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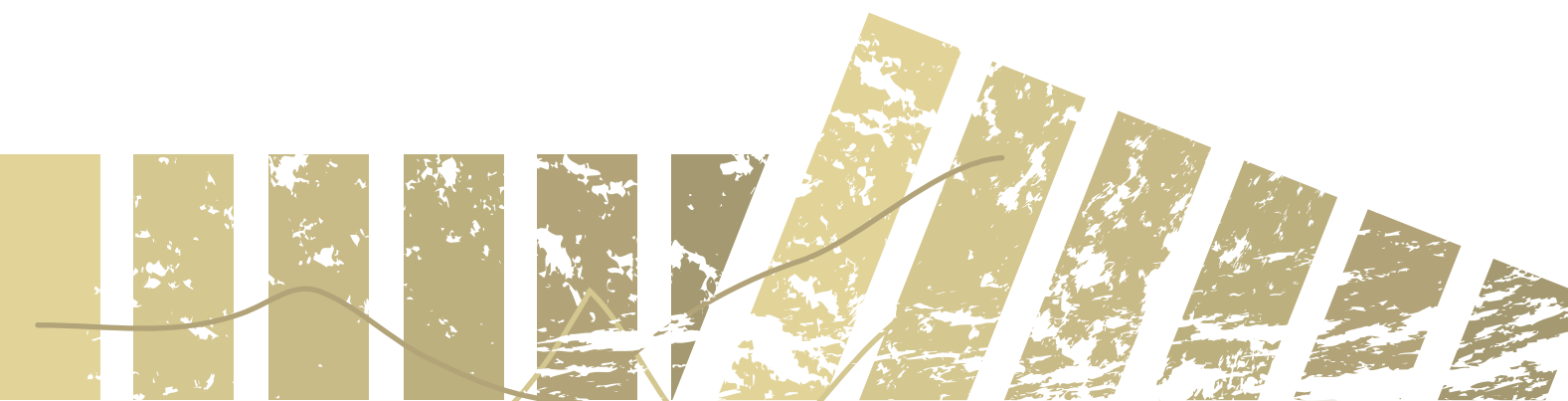
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THE IMPACT OF THE LOW INTEREST RATE ENVIRONMENT ON THE PROFITABILITY OF THE EUROPEAN BANKING SECTORS

VPLYV PROSTREDIA NÍZKYCH ÚROKOVÝCH SADZIEB NA ZISKOVOSŤ EURÓPSKYCH BANKOVÝCH SEKTOROV

ABSTRACT

The current environment of accommodative monetary policy is very challenging for Euro area banks. This is largely due to the falling interest rates and shrinking interest margins putting net interest income under pressure. Based on Consolidated banking data processed by ECB, a strong positive correlation between the net interest income and loans in banks' balance sheets was confirmed. This relationship applies for both the status of individual variables as well as their year-on-year dynamics. Similar relationship was observed between interest margins and net interest income dynamics. Therefore a combination of falling interest margins and subdued lending dynamics creates increasingly challenging conditions to bank profitability. This effect is however heterogeneous across European countries. Traditional banking sectors including the Slovak banking sector are more sensitive to a decrease in net interest income.

ABSTRAKT

Súčasnú prostredie uvoľnenej menovej politiky je pre banky v eurozóne veľkou výzvou. Dôvodom sú najmä klesajúce úrokové sadzby a znižujúce sa úrokové marže, ktoré vytvárajú tlak na čistý úrokový príjem. Na základe konsolidovaných bankových údajov spracúvaných Európskou centrálnou bankou sme potvrdili silnú koreláciu medzi čistými úrokovými príjmami a úvermi v bilanciách bánk. Vzťah platí tak pre stav jednotlivých premenných, ako aj pre ich medziročnú dynamiku. Podobná súvislosť sa preukázala medzi čistým úrokovým príjmom a úrokovou maržou. Z tohto dôvodu vytvára kombinácia klesajúcich úrokových marží a slabšej úverovej aktivity veľmi náročné podmienky pre ziskovosť bánk. Tento efekt však nie je rovnaký vo všetkých krajinách Európskej únie. Tradičné bankové sektory, akým je aj slovenský bankový sektor, sú na pokles čistých úrokových príjmov citlivejšie.

KEY WORDS

interest rates, interest income, bank profitability

KLÍČOVÉ SLOVÁ

úrokové sadzby, úrokový príjem, ziskovosť bánk

1 INTRODUCTION

Central banks around the world were given a mandate and tools to determine the level of short-term interest rates. This is perfectly in line with their primary objective to safeguard price stability. According to the mainstream economic theory, lower nominal interest rates should decrease also real interest rates due to price stickiness. Also, larger liquidity available on the interbank market created by the central bank should push on lending activity in the banking sector. According to this concept, both

lower real interest rates and increasing volumes of new loans provided to households and enterprises should increase investments in the corporate sector and support the demand for durable goods, such as residential property. Accelerated pace of investments is expected to increase output and inflation expectations. While usually banks are not at the forefront when describing the monetary policy and the transmission mechanisms of this policy, in traditional financial systems dominated by banks (like the financial system in general in Europe) these institutions play crucial role in the monetary policy, through e.g. the interest rate channel or the credit channel (as described by Mukherjee and Bhattacharya, [13] or by Bernanke and Gertler, [2]). It is therefore clear that efficient banks are one of the necessary conditions to a smooth and successful process of monetary transmission.

However, banks do not view themselves as a crucial element of monetary policy process but as business entities with objectives comparable to other financial and non-financial industries. As any other companies, to continue their business, banks must be able to generate profit. Therefore there is a fundamental weakness in the monetary theory. According to Mishkin [12] the interest rate channel of monetary policy works even if nominal interest rates hit a floor of zero during a deflationary period. Mishkin states this is due to the focus on real interest rates rather than nominal interest rates. But this concept omits the influence of zero nominal interest rates on the banking sector. While on average net interest income makes at least two thirds of the total net operating income of European banking systems, there are banking systems (like Slovakia, Malta or the Netherlands) where this share is even higher, sometimes close to 90%. Due to the environment of historically low interest rates, the net interest income (together with net fee and commission income) and thus the profitability of the banking sectors throughout Europe became under question in the last period. This phenomenon can be viewed also from a different perspective. According to Mario Draghi (ECB [6]) interest rates cannot go as low as the ECB would want without having a negative consequence on the banking sector profitability. Therefore, in this paper we focus on the effects of the two key determinants of the Euro Area (EA) and broadly, European Union (EU) banks profitability, i.e. total loans and net interest income.

The paper is organized as follows: in section 2 we give a brief overview of the literature related to the impact of low interest rates on banks. The next section is devoted to the description of the data used for the analysis. Section 4 consists of the description of the methodology and the empirical analysis examining how net interest income together with net fee and commission income is affected by the basic balance sheet items and by a possible set of indicators capturing the interest margin in the banking systems. The last section summarizes our main findings.

2 LITERATURE

According to the European Central Bank [5] an accommodative monetary policy stance focused on price stability can basically lead to potential risks to financial stability. These risks should be addressed by macroprudential policy and can have different forms. For example, De Nederlandsche Bank [4] linked low interest rates to sustainability of banking sector business models. This means that the current business model of Dutch banks is not necessarily structured for a prolonged period of low interest rates and flat yield curve. In addition, Sveriges Riksbank [15] focused on the impact of low interest rates on household indebtedness and real estate prices.

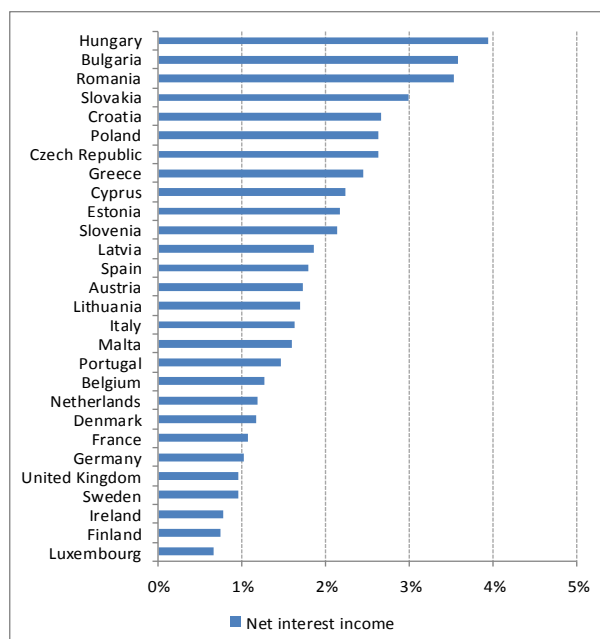
Swedish authorities are concerned about increasing household debt and have already implemented several macroprudential measures including the counter-cyclical capital buffer. Effect of low interest rates on housing loans and property market is also mentioned by Latta [9] and Národná banka Slovenska [14]. Similarly to above-mentioned case of Sweden, Národná banka Slovenska has activated macroprudential instruments focused on retail lending market as described by Jurča [8]. Moreover, low interest rates can also negatively affect lending standards as suggested by Latta [10]. This finding is supported by Lintner [11] concluding that low interest rate environment creates negative incentives in the credit supply, when banks increase the total amount of credit to compensate lower margins. Similar conclusions were published by Banque de France [1] that underlines riskier behaviour of investors in terms of demand for assets with more attractive risk/return ratio.

Moreover, interest rate environment can even change business models of banks. As described by Weistroffer [16] this has happened in Japan, where banks changed their activities towards securities services, government bonds investments or regional expansion. Furthermore, Borio et al [3] found that low interest rates and an unusually flat term structure erode bank profitability.

3 DATA

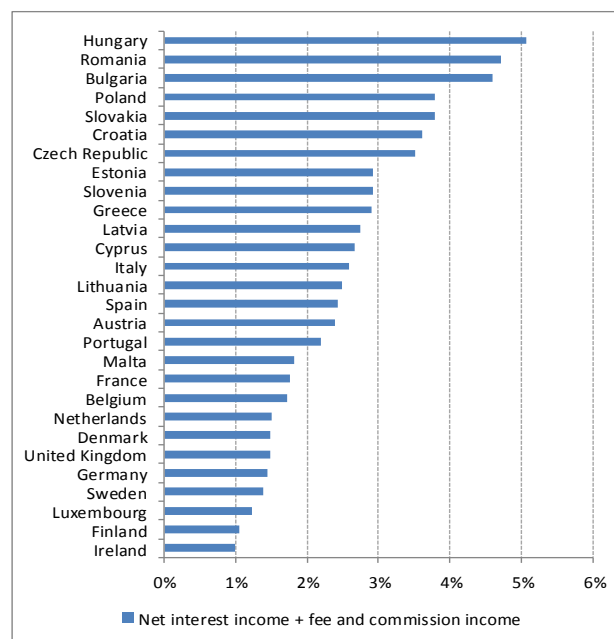
The main focus of the paper is on the impact of the low interest rate environment on the banking sector of EU and particularly EA countries. Therefore, our data set covers the main balance sheet and the profitability items of these banking sectors as well as the possible indicators of the capacity of banks to generate interest income (interest rates, interest margins, government bond yields, etc.). In our analysis we use mostly data from the ECB Statistical Data Warehouse (SDW), particularly Consolidated banking data statistics (CBD, covering balance sheet and profitability items) and Monetary financial institutions interest rates statistics (MIR, covering net interest margins). Data about government bond yields are from Bloomberg and interbank interest rates are from the European Money Markets Institute (EMMI). Due to the structure of CBD, annual data are used from the period 2008-2014, covering all EU countries. As Lithuania and Latvia joined the Euro area only in 2015 and 2014, respectively, these countries are excluded from the EA aggregates.

Chart 1 Net interest income as a share of total assets **Chart 2 Net interest income and net fee and commission income as a share of total assets**



Note: Average figures for the period 2008-2014 are presented.

Source: SDW.



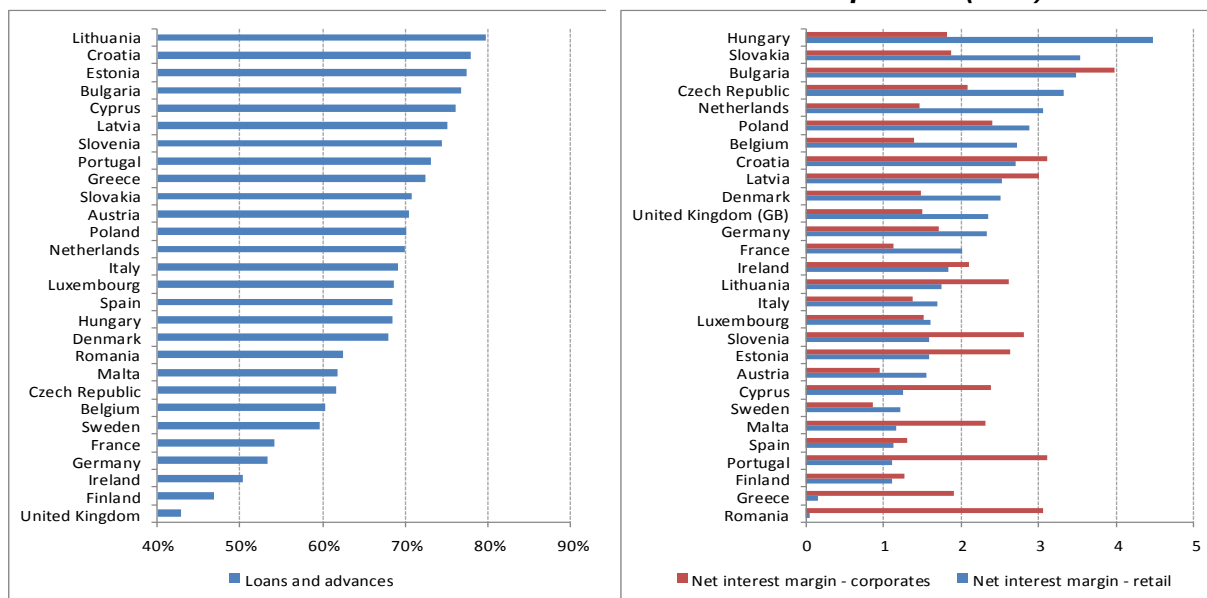
Note: Average figures for the period 2008-2014 are presented.

Source: SDW.

While net interest income is the main source of income for most of the EU banking sectors, there are notable differences between the volumes of this income relative to the size of banking sectors. The average share of net interest income on total assets in the given period ranges between 0.7% (Luxembourg) and 4% (Hungary). Together with net interest income also net income from fees and commissions should be closely followed, as in general, banks may partially compensate for the decrease in interest margin by increasing fees. The average share of net interest income together with net income from fees and commissions on total assets ranges between 1% (Ireland) and 5% (Hungary). In both cases, it is worth noting that among all EA countries the Slovak banking sector it reaches the highest share.

While there are several factors behind these differences, two of them can be considered as the most important, i.e. business model and interest margins of banks. The more traditional is the business model, (i.e. the higher is the share of loans and deposits on the balance sheet), the higher is the importance of interest income for banks. The same way, the higher is the net interest margin, the higher is net interest income relative to the balance sheet. While the average share of loans and advances on total assets ranges from 43% (United Kingdom) to nearly 80% (Lithuania), net interest margin for retail and corporates ranges between 0.1% (Romania, retail – due to negative interest margin reported in years 2008-2010) and 4.7% (Hungary, retail).

Chart 3 Loans and advances as a share of total assets **Chart 4 Net interest margin for retail and non-financial corporates (in %)**



Note: Average figures for the period 2008-2014 are presented.

Source: SDW.

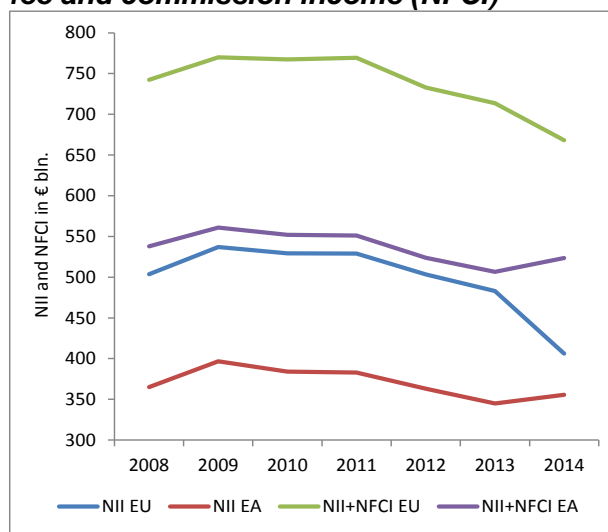
Note: Average figures for the period 2008-2014 are presented.

Source: SDW.

Regarding the trends over time, net interest income in absolute terms decreased for the EU and EA as a whole as well as in the majority of countries. The mild increase in 2014 compared to 2013 is probably related to the change in the coverage of banking sectors due to changes in the methodology of CBD¹. This decreasing trend coexisted with the historical drop of interest rates, when both interbank interest rates and government bond yields decreased significantly in most of the EU countries.

¹ <https://www.ecb.europa.eu/stats/money/consolidated/html/index.en.html>
See background information. Date of access: 3 March 2016.

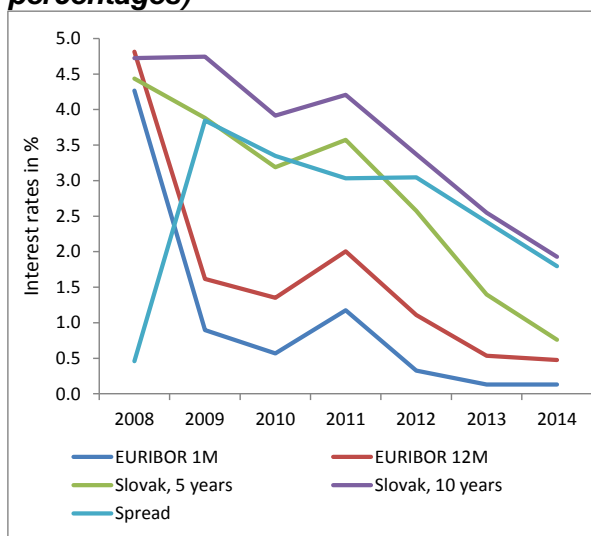
Chart 5 Net interest income (NII) and net fee and commission income (NFCI)



Note: The decrease in 2014 in case of EU aggregate is caused also by missing data about net interest income for UK.

Source: SDW.

Chart 6 Market interest rates (in percentages)

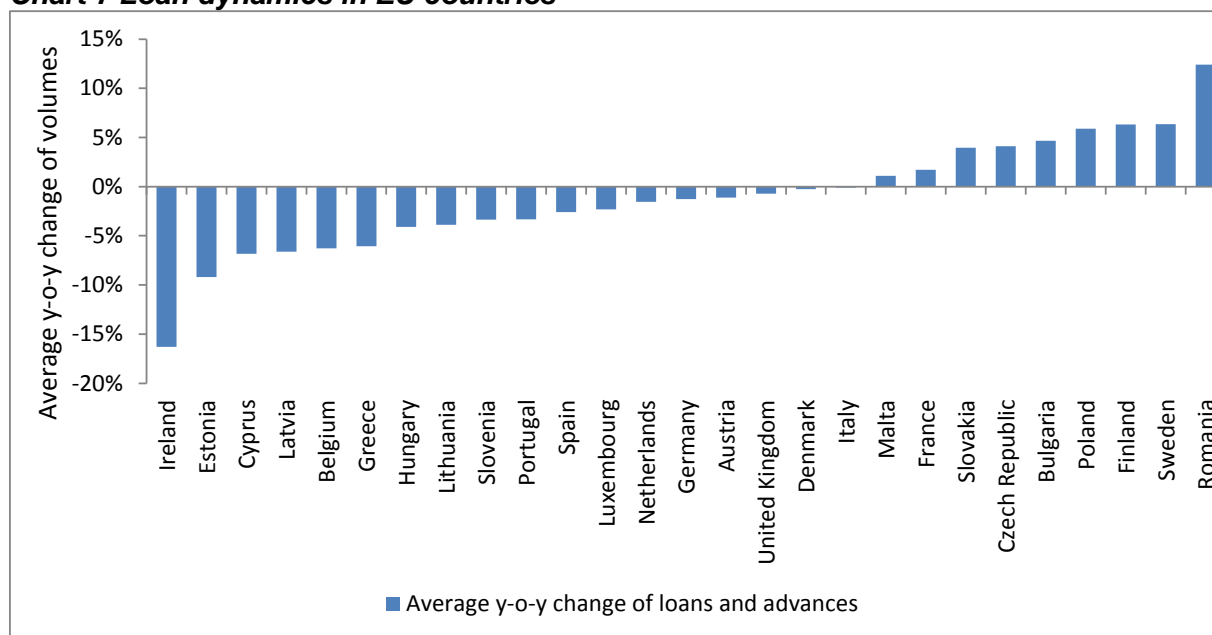


Note: EURIBOR interest rates with 1 month and 12 month maturity and 5 years and 10 years Slovak government bond yields are displayed. Spread is calculated as the difference between 10 years Slovak government bond yield and 1M EURIBOR.

Source: Bloomberg, EMMI.

While there are considerable differences in the dynamics of total loans and advances in the countries, most of the countries recorded, on average over the respective period, negative loan dynamics. The average y-o-y change ranges between less than -16% (Ireland) and more than 12% (Romania).

Chart 7 Loan dynamics in EU countries



Source: SDW.

4 METHODOLOGY AND ESTIMATION RESULTS

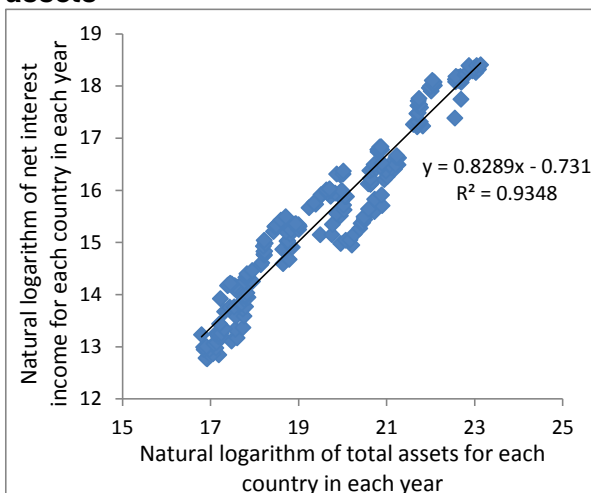
Based on the dataset available, we opted for panel regression techniques when conducting the econometric analysis. The advantage of this methodology is that we can, to a certain extent, capture country-specific differences not included in the explanatory variables by including individual cross-section effects. The first technical question is whether to use fixed or random effects in the model specification. As it is shown e.g. by Hsiao [7], random effects should be included in case the omitted variables captured by these effects are not correlated with the explanatory variables used in the model. As this can't be ensured and the number of cross-sections is not significantly exceeding the number of years included, cross-section fixed effects are included in all model specifications. It means our model takes the form

$$y_{it} = x'_{it}\beta + \alpha_i + \varepsilon_{it},$$

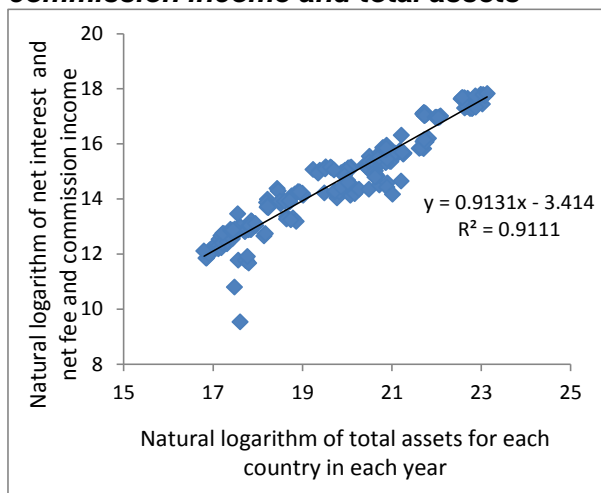
where y_{it} is the dependent variable for country i in year t , x_{it} is the vector of explanatory variables, β is a vector of unknown parameters, α_i is the country-specific constant term and ε_{it} is the disturbance term.

Second, it is not straightforward how to include net interest income and net fee and commission income into the analysis. One option would be to include level data. However, as the correlation between the absolute value of net interest income (and net interest income together with net fee and commission income, respectively) in a given country and year with the value of total assets throughout the sample is very high, all the other potential explanatory variables would have only marginal impact on the results. The possible second option, based on data available, would be net interest income as a share of total net operating income. However, as total net operating income is relatively volatile for a large number of countries, this option is not feasible as well. Therefore, we opted for the share of net interest income (net interest income and net fee and commission income) in total assets as the response variable to be included.

Chart 8 Net interest income and total assets **Chart 9 Net interest income + fee and commission income and total assets**



Source: SDW.



Source: SDW.

Estimation results for net interest income are, to a large extent, in line with our expectations (Table 1). The share of loans on total assets enters estimated equations with a positive coefficient significant on a 1% significance level in each case, both for the EU and EA countries. Together with this variable, also net interest margin in retail segment enters equations with positive coefficient, significant at least on a 10% significance level. Based on the estimation results, it seems that an increase of the share of loans on total assets by 1 percentage point increases the share of net interest income on total assets by approximately 2 basis points and an increase of the interest margin in retail segment by 1 percentage point increases the share of net interest income on total assets by 5-10 basis points.

Table 1 Estimation results – net interest income

	EU countries						EA countries					
Intercept	0.063 (0.86)	0.145 (0.69)	0.119 (0.74)	0.518* (0.06)	1.806*** (0.00)	0.192 (0.58)	-0.002 (1.00)	0.001 (1.00)	-0.010 (0.98)	0.283 (0.32)	1.447*** (0.00)	0.111 (0.76)
Loans/Assets	0.023*** (0.00)	0.022*** (0.00)	0.022*** (0.00)	0.018*** (0.00)			0.019*** (0.00)	0.020*** (0.00)	0.019*** (0.00)	0.017*** (0.00)		
Bonds/Assets	0.012** (0.03)	0.013** (0.02)	0.012** (0.03)		-0.002 (0.69)		0.007 (0.21)	0.008 (0.19)	0.007 (0.21)		-0.004 (0.51)	
Loans+Bonds/Assets						0.019*** (0.00)						0.016*** (0.00)
NIM retail	0.062** (0.04)		0.071** (0.04)	0.071** (0.02)	0.053 (0.10)	0.048 (0.11)	0.102*** (0.00)		0.101** (0.01)	0.105*** (0.00)	0.101** (0.01)	0.096** (0.01)
NIM corporates		0.019 (0.66)	-0.029 (0.55)					0.073 (0.18)	0.005 (0.94)			
Dummy	0.017 (0.75)	0.024 (0.66)	0.021 (0.70)	0.035 (0.52)	-0.001 (0.99)	-0.009 (0.86)	0.097 (0.11)	0.092 (0.16)	0.096 (0.13)	0.112* (0.06)	0.092 (0.16)	0.068 (0.26)
aR ²	92.9%	92.8%	92.9%	92.8%	91.9%	92.8%	89.0%	88.3%	88.9%	88.9%	87.3%	88.6%
F-statistic	85.61	83.46	82.62	86.48	75.82	86.37	51.86	48.63	48.93	54.21	46.62	52.62
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
No. of observations	200	200	200	200	200	200	127	127	127	127	127	127

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

Contrary to these variables, the share of bonds on total assets and net interest margin for non-financial corporations have only marginal impact on net interest income. In general, investments into bonds may have different purposes. Banks may use this kind of investment to generate coupon payment as an alternative income to interest income from the portfolio of loans. Bonds, especially government bonds of selected countries, may be used also as a safe haven investment in times of increased stress and can also compensate for the decrease in the volume of loans. Third, government bonds are used as collateral in collateralized interbank operations and operations with the central bank. This liquidity dimension of the bonds even gained importance after the implementation of the Basel III framework. Lastly, banks may be active also in trading, and in this case part of the bond portfolio is not held to generate interest income but to generate income from trading. All in all, the importance of the bond portfolio over the generation of interest income is clearly visible on the estimation results, as the marginal impact of this portfolio is smaller

compared to that of the loans and is also less significant; especially in case of EA countries (see columns 1, 4, 5 and 6 for both EU and EA countries in Table 1).

The marginal importance of net interest margin of non-financial corporations seems to be also lower compared to that of retail (see columns 1, 2 and 3 for both EU and EA countries in Table 1). There may be several factors explaining this result, like higher riskiness of loans granted to corporates, especially to SMEs compared to retail housing loans or higher impact of competition on loans granted to large corporates (as these corporates can alternatively finance themselves also on funding markets through the issuance of corporate bonds).

We have included also a dummy variable into the equations to capture the possible effect of the change in the methodology of CBD in 2014. This dummy contains ones for each country in 2014 and zeros elsewhere. It seems that the impact of this change is more pronounced for the EA countries.

Overall, results show that decreasing interest margins as a consequence of easing monetary policy should significantly decrease net interest income of the banking sectors. This negative impact can be on one hand compensated to some extent by extending loans to the private sector. On the other hand, the negative impact can be further pronounced in case deleveraging is needed and the loan growth is subdued or even negative.

Estimation results for net interest income and net fee and commission income as a share of total assets underline the close relationship between these two sources of income (Table 2). While qualitatively the results are the same, the marginal impact of both loans and net interest margin is higher under this specification than for net interest income only. The impact of the change in the CBD framework seems to be more pronounced as well, with the dummy variable being significant for all the specifications for the EA countries.

Table 2 Estimation results – net interest income and net fee and commission income

	EU countries						EA countries					
Intercept	0.422 (0.30)	0.488 (0.25)	0.449 (0.29)	0.928*** (0.00)	2.409*** (0.00)	0.573 (0.16)	0.179 (0.66)	0.185 (0.67)	0.172 (0.68)	0.680** (0.03)	1.938*** (0.00)	0.278 (0.49)
Loans/Assets	0.026*** (0.00)	0.026*** (0.00)	0.026*** (0.00)	0.021*** (0.00)			0.023*** (0.00)	0.024*** (0.00)	0.023*** (0.00)	0.019*** (0.00)		
Bonds/Assets	0.013** (0.04)	0.015** (0.02)	0.013** (0.04)		-0.003 (0.66)		0.013* (0.05)	0.014** (0.04)	0.013* (0.05)		0.000 (0.94)	
Loans+Bonds/Assets						0.022*** (0.00)						0.020*** (0.00)
NIM retail	0.100*** (0.00)		0.104** (0.01)	0.110*** (0.00)	0.090** (0.02)	0.084** (0.02)	0.109** (0.01)		0.108** (0.02)	0.115*** (0.00)	0.108** (0.01)	0.103** (0.01)
NIM corporates		0.056 (0.27)	-0.014 (0.81)					0.077 (0.20)	0.004 (0.95)			
Dummy	0.066 (0.29)	0.072 (0.26)	0.068 (0.28)	0.086 (0.17)	0.046 (0.50)	0.035 (0.57)	0.132* (0.05)	0.127* (0.08)	0.131* (0.06)	0.159** (0.02)	0.126* (0.08)	0.107 (0.11)
aR ²	93.9%	93.7%	93.9%	93.8%	93.0%	93.8%	90.4%	89.9%	90.4%	90.2%	88.7%	90.3%
F-statistic	100.11	95.96	96.45	101.43	89.42	101.02	60.61	57.08	57.18	61.83	52.87	62.56
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
No. of observations	200	200	200	200	200	200	127	127	127	127	127	127

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

While these results are underlying the key driving factors of net interest income and net fee and commission income, on the whole the level of these incomes relative to total assets remains quite stable within countries, the dynamics of these incomes are also relevant for the research. Therefore, the regressions were repeated by replacing level data with annual changes. In case of net interest income, net interest income and net fee and commission income, loans and bonds, it is the annual change expressed in natural logarithm and in case of net interest margins, it is the annual change expressed in percentage points that enters the equations.

While changes in the volume of loans remain a significant explanatory variable with the expected sign also in case of changes in net interest income, net interest margin for retail is not explaining significantly annual shifts (Table 3). In contrast, as expected, changes in the CBD framework are significantly affecting changes in the last period.

Table 3 Estimation results – annual changes of net interest income

	EU countries						EA countries					
Intercept	-0.001 (0.95)	-0.001 (0.93)	-0.002 (0.89)	-0.001 (0.92)	-0.014 (0.26)	-0.008 (0.46)	-0.005 (0.70)	-0.007 (0.62)	-0.007 (0.63)	-0.009 (0.50)	-0.021 (0.13)	-0.014 (0.29)
Loans	0.582*** (0.00)	0.571*** (0.00)	0.583*** (0.00)	0.579*** (0.00)			0.477*** (0.00)	0.441*** (0.00)	0.473*** (0.00)	0.442*** (0.00)		
Bonds	-0.006 (0.87)	0.001 (0.97)	-0.004 (0.92)		0.036 (0.37)		-0.057 (0.16)	-0.052 (0.20)	-0.055 (0.17)		-0.021 (0.62)	
Loans+Bonds						0.608*** (0.00)						0.409*** (0.00)
NIM retail	0.018 (0.22)		0.013 (0.43)	0.018 (0.22)	0.002 (0.90)	0.010 (0.51)	0.025 (0.17)		0.019 (0.35)	0.023 (0.21)	0.001 (0.95)	0.017 (0.37)
NIM corporates		0.026 (0.24)	0.018 (0.48)					0.036 (0.24)	0.021 (0.54)			
Dummy	0.053* (0.06)	0.053* (0.06)	0.053* (0.06)	0.054* (0.06)	0.063* (0.05)	0.054* (0.06)	0.083** (0.01)	0.080** (0.01)	0.082** (0.01)	0.083** (0.01)	0.093** (0.01)	0.080** (0.02)
aR ²	21.9%	21.8%	21.6%	22.4%	2.8%	22.3%	26.6%	26.2%	26.1%	25.8%	13.2%	23.0%
F-statistic	2.55	2.54	2.47	2.65	1.16	2.64	2.98	2.94	2.83	2.99	1.88	2.71
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	27.3%	0.0%	0.0%	0.0%	0.0%	0.0%	2.6%	0.1%
No. of observations	172	172	172	172	172	172	110	110	110	110	110	110

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

An interesting outcome of the regressions for the net interest income and net fee and commission income is that while similarly to level data estimation, the results are better in this case; it is the net interest margin for non-financial corporates that seems to drive the dynamics of the income in a significant way apart from changes in the volume of loans (Table 4). It means that while the level of net interest income and net fee and commission income relative to total assets is determined more by the retail part of the balance sheet, dynamics of the income is driven more by the corporate part. A possible explanation of this outcome is that corporate loans as well as corporate deposits are more sensitive to the economic cycle. Also the interest rate sensitivity is generally higher and therefore the monetary transmission mechanism is quicker for these loans and deposits. Again, changes in the CBD framework affects data reported for 2014 in a significant way.

Main conclusions remain generally valid also in case of the regression based on annual changes. Namely, while loan growth may be a way how to deal with the period of low interest rates, this can be difficult in countries with low demand for loans or with a need to deleverage.

Table 4 Estimation results – annual changes of net interest income and net fee and commission income

	EU countries						EA countries					
Intercept	-0.002 (0.87)	-0.003 (0.78)	-0.003 (0.76)	-0.002 (0.81)	-0.016 (0.14)	-0.010 (0.29)	-0.008 (0.47)	-0.011 (0.32)	-0.011 (0.32)	-0.014 (0.50)	-0.027** (0.03)	-0.019 (0.09)
Loans	0.533*** (0.00)	0.529*** (0.00)	0.534*** (0.00)	0.532*** (0.00)			0.408*** (0.00)	0.408*** (0.00)	0.399*** (0.00)	0.384*** (0.00)		
Bonds	-0.001 (0.98)	0.006 (0.86)	0.004 (0.91)		0.039 (0.25)		-0.046 (0.18)	-0.044 (0.19)	-0.043 (0.21)		-0.014 (0.70)	
Loans+Bonds						0.575*** (0.00)						0.371*** (0.00)
NIM retail	0.013 (0.28)		0.005 (0.71)				0.008 (0.62)		-0.005 (0.77)			
NIM corporates		0.031* (0.09)	0.028 (0.18)	0.031* (0.09)	0.020 (0.33)	0.031* (0.09)		0.042 (0.10)	0.046 (0.11)	0.042 (0.10)	0.030 (0.28)	0.040 (0.13)
Dummy	0.063** (0.01)	0.063** (0.01)	0.063** (0.01)	0.062** (0.01)	0.072** (0.01)	0.063** (0.01)	0.086*** (0.00)	0.084*** (0.00)	0.083*** (0.00)	0.084*** (0.00)	0.095*** (0.00)	0.082*** (0.00)
aR ²	27.1%	28.0%	27.6%	28.5%	6.2%	29.3%	29.8%	31.7%	31.0%	31.1%	17.2%	28.6%
F-statistic	3.5	3.14	3.3	3.27	1.38	3.36	3.31	3.53	3.33	3.59	2.19	3.30
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	11.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%
No. of observations	172	172	172	172	172	172	110	110	110	110	110	110

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

Table 5 Estimation results using government bonds spreads – net interest income

Intercept	0.109 (0.77)	0.836*** (0.00)	1.765*** (0.00)	0.086 (0.81)	0.284 (0.46)	0.557** (0.04)	1.724*** (0.00)	0.223 (0.57)	0.183 (0.63)	0.224 (0.55)
Loans/Assets	0.021*** (0.00)	0.015*** (0.00)			0.019*** (0.00)	0.017*** (0.00)				
Bonds/Assets	0.019** (0.01)		0.001 (0.93)		0.008 (0.32)		-0.007 (0.30)			
Loans + Bonds/Assets				0.021*** (0.00)				0.018*** (0.00)	0.017*** (0.00)	0.016*** (0.00)
Spread 10y-3y	0.004** (0.03)	0.005** (0.02)	0.006** (0.01)	0.004** (0.03)						
Spread 10y-5y					0.159*** (0.00)	0.178*** (0.00)	0.173*** (0.00)	0.128*** (0.00)		0.070 (0.13)
NIM retail									0.107*** (0.00)	0.080** (0.02)
Dummy	-0.002 (0.98)	0.034 (0.54)	0.032 (0.60)	0.030 (0.92)	-0.071 (0.22)	-0.066 (0.25)	-0.041 (0.50)	-0.070 (0.23)	-0.019 (0.72)	-0.050 (0.38)
aR ²	95.1%	94.8%	94.1%	95.2%	95.7%	95.7%	95.1%	95.6%	95.8%	95.8%
F-statistic	118.45	117.23	102.02	125.72	132.68	139.97	121.09	137.07	142.15	136.71
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
No. of observations	121	121	121	121	113	113	113	113	113	113

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

For selected countries it is possible to substitute net interest margin (as the measure of profitability of the loan portfolio) by a more complex measure of profitability of the loan and bond portfolio, namely by the spread between government bonds with different maturities². Estimation results for net interest income as a share of total assets show that the spread between 10 years and 5 years government bond yields is a better explanatory variable than the spread between 10 years and 3 years government bond yields. While both variables have significant positive impact on the level of interest margin, the former one has a higher impact (the coefficients estimated are significantly higher) and estimation results are better as well (columns 1-4 compared to column 5-8, Table 5). While estimation results are better compared to the results using net interest margin as an explanatory variable, this is more related to the feature of countries for which spreads are available. Also, it seems that net interest margin for retail better explains the level of net interest income (see column 9 and 10, Table 5).

Estimations results for net interest income and net fee and commission income are to a large extent in line with the qualitative outcome of the results for net interest income (Table 6). Interestingly, estimation results are better in case of net interest income.

Table 6 Estimation results using government bonds spreads – net interest income and net fee and commission income

Intercept	0.133 (0.77)	1.317*** (0.00)	2.324*** (0.00)	0.159 (0.73)	0.445 (0.37)	1.080*** (0.00)	2.270*** (0.00)	0.412 (0.40)	0.364 (0.45)	0.414 (0.39)
Loans/Assets	0.028*** (0.00)	0.018*** (0.00)			0.024*** (0.00)	0.018*** (0.00)				
Bonds/Assets	0.031*** (0.00)		0.007 (0.43)		0.018* (0.07)		-0.001 (0.90)			
Loans + Bonds/Assets				0.028*** (0.00)				0.024*** (0.00)	0.022*** (0.00)	0.021*** (0.00)
Spread 10y-3y	0.005** (0.04)	0.006** (0.03)	0.007** (0.01)	0.005** (0.04)						
Spread 10y-5y					0.183*** (0.00)	0.226*** (0.00)	0.199*** (0.00)	0.165*** (0.00)		0.083 (0.15)
NIM retail									0.146*** (0.00)	0.114** (0.01)
Dummy	0.025 (0.72)	0.083 (0.25)	0.069 (0.37)	0.030 (0.66)	-0.049 (0.51)	-0.038 (0.61)	-0.011 (0.89)	-0.048 (0.51)	0.017 (0.80)	-0.020 (0.78)
aR ²	95.1%	94.6%	94.0%	95.1%	95.6%	95.5%	95.8%	95.7%	95.9%	95.9%
F-statistic	117.31	111.02	99.21	124.56	130.04	133.76	119.21	137.92	145.81	139.83
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
No. of observations	121	121	121	121	113	113	113	113	113	113

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

² The availability of this measure depends on the availability of government bond yields with different maturity for respective countries as well as the liquidity of the market with these bonds. For the analysis, following countries were selected: Austria, Belgium, Czech Republic, Germany, Spain, Finland, France, Great Britain, Greece, Hungary, Ireland, Italy, Netherlands, Poland, Portugal, Slovenia and Slovakia.

While annual changes in the total volume of loans remain to be a significant driver of annual changes of net interest income when including government bond spreads instead of net interest margin, changes in government bond spreads seems to be a significant explanatory variable as well. Contrary to the estimation of level data, it is the specification including the spread between 10 years and 3 years government bond yields that gives better estimation results (see columns 1 – 4 vs columns 5 – 8, Table 7). Including net interest margin instead of government bond spreads for the compressed group of countries does not improve estimation results (columns 1 – 4 vs the last 2 columns, Table 7). Therefore, it seems that contrary to the estimation of level data, the dynamics can be better explained by government bond spreads.

Table 7 Estimation results using government bonds spreads – annual changes of net interest income

Intercept	0.003 (0.84)	0.004 (0.72)	-0.006 (0.63)	0.000 (0.99)	-0.005 (0.70)	-0.004 (0.79)	-0.013 (0.35)	-0.007 (0.57)	-0.005 (0.68)	-0.007 (0.60)
Loans	0.427*** (0.00)	0.393*** (0.00)			0.433*** (0.00)	0.394*** (0.00)				
Bonds	0.044 (0.47)		-0.017 (0.78)		0.051 (0.45)		-0.019 (0.77)			
Loans+Bonds				0.523*** (0.00)				0.527*** (0.00)	0.545*** (0.00)	0.543*** (0.00)
Spread 10y-3y	0.004** (0.01)	0.004** (0.01)	0.004** (0.01)	0.004** (0.01)						0.010 (0.51)
Spread 10y-5y					0.031 (0.13)	0.034 (0.09)	0.027 (0.20)	0.029 (0.14)		
NIM retail									0.017 (0.28)	0.011 (0.52)
Dummy	0.030 (0.34)	0.029 (0.36)	0.049 (0.14)	0.034 (0.27)	0.037 (0.25)	0.036 (0.27)	0.057* (0.09)	0.040 (0.20)	0.045 (0.15)	0.046 (0.14)
aR ²	20.8%	21.3%	13.1%	22.8%	17.5%	18.0%	9.2%	19.5%	18.5%	17.9%
F-statistic	2.35	2.46	1.82	2.60	2.07	2.17	1.54	2.30	2.21	2.10
P(F-statistic)	0.4%	0.3%	3.4%	0.1%	1.3%	1.0%	10.0%	0.6%	0.9%	1.2%
No. of observations	104	104	104	104	97	97	97	97	97	97

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

Estimation results for the annual changes of net interest income and net fee and commission income are qualitatively the same as results for the annual changes of net interest income (see Table 8). The only significant difference is that in this case the annual changes of the volume of the bond portfolio are significant explanatory factors when included together with the annual changes of the volume of loans.

Lastly, for EA countries, it is possible to use the spread between short and longer-term EURIBOR interest rates as a proxy measure of return of the loan as well as bond portfolio. In our estimations we use the spread between 12M and 1M EURIBOR interest rates (Table 9). In case of net interest income as a share of total assets results are comparable to those presented for the EA countries in Table 1 using net interest margin, even if using net interest margin for retail as an explanatory variable leads to somewhat better estimation results. On the other hand, in case of the annual

changes of net interest income, estimation results are better when using the spread of EURIBOR rates as an explanatory variable compared to the specifications presented in Table 3. It means that while net interest margin for retail seems to explain more the level of net interest income, the dynamics are better captured by the changes in the EURIBOR spread. As both the coefficient for loans and the interest rate spread are positive and significant for most of the specifications, the qualitative result of the negative impact of the low interest rate environment and deleveraging remains valid and supported by these specifications as well.

Table 8 Estimation results using government bonds spreads – annual changes of net interest income and net fee and commission income

Intercept	-0.003 (0.72)	0.000 (0.96)	-0.012 (0.23)	-0.003 (0.72)	-0.007 (0.47)	-0.004 (0.70)	-0.014 (0.16)	-0.006 (0.48)	-0.004 (0.66)	-0.005 (0.57)
Loans	0.412*** (0.00)	0.347*** (0.00)			0.430*** (0.00)	0.354*** (0.00)				
Bonds	0.084* (0.06)		0.026 (0.57)		0.099** (0.04)		0.029 (0.56)			
Loans+Bonds				0.504*** (0.00)				0.519*** (0.00)	0.516*** (0.00)	0.519*** (0.00)
Spread 10y-3y	0.003*** (0.00)	0.003*** (0.00)	0.004*** (0.00)	0.003*** (0.00)						0.007 (0.52)
Spread 10y-5y					0.018 (0.23)	0.024 (0.11)	0.014 (0.38)	0.020 (0.17)		
NIM corporations									0.014 (0.57)	0.008 (0.76)
Dummy	0.033 (0.15)	0.030 (0.20)	0.050** (0.04)	0.034 (0.13)	0.037 (0.12)	0.034 (0.15)	0.057** (0.03)	0.037 (0.11)	0.038 (0.10)	0.039 (0.09)
aR ²	30.9%	28.6%	18.3%	33.1%	24.9%	21.9%	9.9%	27.0%	25.5%	25.0%
F-statistic	3.30	3.18	2.21	3.68	2.68	2.49	1.59	2.97	2.83	2.68
P(F-statistic)	0.0%	0.0%	0.7%	0.0%	0.1%	0.3%	8.4%	0.0%	0.1%	0.1%
No. of observations	104	104	104	104	97	97	97	97	97	97

Note: p-values are reported in parenthesis.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

Table 9 Estimation results – net interest income for EA countries

	level				annual change			
Intercept	-0.068 (0.86)	0.221 (0.49)	1.525*** (0.00)	0.102 (0.79)	-0.002 (0.86)	-0.007 (0.58)	-0.018 (0.17)	-0.012 (0.34)
Loans	0.021*** (0.00)	0.018*** (0.00)			0.391*** (0.00)	0.357*** (0.00)		
Bonds	0.008 (0.20)		-0.003 (0.56)		-0.070* (0.08)		-0.044 (0.28)	
Loans+Bonds				0.017*** (0.00)				0.326** (0.01)
Spread 12M - 1M	0.233* (0.09)	0.249* (0.07)	0.140 (0.33)	0.167 (0.22)	0.179** (0.01)	0.160** (0.02)	0.209*** (0.00)	0.155** (0.02)
Dummy	0.195** (0.01)	0.216*** (0.00)	0.158* (0.06)	0.142* (0.06)	0.092*** (0.00)	0.091*** (0.00)	0.104*** (0.00)	0.089** (0.01)
aR ²	88.4%	88.4%	86.6%	88.0%	30.9%	29.2%	21.2%	26.6%
F-statistic	49.22	51.40	43.83	49.79	3.44	3.36	2.54	3.08
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
No. of observations	127	127	127	127	110	110	110	110

Note: p-values are reported in parenthesis.

In case of level data, loans and bonds are expressed as a share of total assets.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

All the qualitative outcomes remain valid also for the estimation of net interest income and net fee and commission income (Table 10). Both loans and the interest rate spread enter the specifications with significant positive coefficient and the annual changes are better explained by the interest rate spread than by net interest margins.

Table 10 Estimation results – net interest income and net fee and commission income for EA countries

	level				annual change			
Intercept	0.185 (0.67)	0.695* (0.06)	2.070*** (0.00)	0.326 (0.45)	-0.007 (0.54)	-0.011 (0.33)	-0.022* (0.06)	-0.015 (0.16)
Loans	0.024*** (0.00)	0.020*** (0.00)			0.371*** (0.00)	0.344*** (0.00)		
Bonds	0.014** (0.04)		0.000 (0.94)		-0.055 (0.10)		-0.031 (0.39)	
Loans + Bonds				0.021*** (0.00)				0.324*** (0.00)
Spread 12M - 1M	0.171 (0.26)	0.198 (0.20)	0.061 (0.71)	0.116 (0.43)	0.110* (0.05)	0.095* (0.09)	0.138** (0.02)	0.089 (0.12)
Dummy	0.210** (0.01)	0.248*** (0.00)	0.167* (0.07)	0.166** (0.04)	0.092*** (0.00)	0.091*** (0.00)	0.104*** (0.00)	0.089*** (0.00)
aR2	89.9%	89.6%	88.0%	89.7%	32.6%	31.2%	20.8%	28.6%
F-statistic	56.87	57.90	49.64	58.80	3.63	3.61	2.50	3.30
P(F-statistic)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%
No. of observations	127	127	127	127	110	110	110	110

Note: p-values are reported in parenthesis.

In case of level data, loans and bonds are expressed as a share of total assets.

*, ** and *** indicate statistical significance at the 10%, 5% and 1% significance levels, respectively.

Source: Authors' calculations.

5 CONCLUSIONS

After the outbreak of the global financial crisis and the economic downturn in 2007 and the consequent sovereign crises throughout the Euro area, central banks have in general eased monetary policy in a historically unprecedented way to boost up private consumption as well as investment and thus to speed up economic recovery. The environment of low interest rates in the EA and EU in the current subdued economic development and low inflation environment is expected to remain present in the medium term.

Based on the economic theory, this environment of low interest rates should have a positive impact on the demand for consumption and investment, mainly through the interest rate channel and the bank lending channel; that is of utmost importance from the perspective of the banking sector. On the other hand, historically low interest rates create a lot of challenges for the banking sectors throughout EA, as their main source of income is exactly the net interest income (together with net fee and commission income).

While net interest income is affected by several factors (the development of the real economy that can be captured e.g. by the development of GDP or

unemployment, the concentration of the banking system, the presence of cross-border banks, etc.), a relatively basic and straightforward analysis applied in this paper showed that there is a strong positive correlation, both in case of level and dynamics, of the net interest (and fee and commission) income with the loans granted by banks in the EU as well as EA countries. While the inclusion of loans into the analysis is relatively easy and straightforward, it is harder to incorporate the exact form of the interest rates that can capture in the best way the development of net interest (and net fee and commission) income. However, while there are several alternatives, in all cases the positive correlation of different measures of interest rate margins/spreads with the level and/or the dynamics of the net interest income is present.

It indeed means that, in all EA and EU countries, decreasing margins due to the eased monetary policy create an environment where banks face challenges in keeping their profitability at vital levels. While in several countries still strong demand for loans and thus the loan growth can help to some extent to overcome this challenge, in most of the countries the subdued demand due to the fragile economic conditions does not allow the banks to increase the volume of loans. This fact, together with the current situation, where basically there is no more opportunity for banks to further decrease interest rate costs, it can lead to a situation, where banking systems will face heavy constraints in terms of income generation if the current low interest rate environment lasts for a longer period.

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RESUMÉ

Ziskovosť bánk je negatívne ovplyvnená prostredím nízkych úrokových sadzieb, ktoré vytvárajú tlak na pokles úrokových marží. Tie sú v kombinácii s rastom úverov hlavným zdrojom úrokových príjmov bánk tvoriacich rozhodujúci príspevok k ziskovosti bankových sektorov. Veľkosť tohto efektu je rôzna v závislosti od obchodného modelu príslušného bankového sektora.

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