions	yes		
8. Other income	yes		
9. Administrative expenses	yes		
10. Other expenses	yes		
11. Earnings before risk costs and taxes (3+4+5+6+7+8+9+10)			

Results

Deposit costs



Customer loans' yield



As intended, deposits costs cannot go below zero and do not drop further, while yields on assets follow the reference rates.

→ Substantial impact to banks' NIM.

Results

Sector	realized	Scen.(+1)	Scen.(-1)	Scen.(-2)	$\Delta(+1)$	$\Delta(-1)$	$\Delta(-2)$
Volksbanks	176.9	194.3	133.5	86.3	17.4	-43.4	-90.6
Automotive banks	244.9	247.1	212.3	173.9	2.3	-32.6	-71.0
Raiffeisen banks	170.8	189.6	141.0	104.8	18.8	-29.8	-66.0
Sparkassen	161.8	184.8	137.4	99.2	23.0	-24.4	-62.5
Medium universal banks	153.5	151.8	122.2	95.4	-1.7	-31.4	-58.2
Specialized institutions	110.1	103.7	76.5	53.5	-6.4	-33.6	-56.6
Branches	64.5	65.2	26.1	10.7	0.8	-38.4	-53.7
Private stock banks	59.6	110.3	43.4	27.5	50.8	-16.1	-32.0
Building societies and housing finance banks	58.8	54.7	44.5	38.8	-4.1	-14.4	-20.0
Large banks	79.2	113.1	73.4	67.6	33.9	-5.8	-11.6
All banks	165.3	184.5	135.5	98.6	19.2	-29.8	-66.7

Under a reference rate of -1% impact ranges from (a median of) -43.4 basis points for Volksbank credit cooperatives to -5.8 basis points for large banks.

ARIMA approach agrees with panel model approach for positive reference rates but predicts a stronger decline in NIM when reference rates move to negative territory.

→ Zero floor on deposits is important to consider!

Conclusions

- We analyze the effects of low and negative rates on the profitability of Austrian banks
- We found that banks' NIM is linked to the interest rate environment. The link is strong when reference rates are close to zero (at around 16bps per 100bps) but due to nonlinearities is subdued in normal times.
- We are skeptical of extrapolating these findings to negative rates
- We employ an ARIMA simulations approach that takes into account the asymmetric dilemma that deposit rates are legally floored at zero while loan rates directly track reference rates
- Using such an approach, we found that negative rates can create a substantial risk to the profitability of banks.
- Smaller deposit-financed banks, in particular, are hit hardest. This finding is important as these banks often do not participate in empirical studies due to a shortage of data.
- We find that a hypothetical reference rate close to -2% would pose a substantial burden to banks' profitability.

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