The pass-through effect of unconventional monetary policy to net interest income structure of European banks

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THE PASS-THROUGH EFFECT OF UNCONVENTIONAL MONETARY POLICY TO NET INTEREST INCOME STRUCTURE OF EUROPEAN BANKS

Abstract

Purpose: Financial banking intermediaries are sensitive to changes in market interest rates. The volatility of market interest rates affects the level of bank net interest income and determines the bank interest rate policy. Banks are actively managing structural interest rate risks to mitigate the negative effects of changes in market interest rates. The post-crisis period is characterised by unconventional monetary policy, and one of the basic objectives of the monetary instrument is a negative interest rate policy. This paper researches the effects on the bank net interest income structure with an impact on bank performance indicators. The basic research hypothesis is that during the financial crisis and a negative interest rate policy, the movement of bank interest income does not converge compared to a bank interest expense.

Methodology: According to the characteristics of the dataset, which includes 32 listed banks from Great Britain, Switzerland and the European Union for the period 2002-2019, panel data analysis is applied. To analyse the effect of the interest rate level on total interest income and total interest expense, we formed two models. Fixed-effects models were used for parameter estimation.

Results: A bank interest expense is more sensitive to unconventional macroeconomic policy than bank interest income.

Conclusion: The traditional interest earning customer related business can enable banks to stabilise the bank performance indicator during market disruption.

Keywords: Unconventional monetary policy, net interest income, bank, bank management

1. Introduction

The main responsibility of the European Central Bank (ECB) is to maintain appropriate monetary policy and price stability. During the last financial crisis the ECB started with a negative interest rate policy. A central bank negative interest rate is part of unconventional policy and it is usually applied during the crisis period. Unconventional monetary policy aims at the medium- and long-term interest rate to stimulate money demand and investments. A negative interest rate policy makes a significant effect on business performance of commercial banks. In economic theory, low interest rates should increase bank lending activities, dissimulate bank deposit holders, allocate saving funds to capital market instruments, decrease interest income and disturb bank profit. The central bank monetary policy transition mechanism from policy to market interest rates is making an impact on the bank funding structure. Low interest rates will make investing in bank deposits less attractive, which decreases credit capacity of the banking sector. To make the funding source stable, most banks follow the zero interest rate policy on client deposits even when the market rates have a negative value. To retain their profitability, banks should increase interest rate margins where the lending rates have a slower downward trend than deposit rates. Unconventional monetary policy forced banks to manage interest income and interest expenses to keep the client related business and market share. The main research objective of the paper is to analyse the effect of the negative interest rate on a particular component of bank net interest income. In comparison with other similar research, this paper compares the market interest rate impact on bank interest income and interest expenses, separately taking into consideration other relevant endogenous and exogenous parameters. The research hypothesis is that interest expenses are more sensitive to unconventional monetary policy during the crisis period than interest income. Interest rates on the loan portfolio are more stable during the crisis period. Banks are motivated to preserve profitability indicators as well as to cover enlarged credit risk on the loan portfolio. The research hypothesis will be analysed on the system of important European banks using panel data estimation during the period 2002-2019.

2. Literature review

After the sovereign debt crisis, unconventional monetary policy should stabilise the European monetary system and the interbank market with a positive effect on lending activities and investor expectations on long-run market stability (Piplica, 2013). During the 2007 financial crisis, there were many research papers on a low interest rate policy impact on bank net interest income (Klein, 2020). Bernanke and Reinhart (2004) questioned the effectiveness of monetary policy of low interest rates. Bullard (2009) suggests that a quantitative approach to solving emerging problems is more appropriate in the current environment, while interest rate policies were more appropriate in the past. His approach is that central banks should expand permanent parts of their balance sheets and maintain the monetary base at an increased rate. Bullard also suggests inflation targeting to help control inflation expectations. Cecioni et al. (2011) agree that empirical research has shown that the application of unconventional measures in monetary policy have been effective with a significant impact on the economy. Weber et al. (2009) showed that the general principles of the Eurosystem's monetary policy remain appropriate despite the significant turning points of the transmission mechanism. Duarte and Modenesi (2015) concluded that in spite of the gradual reduction in unconventional ECB measures, sustainable growth in the euro area could not be based on monetary policy but needs to be complemented with countercyclical fiscal policy measures as well as institutional reforms. Ozhan et al. (2013) argue that despite certain constructive implications of unconventional measures, the implementation of such monetary policy does not guarantee long-lasting effects. The authors propose that appropriate procedures should be taken to rehabilitate the financial sector that will be more aggressive in lending to investment activities.

The theoretical and empirical research on the relationship of interest rate volatility and bank performance indicators has attracted the attention of many authors. In a banking firm, there is constant asynchronous information on the loan and deposit side that affects bank net interest income. Ho and Saunders (1981) developed the model of maximising the bank utility function with optimising the interest margin at the level of accepted risk aversion. Efficient interest rate risk management should immunise the bank position of market interest rate

volatility. That fact encourages English (2002) to analyse the sensitivity of the interest margin to interest rate volatility in developed financial markets. Analysing a small open economy, Peng (2003) also found a strong relationship between interest rate movements and bank profitability. Other studies focused on changes in the regulatory framework and the level of the banks' net interest margin (Saunders & Schumacher, 2000). The new regulation required banks to hold more stable customer deposits with higher costs compared to deposits in the interbank market, which increased funding costs (Ötker & Pazarbasioglu, 2010). Unconventional and low interest rate monetary policy has changed some traditional views of interest rate risk management in commercial banks (Ercegovac & Buljan, 2017). Borio et al. (2017) found a positive relationship between bank profits and interest rates and also found that the relationships are more significant when market interest rates are lower. Claessens et al. (2017) reached similar conclusions when analysing net interest income relative to total earning assets for a wide range of banks over the 2005-2013 period. Klein (2020) concludes that net interest income is always positively related to bank lending activities absent during the post-crisis deleveraging process. Demiralp et al. (2017) extended the research and concluded that the sensitivity of net interest income is related to the bank business model. They defined the unconventional monetary channels and emphasised that wholesale and investment banks are more flexible in balance sheet reorganisation and more efficient in structural interest rate risk management. The complexity of the transmission channels of unconventional monetary policy is the challenge for bank management in optimising bank performance measures (Dell' Ariccia et al., 2017).

3. Research data

To analyse the impact of the interest rate level on each component of net income, we formed two models. In the first model, we analysed the effect of the interest rate level on total interest income. In the second model, we analysed the effect of the interest rate level on total interest expense. After the 2007 crisis, monetary authorities promote an expansionary monetary policy with the zero interest rate set as its target. The end-of-year interest rates used in the model during the period under study are shown in the following table.

Table 1 Currency structure of the three month market interest rates (in %, end-of-year data)[1]

Year	CHF	EUR	GBP
2002	0.6167	2.2971	4.0225
2003	0.2600	2.1240	4.0375
2004	0.7167	2.1550	4.8850
2005	1.0100	2.4880	4.6394
2006	2.1025	3.7250	5.3200
2007	2.7567	4.6840	5.9938
2008	0.6617	2.8920	2.7700
2009	0.2517	0.7000	0.6050
2010	0.1700	1.0060	0.7575
2011	0.0517	1.3560	1.0801
2012	0.0120	0.1870	0.5150
2013	0.0230	0.2870	0.5253
2014	-0.0630	0.0780	0.5640
2015	-0.7560	-0.1310	0.5904
2016	-0.7292	-0.3190	0.3666
2017	-0.7462	-0.3290	0.5211
2018	-0.7134	-0.3090	0.9124
2019	-0.6884	-0.3830	0.7916

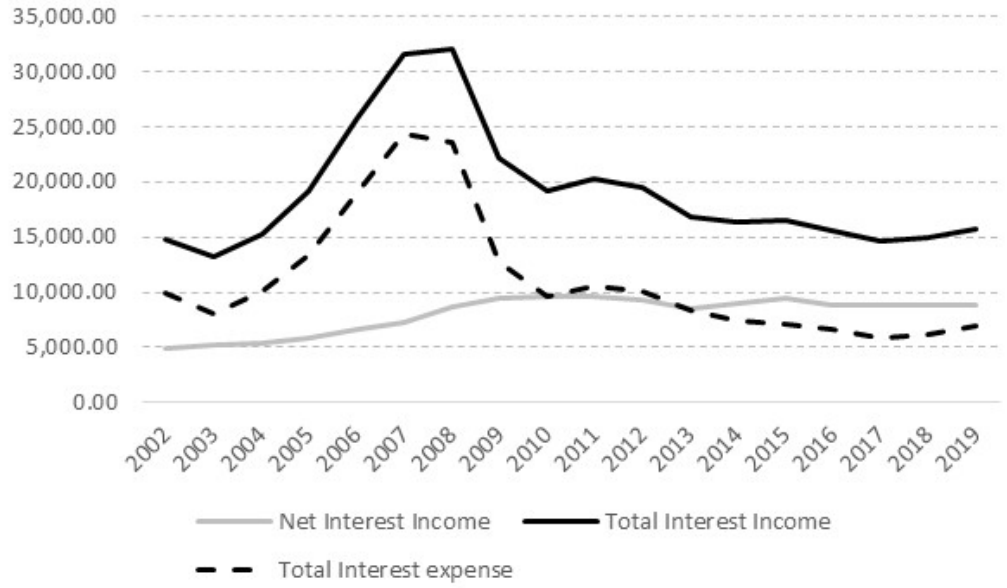
Source: Bloomberg

The data in the table confirm the sharp decline in interest rates from 2008 with the negative value of EUR and CHF interest rates. This fact challenged the banks' interest rate policy and structural risk management, as the focus of fund transfer pricing policy shifted from borrowing costs to lending income. To capture the change in sensitivity of the impact of the interest rate level on total interest income and total interest expense, we compared the parameters of the model in the whole period (2002-2019) with the parameters in the sub-period (2012-2019). The model under study includes balance sheet data and market parameters of 32 listed banks from Great Britain, Switzerland and the European Union.[2] The following figure shows the dynamic lines of interest income and interest expenses, including net interest income, during the period under study.

1 For non-euro European banks, the euro exchange rate will be used to adjust the national monetary policy to the ECB.

2 Banks included in the model are as follows: Abn Amro, Banco Bilbao Vizcaya Argenta, Banco de Sabadell Sa, Banco Santander Sa, Bankia Sa, Bankinter Sa, Barclays Plc, BNP Paribas, Caixabank Sa, Commerzbank Ag, Credit Agricole Sa, Credit Suisse Group Ag, Danske Bank As, Deutsche Bank Ag, Dexia Sa, DNB Asa, Erste Group Bank Ag, HSBC Holdings Plc, Intesa Sanpaolo, Jyske Bank, KBC Group Nv, Lloyds Banking Group Plc, Nordea Bank Abp, Raiffeisen Bank International, Royal Bank of Scotland Group, Skandinaviska Enskilda Bank, Societe Generale Sa, Standard Chartered Plc, Swedbank, UBS Group Ag, and Unicredit Spa.

Figure 1 Average net interest income component of selected banks (in million EUR)



Source: Bloomberg, annual reports, authors' calculation

It is clear from Figure 1 that during the research period the dynamic lines of interest income and interest expenses, including net interest income, do not have the same slope. Banks manage interest rate policy in new market conditions to achieve required performance. They used to exploit liquidity transformation of funding lines under the zero funding costs using liquidity profile internal modelling to match liquidity requirements.

Table 2 shows summary statistics for the variables. As can be seen from the table, the average total interest income of the banks during the period under study was 18,979.95 million EUR, with a maximum of 104,515 million EUR (Dexia Sa. in 2008), and a minimum of 552 million EUR (Jyske Bank in 2004).

The average total expense of the banks was 10,913 million EUR. The highest and the lowest total interest expense were made by Dexia Sa. in 2008 (101,786 million EUR) and Jyske Bank in 2013 (181 million EUR), respectively.

Although the average country risk premium was 9.16, standard deviation was only 2.03, showing that resident banks' systemic risk remained relatively stable over the period under study.

HSBC Holdings Plc had the highest total equity in 2015 (181,776 million EUR), which is significantly higher than the average total equity of banks in the period under study (35,056 million EUR).

The average non-performing asset of banks amounted to 12,656 million EUR, with the highest value achieved by Intesa Sanpaolo in 2014.

Standard deviation of a total risk-based capital ratio (4.11) has relatively small variations due to a regulatory determination of the minimum indicator value.

The average three month interest rate of banks was 1.33%. Although it was positive for most of the period, Table 1 shows the effect of unconventional monetary policy during the post-crisis period and the negative interest rates for the EUR and CHF currency structure.

GDP growth and CPI with the highest (7.5% and 4.20, respectively) and lowest (-8.28% and -1.30, respectively) values show that bank managed within the business cycle and the time horizon of the study is appropriate.

Table 2 Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Total interest income (TII)	553	18,979	16,205	552	104,515
Total interest expense (TIE)	551	10,913	11,961	181	101,786
Country risk premium (CRP)	416	9.16	2.03	4.36	16.15
Total equity (TEQ)	553	35,056	31,635	-6,055	181,776
Non-performing asset (NPF)	531	12,656	15,011	35,67	84,079
Total risk-based capital ratio (RCR)	544	15.07	4.11	7.70	31.80
Three month interest rate (MIR)	576	1.33	1.64	-0.76	5.99
GDP growth (GDP)	558	1.44	1.94	-8.28	7.50
Consumer price index (CPI)	540	1.64	1.11	-1.30	4.20

Source: Bloomberg, annual reports, authors' calculation

4. Research model definition

Given the theoretical framework and previous research, we used five independent variables in the first model, i.e. the country risk premium, non-performing assets, total equity, the total risk-based capital ratio and a three-month interest rate. We also used two control variables, i.e. GDP growth and the consumer price index. The country risk-free rate and total loans were omitted due to their correlation with other independent variables. The data were taken from the Bloomberg database including annual reports of particular banks. All balance sheet data are nominated in millions of EUR.

According to the characteristics of our dataset, panel data analysis is applied. To analyse the effect of interest rate level on total interest income, we formed the following model:

$$TII_{it} = \alpha_0 + \alpha_1 CRP_{it} + \alpha_2 NPA_{it} + \alpha_3 MIR_{it} + \alpha_4 RCR_{it} + \alpha_5 TEQ_{it} + \alpha_6 GDP_{it} + \alpha_7 CPI_{it} + \varepsilon_{it},$$

where TII_{it} represents total interest income of the bank i in year t, CRP_{it} stands for the country risk premium in the countries of residence of the banks (Great Britain, Switzerland, Austria, Belgium, Denmark, Germany, Finland, France, Italy, the Netherlands, Norway, Spain and Sweden) in the 2002-2019 period, NPA_{it} denotes the non-performing asset of the bank i in year t, MIR_{it} denotes the three month interest rate of the bank i in year t, RCR_{it} denotes the total risk-based capital ratio of the bank i in year t, TEQ_{it} denotes total equity of the bank i in year t, GDP_{it} denotes the gross domestic product growth rate of the country i in year t, CPI_{it} denotes the consumer price index of the countries of residence of the banks in the 2002-2019 period, α_0 is a constant, and it is assumed that ε_{it} are identically and independently distributed error terms. All variables were log-transformed.[3]

Parameter estimation was performed using fixed effects models. The fixed effects model controls for the difficult-to-measure time-invariant variables with time-invariant effects, which reduces the problem of endogeneity due to omitted variables. The results of the Hausman test confirm the suitability for use of the fixed effects model.

The results of the modified Wald test confirm the heteroscedasticity problem, and the results of the Wooldridge test confirm the serial autocorrelation problem. To eliminate the problems of heteroscedasticity and autocorrelation, we used robust standard errors.

To analyse the effect of the interest rate level on total interest expense, we formed the following model:

$$TIE_{it} = \alpha_0 + \alpha_1 CRP_{it} + \alpha_2 TEQ_{it} + \alpha_3 MIR_{it} + \alpha_4 GDP_{it} + \alpha_5 CPI_{it} + \varepsilon_{it},$$

where TIE_{it} represents total interest expense of the bank i in year t and TEQ_{it} denotes total equity of the bank i in year t.

The results of the Hausman test confirm the suitability for use of the fixed effects model. All variables were log-transformed. As in Model 1, the modified Wald test and the Wooldridge test confirmed the problem of serial autocorrelation and heteroscedasticity, which were eliminated by using robust standard errors.

3 For variables that contain negative values, a constant value is added to the data before applying the log transformation.

5. Results and discussion

The Panel 1 results are shown in the following table.

Table 3 Results of selected total interest income variables

Total interest income (TII) / Period	2002-2019	2012-2019
Country risk premium (CRP)	-0.063892	-0.02128
	(0.091839)	(0.062265)
Non-performing asset (NPA)	0.1842188	0.2074903
	(0.0285339)***	(0.0442478)***
Total equity (TEQ)	-0.0006172	-0.0347826
	(0.0295979)	(0.0047312)***
Total risk-based capital ratio (RCR)	-0.5676411	-0.15791
	(0.1254287)***	(0.1506534)
Three month interest rate (MIR)	0.0850665	0.0314196
	(0.0292845)***	(0.0162041)*
GDP growth (GDP)	-0.0433059	-0.2418163
	(0.0462599)	(0.1003541)**
Consumer price index (CPI)	-0.0466064	-0.0428189
	(0.0166684)***	(0.0204268)**
Constant	9.736219	8.98861
	(0.5640523)***	(0.7188938)***

*, **, *** indicate 10%, 5% and 1% levels of significance

Source: Bloomberg, annual reports, authors' calculation

The Panel 1 results confirm a negative statistically insignificant impact of the country risk premium on total interest income. Comparing the model coefficients for the entire period under study (2002-2019) and the post-crisis period (2012-2019), we find that the country risk premium on total interest income is smaller and not statistically significant in the post-crisis period. This is due to the strong effect of unconventional macroprudential regulation that targets low interest rates and enforces the repurchase programme for securities on bank balance sheets. In this way, regulators minimise the negative effects of bank restructuring and adjustment to Basel III requirements on banks' liquidity and capital positions (Baumeister & Benati, 2013).

The impact of non-performing assets on total interest income is positive and statistically significant in both pre- and post-crisis periods. Non-performing assets are directly related to net interest income, adjusted for provisioning costs for certain interest-earning assets.

Total equity has a weak negative and statistically insignificant impact on total interest income throughout the period under study. Comparing the impact of equity volume in the post-crisis period, it is clear that the impact is stronger due to the substantial capitalisation of banks enforced by regulatory requirements.

The total risk-based capital ratio has a negative impact on total interest income throughout the period under study. The impact in the post-crisis period is smaller and not statistically significant. Banks increased the ratio in the post-crisis period and replaced a significant portion of the loan portfo-

lio with lower-income sovereign bonds. The effect was regulatory and had no economic impact on the bank's interest income.

The three month interest rate has a positive impact on total interest income. In the post-crisis period, the effect is less significant. Despite the embedded floor, banks have increased their credit risk premiums in order to stabilise net interest income due to the increase in the share of non-performing loans (Eggertsson et al., 2019).

The impact of GDP is negative but not statistically significant in the period under study and more significant in the post-crisis period due to the stable GDP growth line after the crisis shock. Lending activities of banks are the most stable activities during the systemic financial crisis with a time lag in the adjustment of lending rates to market changes. The unexpected results are directly related to long-term unconventional monetary policy with the zero interest rate and liquidity access channels (Heider et al., 2019).

The consumer price index has a negative impact on total interest income. In the post-crisis period, the effect of the consumer price index was unchanged compared to the total period under study.

The Panel 2 results are shown in the following table.

Table 4 Results of selected total interest expense variables

Total interest expense (TIE) / Period	2002-2019	2012-2019
Country risk premium (CRP)	-0.3985755	-0.1821387
	(0.1147096)***	(0.1950606)
Total equity (TEQ)	-0.0515851	-0.0750777
	(0.0287573)*	(0.0086437)***
Three month interest rate (MIR)	0.281764	0.1415343
	(0.0280129)***	(0.0568072)**
GDP growth (GDP)	-0.1562996	-0.9749828
	(0.0518124)***	(0.1996858)***
Consumer price index (CPI)	-0.0953442	-0.1664606
	(0.0407472)**	(0.0634555)**
Constant	10.64512	12.15014
	(0.3687717)***	(0.5235712)***

*, **, *** indicate 10%, 5% and 1% levels of significance

Source: Bloomberg, annual reports, authors' calculation

The results confirm a negative statistically significant impact of the country risk premium on total interest expense over the period 2002-2019. The effect of the country risk premium is negative and not significant in the post-crisis period due to the same explanatory reasons of the influence of bank interest income. An overly liquid banking sector during the implementation of unconventional policy combined with a low interest rate policy reduced the sensitivity of banks' interest expenses to systemic risk conditions.

Total equity has a negative effect on total interest expense in both periods under study. The statistical significance is stronger in the post-crisis period due to the relative importance of bank capital structure compared to the funding of interest expenses.

The three month interest rate has a positive impact on total interest expense. The impact is lower in the post-crisis period due to the zero floor on most client deposits of the banks (Beau et al., 2014). Banks manage different funding options during the period

when they exploit the effects of expansionary monetary policy (Ginelli et al., 2018). This caused a discrepancy compared to research conducted during the going concern macroeconomic conditions.

The effect of GDP is negative in both periods under study. The comparison shows a stronger effect after 2012, also an increase in savings, but the strong effect of zero interest rate monetary policy lowers the funding costs of banks (Han & Melecky, 2013).

The consumer price index has a negative statistically significant impact on total interest expense during the total period under study. In the post-crisis period, the impact of the consumer price index on bank interest expenses is unchanged. The impact of consumer prices on the nominal interest rate is constant.

6. Conclusion

Net interest income is one of the most important performance measures of the banking financial intermediaries. The structure of net interest income is directly related to market interest rates, the level of systemic risk, the volume of non-performing loans, client risk profiles, and the macroeconomic environment. Many authors indicated the insufficient pass-through effect of interest rate monetary policy on the bank lending channel (Stráský & Hwang, 2019). The negative interest rate policy transfers lower market rates and lower rates to interbank deposits without a similar effect on bank loans and deposit rates (Heider et al., 2021). Therefore, the research findings of this paper suggest a differential sensitivity of banks' interest income and interest expense to unconventional monetary policy. The sample results show that unconventional monetary policy of negative interest rates caused a convergence of banks' funding costs toward zero. Banks took advantage of free funding and protected the level of their net interest margins by keeping lending rates above market interest rates. With the higher interest income, bank intermediaries would have had to cover increased regulatory costs and the risk of non-performing loans, including the loss of income from unfair competition from shadow banks (Doyle et al., 2016). Unconventional monetary policy has not helped to expand bank lending and lower commercial sector loan prices, which were the main objectives of monetary policy to support economic growth (Roengpitya et al., 2017). Contrary to monetary policy expectations, the banking sector faced additional and significant asset and liability management costs due to negative interest rates (Ercegovac & Buljan, 2017). The results of the study can recommend monetary authorities to work with prudential authorities to take advantage of the impact of low market interest rates. The research can analyse the lack of positive effects of unconventional monetary policy and appropriate complementary prudential measures to support lending. Otherwise, banks will adjust the structure of their assets and switch to risk-free positions with positive returns, which will reduce lending and increase net interest margin (Bubeck et al., 2020). Without regulatory convergence, the contribution of the banking system to the restructuring of the global economy will be insufficient (Roengpitya et al., 2017).

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