

Effects of Negative Interest Rates on Stability and Profitability of Commercial Banks

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Received: May 16, 2024

Accepted: June 15, 2024

Online Published: June 17, 2024

doi:10.5430/afr.v13n3p9

URL: <https://doi.org/10.5430/afr.v13n3p9>

Abstract

The article examines the impact of the European Central Bank's (ECB) negative interest rate policy (NIRP) on commercial banks in Europe. It traces the historical context of the policy back to the financial market and banking crises, which eroded trust among banks, leading to liquidity issues and economic downturns. To counteract this, the ECB introduced negative interest rates in 2014, aiming to stimulate the economy.

The research question focuses on how NIRP affects banks' annual reports, particularly concerning total assets, credit and risk volumes, proprietary trading, profits, and stability. The hypothesis suggests that NIRP significantly increases risks in bank profitability and stability. Analysis spanning from 2014 to 2022 compares negative interest rate changes with bank balance sheet and profit/loss account developments.

Economic theory predicts that negative interest rates decrease bank profits but increase lending activity. Statistical analysis confirms a correlation between NIRP and increased credit risk volume, as well as a shift from bonds to shares in proprietary trading. However, there is no statistical evidence linking NIRP with profit and profitability declines.

In conclusion, while NIRP does lead to a significant increase in credit risk volume, it does not halt falling profits and profitability. Therefore, the hypothesis that NIRP increases risks for commercial banks' profitability and stability holds true, posing a threat to financial stability.

Keywords: negative interest rate policy, financial stability

1. Introduction

The historical triggers of the problem examined below are the financial market crisis and the resulting banking crisis. This led to a loss of trust among the banks, which resulted in liquidity bottlenecks and an overall economic downturn.

To counteract these issues, the ECB is setting its key interest rates. On this way, in 2014, a negative interest rate was charged for the first time on the deposit facility, to stimulate and stabilize the economy through the interest rate policy. This broke new ground in interest rate policy. Because so far there have never been negative interest rates in either the euro area or any of the member states. Therefore, historical or empirical knowledge is also lacking and the effects have not been researched.

The low interest rate policy worked like a boost for the northern states. The demand for credit grew to a record level, which at the same time, due to increased demand, resulted in an increase in the rate of price increases and thus in inflation.

The negative interest rate policy of the ECB thus results in two strands of risk: a macroeconomic risk of the growing divergence between northern and southern economies within the euro area.

The current state of research in spring 2024 shows synthesizes that act on financial stability. Altunbas et al. (2023) and Schnabel (2020) argue, that NIRP increases market power of banks and alters competitive behavior. Molyneux (2019) found out, that NIRP leads to increased risk-taking by banks as they seek higher yields due to compressed margins. Heider and Leonello (2021), as well as López-Penabad et al. (2022) argue, negative interest rates have mixed impacts on bank profitability, often requiring banks to adapt through other means. Schnabel (2020), Molyneux (2019) and Molyneux (2019) conclude that NIRP poses challenges to financial stability, necessitating careful policy design and implementation to mitigate adverse effects.

The aim of this article attaches on this point. The risks associated with negative interest rates are researched in order to identify and evaluate the effects on stability and profitability for commercial banks in Europe.

1.1 Research Question

The research question is based on microeconomic effects on commercial banks:

How causally does the negative interest rate policy affect the banks' annual reports?

This research raises several questions: the causal impact of negative interest rates on banks' total assets, credit and risk volumes, and proprietary trading (both bond and stock purchases). It explores the effects on banks' overall profits, interest rate transaction income, commission income, other income, return on equity, and cost-income ratio, examining the direction and significance of these causal relationships.

1.2 Hypothesis Derivation

Assuming NIRP impacts commercial banks' balance sheets and profit/loss accounts, the hypothesis states that the ECB's NIRP significantly increases risks in bank profitability and stability. Analysis compares negative interest rate changes from 2014-2022 with euro banks' aggregated balance sheet and profit/loss account developments. Key attributes like risk volumes, credit risks, self-trading activities, loan types, total earnings, and return on equity are examined through panel analysis.

Hypothesis: ECB's NIRP leads significantly to increasing risks for commercial banks in profitability and stability.

2. Data and Methods

The analysis regards a timeline from 2014 to 2022, faced on half-year-reports. In this period, ECB adjusts the interest rate for deposit facility several times. So, it do not exist just one negative interest rate, there are several negative interest rates in the period of seven years.

Various data sets are imported in the categories Balance Sheet and profit and loss statement (dependent variables). These are then compared over time for correlations with the applicable negative interest rates, expressed by the deposit facility rate (independent variable).

A correlation describes the relationship between the 'deposit facility' and the respective characteristic that was tested for. This serves to check whether a change in the variable is causally related to the drop in the deposit facility. The results will lead us to answer the research question of causal context, between negative interest rates and negative balance sheet effects.

The researched banks are all Euro banks. Therefore, the size of the sample is around 4,400 banks, which delivers aggregated data to supervisory authorities (Klein, 2020). The aggregated data are analyzed and evaluated in a time distance of six months.

3. Research

The effects of the ECB's negative interest rate policy on various balance sheet items of European commercial banks are examined, as is the profitability of commercial banks.

The deposit facility rate is used as a reference value. It is the short-term measure of monetary policy and reflects interest rate fluctuations most quickly and in the shortest possible time.

Correlations of the individual balance sheet values and p/l values with the deposit facility are examined. In addition, a multiple regression is then carried out to check the causality of the change with the negative interest rate policy.

4. Results

4.1 Results in Balance Sheet

The total balance sheet of the banks increases over time. The commercial banks in particular recorded increases in their total assets. This is due to the effectiveness of the ECB's monetary policy measures. By lowering the interest rate level, the ECB is causing an increase in the money supply. In addition, this is initially reflected in the accounts of the bank accounts, and thus in the bank balance sheets. So, the bank's balance sheets are growing in absolute terms.

		deposit_facility	Balance Sheet total
deposit_facility	Pearson-Correlation	1	-,090
	Sig. (2-tailed)		,715
	N	19	19
Balance_Sheet_total	Pearson-Correlation	-,090	1
	Sig. (2-tailed)	,715	
	N	19	19

Figure 1.

The analysis clearly shows an increase of balance sheet total over evaluated time period with an increasing deposit facility. Statistically, however, no level of significance could be determined in the evaluation (p value >1%). Thus, the increase in the balance sheet total can be justified comprehensibly. However, there is no statistical connection with the negative increase in the deposit facility within the euro zone.

The risk volume of non-banks shows a fissured dispersion over time. It does rise slightly between -0.1% and -0.3% deposit facility. At -0.4% there is an extreme jump. At -0.5% the value is then at the highest level. It is logically understandable that the lowering of the key interest rate also reduces the lending rate for bank customers. This increases the demand for loans and thus the volume of risk from lending increases. In addition, it is becoming increasingly unprofitable for banks to leave the money in the ECB account. This also increases the banks' own investments, which also increases the risk volume. In this respect, the increase in nominal volume is certainly a consequence of increasingly negative deposit facilities. Therefore, there is an economic connection.

Correlation

		deposit_facility	risk_volume_non_banks
deposit_facility	Pearson-Correlation	1	-,805**
	Sig. (2-tailed)		<,001
	N	19	19
risk_volume_non_banks	Pearson-Correlation	-,805**	1
	Sig. (2-tailed)	<,001	
	N	19	19

** The correlation is significant at the 0.01 level (2-tailed).

Figure 2.

A statistical relationship can be demonstrated here. The p value is in the significant range. Thus, there is a sufficient level of significance in the correlation analysis (-,805) to be able to demonstrate a statistical relationship over time. Negatively increasing deposit facility leads to increasing risk volume total.

The feature Credit Risk Volume Banks seems to increase on average over time.

Correlation

		deposit_facility	credit_risk_volum_total
deposit_facility	Pearson-Correlation	1	-,747**
	Sig. (2-tailed)		<,001
	N	19	19
credit_risk_volum_total	Pearson-Correlation	-,747**	1
	Sig. (2-tailed)	<,001	
	N	19	19

** The correlation is significant at the 0.01 level (2-tailed).

Figure 3.

The statistical evaluation confirms the estimation. According to the correlation analysis, there is statistical significance. Negatively increasing deposit facility leads to increasing credit risk volume total. From a purely logical point of view, the connection can be made between the deposit facility and Risk Volume Banks. The banks try to place the excess liquidity on the market. This means either an increasing customer lending business or increasing own investments.

A more in-depth investigation then deals with the individual growth areas, i.e. the customer lending business on the one hand and proprietary trading on the other.

First, the author considers on the customer lending business. As described, banks in the euro zone have an economic incentive to expand customer lending business through the negative deposit facility. At the same time, the market interest rate for credit is falling. So, the demand increases at the same time. Thus, there must be an economic connection between the increase in negative interest rates by the ECB and an increase in housing loans.

Correlation

		deposit_facility	Housing_loans
deposit_facility	Pearson-Correlation	1	-,826**
	Sig. (2-tailed)		<,001
	N	19	19
Housing_loans	Pearson-Correlation	-,826**	1
	Sig. (2-tailed)	<,001	
	N	19	19

** . The correlation is significant at the 0.01 level (2-tailed).

Figure 4.

There is also a statistically verifiable connection. The p value of <1% shows a level of significance. The correlation value of -0,826 shows the estimated strong connection between increasing negative deposit facility and housing loans volume.

The second largest loan volume is implemented in loans for corporates. Here, too, there is a sharp increase from a deposit facility of -0.4%. Here, too, the falling market interest rates lead to an increase in demand with a simultaneous increase in supply by the banks. The panel analysis shows a very significant result with a p value of <1%.

Correlation

		deposit_facility	loans_for_corporates
deposit_facility	Pearson-Correlation	1	-,720**
	Sig. (2-tailed)		<,001
	N	19	19
loans_for_corporates	Pearson-Correlation	-,720**	1
	Sig. (2-tailed)	<,001	
	N	19	19

** . The correlation is significant at the 0.01 level (2-tailed).

Figure 5.

The correlation test shows a high statistical significance between increasing negative deposit facility and corporate loans volume.

The third major, but considerably smaller, loan volume is implemented through loans for self-employed. As in the other areas, the banks are also trying to expand their loan volumes here. At the same time, falling market interest rates are fueling demand here too.

Correlation

		deposit_facility	loans_for_self-employed
deposit_facility	Pearson-Correlation	1	-.826**
	Sig. (2-tailed)		<.001
	N	19	19
loans_for_self-employed	Pearson-Correlation	-.826**	1
	Sig. (2-tailed)	<.001	
	N	19	19

** The correlation is significant at the 0.01 level (2-tailed).

Figure 6.

The correlation analysis shows a highly significant result (-0,826). Thus, the credit volumes in all three sub-areas examined increase significantly as the deposit facility decreases.

On the other hand, an economic incentive should also be created for own systems. The banks would have to try to place the high inflowing liquidity, in addition to the customer credit business, also in proprietary trading.

Correlation

		deposit_facility	self_trading_total
deposit_facility	Pearson-Correlation	1	,897**
	Sig. (2-tailed)		<.001
	N	19	19
self_trading_total	Pearson-Correlation	,897**	1
	Sig. (2-tailed)	<.001	
	N	19	19

** The correlation is significant at the 0.01 level (2-tailed).

Figure 7.

The look on volume over the time period by pure visualization shows a decrease in own investments as the deposit facility increases. Statistically, the p value of <0.1% shows a highly significant result. Statistic correlation test shows, there is definitely a strong correlation between the increasingly negative deposit facility and the decline in self-trading total (0,897). This contradicts the economic logic of the increase in demand. The reason, however, is that the increasingly negative interest rates have a precautionary effect. The author analyzes this development in the next step.

Correlation

		deposit_facility	self_trading_bonds
deposit_facility	Pearson-Correlation	1	,918**
	Sig. (2-tailed)		<.001
	N	19	19
self_trading_bonds	Pearson-Correlation	,918**	1
	Sig. (2-tailed)	<.001	
	N	19	19

** The correlation is significant at the 0.01 level (2-tailed).

Figure 8.

New investments are becoming increasingly unattractive as interest coupons decrease in bond trading. There is a high correlation between negatively increasing deposit facility rate and self-trading bonds volume (+0,918). The banks shy away from these investments and are looking for alternative investments. You can only find them in poor credit ratings or in other asset classes such as stocks. The author analyzes this development in the next step.

Correlation

		deposit_facility	self_trading_stocks
deposit_facility	Pearson-Correlation	1	-,796**
	Sig. (2-tailed)		<,001
	N	19	19
self_trading_stocks	Pearson-Correlation	-,796**	1
	Sig. (2-tailed)	<,001	
	N	19	19

** . The correlation is significant at the 0.01 level (2-tailed).

Figure 9.

In fact, the volume of equity investments increases as the deposit facility becomes negative. This is a statistically very significant result. This confirms the theory from the previous paragraph. Since the total volume of proprietary trading is falling, the bond volume would have to decrease significantly over the same period of time.

Indeed, the visualization shows this result. Statistically, there is a highly significant result with a p value <0.1% and a correlation of -0,796. Since the volume of the bonds is significantly higher, and thus falls considerably more than the volume of the shares grows, the total self-trading decreases significantly as a result.

Now the author extend it to multiple regression analysis. This supports the results of the correlation analysis.

Modell	R	R-Quadrat	Korrigiertes R-Quadrat	Standardfehler des Schätzers
1	,412 ^a	,170	-,025	1,23063%

Figure 10.

The multiple regression model for the key figures of the balance sheet is not significant $p > .001$. The interpretation of the results is inapplicable in this case.

4.2 Results in Profit and Loss Statement

After evaluating the balance sheet variables for correlation with the deposit facility rate, the variables of the profit and loss statements are now assessed.

The flattening of the yield curve causes the banks to lose profitability. The difference between long-term and short-term rates is decreasing. This makes maturity transformation less profitable. The result is lower margins for the banks (Prof. Dr. Illing, 2018). The negative interest rate policy limits maturity transformation even further (Bouchinha & Burlon, 2020). If the banks achieve clearly positive results from the maturity transformation in “normal” times, these become negative as soon as the short-term rate approaches the zero-interest rate line. The effect is so strong that about 1% of the margin is lost. The effects are even more serious if the short-term rate breaks below the zero-interest rate line. Then the effect increases again by around 10% compared to the previous scenario. This means that the zero-lower bound for deposit rates plays a crucial role in measuring the effects of the NIRP on banks (Klein, 2020).

The total earnings therefore tend to decrease economically with increasingly negative deposit facilities. The statistical correlation test doesn’t show significance between independent variable deposit facility rate and dependent variable total earnings over the time period NIRP.

Correlation

		deposit_facility	total_earnings
deposit_facility	Pearson-Correlation	1	-,010
	Sig. (2-tailed)		,967
	N	19	19
total_earnings	Pearson-Correlation	-,010	1
	Sig. (2-tailed)	,967	
	N	19	19

Figure 11.

Earnings from interest are particularly notable, because this relates to the core business of the banks and is directly related to the key interest rate of the ECB. In this respect, there should be a logical direct connection here. Unfortunately, the correlation test again doesn't show a sufficient significant level with a p value >0.1%.

Correlation

		deposit_facility	earnings_from_interest
deposit_facility	Pearson-Correlation	1	-,021
	Sig. (2-tailed)		,932
	N	19	19
earnings_from_interest	Pearson-Correlation	-,021	1
	Sig. (2-tailed)	,932	
	N	19	19

Figure 12.

Regardless of the results of the statistical correlation tests, Prof. Dr. Illing, 2018, as well as Bouchinha and Burlon, 2020, and Klein, 2020, affirm that profitability decreases during NIRP. Since the author has not yet been able to provide any statistical evidence for these declarations regarding the volume of income, key figures are now being checked.

As a consequence of their affirmations, banks would have to lose profitability. Two measurands for this are the CIR and the ROE. Both decline as the deposit facility becomes increasingly negative.

Correlation

		deposit_facility	RoE
deposit_facility	Pearson-Correlation	1	,077
	Sig. (2-tailed)		,753
	N	19	19
RoE	Pearson-Correlation	,077	1
	Sig. (2-tailed)	,753	
	N	19	19

Figure 13.

Correlation

		deposit_facility	CIR
deposit_facility	Pearson-Correlation	1	-,067
	Sig. (2-tailed)		,786
	N	19	19
CIR	Pearson-Correlation	-,067	1
	Sig. (2-tailed)	,786	
	N	19	19

Figure 14.

ROE, as well as CIR show statistical p values >1.0%. So, with correlation test no significance can be proven.

In all tested cases of the profit and loss variables, no statistical connection with the negative deposit facility rate over the NIRP period can be proven.

Now, multiple regression of the investigated determinants is tested with the NIRP.

Modell	R	R-Quadrat	Korrigiertes R-Quadrat	Standardfehler des Schätzers
1	,789 ^a	,622	,586	,85975

Figure 15.

The regression model for Deposit Facility Rate with ROE, CIR and NIM, is significant and explains 62 % of the variance, $F(3,31) = 12,580, p < .001$.

Falling deposit facility rate leads to falling NIM and ROE. CIR remains relatively constant.

In summary, it can be stated that the multiple regression analysis establishes a causal statistical relationship between the key figures examined and declining profitability.

5. Discussion

The economic theory describes a decline in the deposit facility, i.e. the key interest rate, into negative territory, which results in a significant decline in bank profits. As a result, banks are increasing their willingness to lend, while at the same time increasing customer demand. In addition, banks are looking for alternative ways to generate returns, for example in their own business. But the reports speak of a sustained decline in total earnings and the profitability of the banks. (Prof. Dr. Illing, 2018) (Klein, 2020)

The chapter examined this statistically. An increase in the credit risk volume was indeed verified. In the area of loans in particular, there was a very strong to highly significant correlation between the decrease in the deposit facility and the increase in loans. At the same time, it was statistically proven that banks are increasingly transferring from bonds to shares in proprietary trading in order to increase returns.

Overall, there is a very strong statistical connection between the risk developments in the balance sheet due to the negative interest rate policy. In this case hypothesis is accepted.

In the p/l statement, however, there is no statistical evidence of a connection with the negative deposit facility. Here the hypothesis must be rejected.

The research question, “How causally does the negative interest rate policy affect the banks' annual reports?”, can be answered as: NIRP has a causal and significant positive effect on growing credit risk volume. However, this does not help to stop the falling profits and falling profitability. To focus on the hypothesis ”ECB's NIRP leads significantly to increasing risks for commercial banks in profitability and stability”, it can finally be stated, that the NIRP of the ECB is causally and significantly responsible for the fact that the (risky) credit volumes of the banks continuously rise over time. Accordingly, it also threatens the financial stability of commercial banks.

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