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IMPORTANCE OF INTEREST RATES ON THE CREDIT MARKET IN SLOVAKIA

Abstract:

One of the ways how monetary policy can affect the economy is through the interest rate channel. Interest rates have vital importance for economic decision making and recently, we can observe a rare phenomenon in European monetary policy, the negative interest rate. This situation can affect the volume of granted loans of every European area country. Slovakia is ranked among the fastest countries of retail lending increase in the European Union. The aim of this paper is to analyse the development of consumer loans and three interest rates which can affect the amount of granted loans by the Slovak banking market from 2009 to 2019 period, using monthly based data. The paper is concentrated on eight groups of loans, according to the division of the National Bank of Slovakia and it analyses the impact of three interest rates, the fixed rate set by the European Central Bank, the EONIA interest rate and the average interest rate for a specific group of loans in Slovakia. The paper also focuses on the analysis of the development of the credit market in Slovakia and the development of the loans and interest rates. The main analytical part of the paper uses the ordinary least squares regression method for linear models, which analyses the relationship between group of loans, as a dependent variable, and interest rates, represented as independent variables. The ANOVA method is performed, and it allows a comparison of more than two groups at the same time to determine whether a relationship exists between them.

Keywords:

Slovak credit market, interest rate, fixed rate, EONIA, OLS, ANOVA, Kruskal-Wallis test

JEL Classification: G21, C12, B40

1 Introduction

There is a traditional rationale stated by Teichert (2018) that monetary policy can affects the volume of loans through the central bank through its open market determines the short-term rate and also the volume of loans. He brings an example, if the central bank aims at implementing a contractionary monetary policy, it sells securities and charges reserves, and thereby reserves are drained from the system. As a consequence, the possible volume of loans is decreased. Maddaloni & Peydró (2011) state that many researchers have suggested that low levels of short-term and long-term interest rates induced an excessive softening of lending standards in the runup to the financial crisis. The authors use the dataset of the Euro area and the United States banks' lending standards and find that low monetary policy short-term interest rates soften standards for household and corporate loans and low long-term interest rates do not soften lending standards.

In recent times, we can observe a rare phenomenon that was unimaginable a few years ago, the negative interest rates. The idea of negative interest rates was almost impossible a few years ago, but at the beginning of 2009, there were discussions of a negative interest rate at the level of central banks. Jobst & Lin (2016) argue that negative interest rates have a positive effect on the European economy, helping to lower bank funding costs and boost asset prices and they have significantly enhanced the signalling effect of the ECB's monetary stance strengthening its forward guidance. Their results show that lower lending rates have encouraged higher credit demand but the outlook for bank profitability has worsened. Janáčková (2015) states that the aim of negative interest rates is to impair the holding of unused money and to force subjects to save less and spend more. As a result, commercial banks begin use their free reserves to finance the real economy. Since the aim of the study is to analyse the impact of a change in monetary policy on the volume of loans provided, this study examines factors that may affect this volume.

Monetary policy in Slovakia has undergone several changes in the competencies that determine the direction of monetary policy in this country. Until the end of 2008, the monetary policy was determined by the Slovak central bank, the National Bank of Slovakia (NBS). After the entry of the Slovak Republic into the European Monetary Union on the 1st of January in 2009, monetary policy began to be managed by the European Central Bank (ECB). Monetary policy is one of the ways in which a country's economy is influenced and controlled through the activities of the central bank, the monetary board or other policy regulatory members, which determine the size and growth rate of the money supply, which ultimately affects interest rates. Monetary policy is maintained through measures such as raising or lowering interest rates or changing the amount of money banks need to hold in their reserves. Credit policy is closely linked to monetary policy, which is perceived as a system of measures that enforces the intentions of the lender.

1.1 Development of Slovak monetary policy

The role of the National Bank of Slovakia, as a member of the Eurosystem, is to participate in a common monetary policy in the euro area that is determined by the European Central Bank and the primary objective of the ECB's monetary policy is to maintain price stability. The monetary policy of the central bank affects the economy through various channels, for example interest rate channel, the credit channel or exchange rate channel, with the use of monetary policy instruments. This process is called the monetary policy transmission mechanism. In the short run, a change in money market interest rates induced by the central bank sets in motion a number of

mechanisms and actions by economic agents. Ultimately the change will influence developments in economic variables such as output or prices.

The change in Slovak monetary policy in recent years represents its development, which is reflected in the key interest rate and the monetary aggregate M2, which has been used by the NBS since 2006 and after joining the EMU was replaced by the M3 monetary aggregate used by the ECB. The development of these indicators from 1998 to the present has undergone significant changes due to the liberalization of the foreign exchange market and efforts to achieve macroeconomic stability in the country. These efforts were mainly reflected in the values of the NBS base interest rate, which has fallen rapidly since 1993 from 12% to 2.5% in 2008. As the Slovak Republic became a member of the European Union in 2004 and subsequently started to prepare to join the euro area, this period was characterized by the adjustment of the NBS rate to the ECB rate. It follows that monetary policy needs to be divided into three key stages, namely the period of implementation of the NBS's independent monetary policy since 1999, the subsequent harmonization of the NBS's and the ECB's monetary policy instruments from 2000 to 2008. The period from 1993 to 1999 was characterized primarily by the establishment of the Slovak Republic as an independent country and the beginning of the implementation of the NBS's independent monetary policy. The state of the economy was negatively affected by inflation, high unemployment, currency devaluation, the state budget deficit, which led to a slowdown in economic performance, but on the other hand, efforts began to restore internal and external balance. The policy of the NBS in the first years of this period was characterized by quantitative management through the money supply, or rather the regulation of the monetary aggregate M2 through the monetary base. The NBS used both direct and indirect instruments, the importance of which grew in the following years. In 1996, the NBS began to make more active use of securities-backed operations, and OMOs (REPO tenders) became dominant in the following years as well. Also, in 1996, the NBS issued its own treasury bills for the first time, due to excess liquidity in the sector. In 1997 and 1998, the NBS pursued a rather restrictive monetary policy with the aim of reducing the inflation rate, as well as establishing external currency stability and eliminating foreign trade imbalances. Interest rates gradually declined, but the government continued to indebt the country internally and externally. In 2000, the NBS switched from quantitative monetary policy management, which was characterized by extreme fluctuations in interest rates, to qualitative, which means that market instruments for influencing the interbank money market and the setting of interest rates by the NBS Bank Board began more flexible monetary policy. The primary goal in this period was inflation targeting, as well as the gradual convergence of the NBS's monetary policy with ECB standards. Minimum reserves rates were reduced, and monetary policy was conducted mainly through standard open market operations. The conduct of monetary policy was based on the setting of key NBS interest rates in the application of qualitative monetary policy management. As a result of non-economic and speculative factors that caused the strengthening of the Slovak koruna, the NBS intervened in the foreign exchange market in an effort to eliminate these factors, which was reflected in the reduction of all key rates. Since Slovakia's accession to the EU, the NBS's greatest interest has been in focusing on inflation targeting and meeting the Maastricht criteria for joining the euro area. Interest rates as well as the formation of the company's inflation expectations were used as a central bank tool to influence inflation. In 2005, the NBS switched to the inflation targeting regime under ERM II conditions, and from January the HICP targeting began. Medium-term monetary programs have been replaced by quarterly forecasts. Following Slovakia's entry into the ERM II exchange rate

mechanism, the Slovak koruna appreciated more markedly against the central parity. In May 2008, the European Commission stated that the Slovak Republic met the criteria for entry into the euro area and that the central parity of the Slovak koruna to the euro was set at a constant value of SKK 30.1260. On 1 January, Slovakia became the 16th country in the euro area.

Following Slovakia's entry into the euro area, the NBS has the task of implementing and participating in the common monetary policy determined by the ECB. The ECB's monetary policy operates on two basic pillars, namely monetary and economic analysis, which helps to achieve the basic objective of maintaining price stability. The ECB monitors money developments in the economy, money aggregate M3, as well as macroeconomic developments and their impact on inflation. The Eurosystem is a monopoly supplier of monetary base, which consists of currency and bank reserves. Based on this fact, the central bank can determine the conditions under which banks borrow funds from it. This in turn affects the conditions, in particular the interest rates at which commercial banks then lend money to businesses and the general public. If these conditions change, the behaviour of entrepreneurs and the population will change for this reason, as well as the development of prices and the volume of production of goods and services.

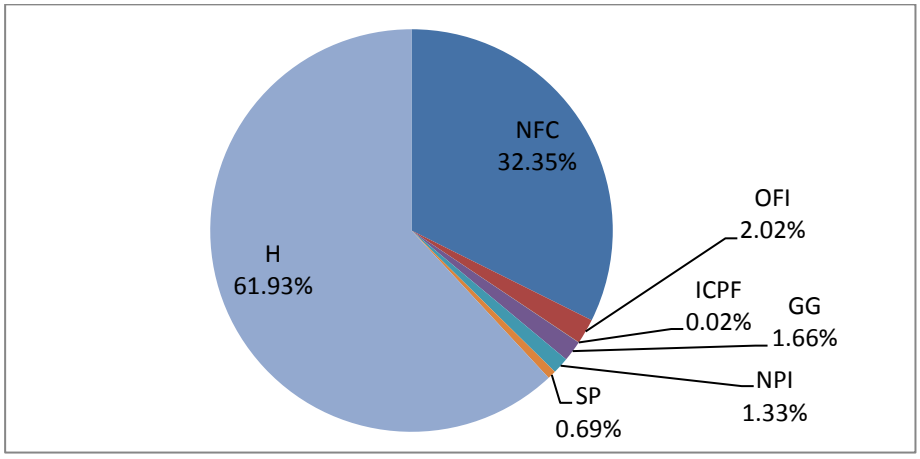
1.2 Development of Slovak credit market since 2009

The Slovak banking sector is a two-tier banking sector, which consists of a central bank and a network of commercial banks. As it was mentioned, the role of the central bank is performed by the National Bank of Slovakia. One of the tasks of the NBS is to supervise and regulate the activities of commercial banks. The commercial bank as a term in the conditions of the Slovak Republic can be understood as various types of banks. These are primarily banks domiciled in the Slovak Republic and branches of foreign banks. In addition to the above criteria, we can analyse banks with or without foreign capital participation. The oldest banks in the Slovak banking market are Tatra banka and Všeobecná úverová banka. The most accessible to the clients is Slovenská sporiteľňa, which has the highest number of branches across the country. The central bank identifies these three banks, with Československá obchodná banka and Poštová banka, as five domestic systemically important banks in Slovakia since 2016. As at 31 December 2019, a total of 12 banks and 15 foreign bank branches were operating in Slovakia (NBS, 2020b).

Report published by NBS (NBS, 2020a) states that despite the slowdown of retail lending, Slovak Republic remained among the fastest in the EU. Developments in the retail loan market in 2019 were also supported by macroeconomic fundamentals. In 2019, the growth of loans was also dampened by the macroprudential measures adopted by the NBS. Although no new action came into force during the year, in the first half of the year the transition periods for regulating loans with a high LTV or DTI were still coming to finish. At the same time, stricter rules for the consumer's ability to repay indicator were adopted at the end of the year, but were not effective until January 2020, with a transitional period until the end of June 2020. The interbank market was marked by an inflow of liquidity from covered bond issues, as a result of which resources drawn from the central bank decreased and free liquidity deposited with the central bank increased.

Figure 1 shows share of individual groups in the total volume of provided short-term, medium-term and long-term consumer loans granted by the Slovak banking sector within the euro area in December 2019. Based on the NBS reporting methodology we consider short-term loans to be with a maturity of up to one-year, medium-term loans with a maturity of 1 to 5 years, and in the case of long-term loans, their maturity exceeds 5 years.

Figure 1: Share of groups in the total volume of provided consumer loans in 12/2019 (%)



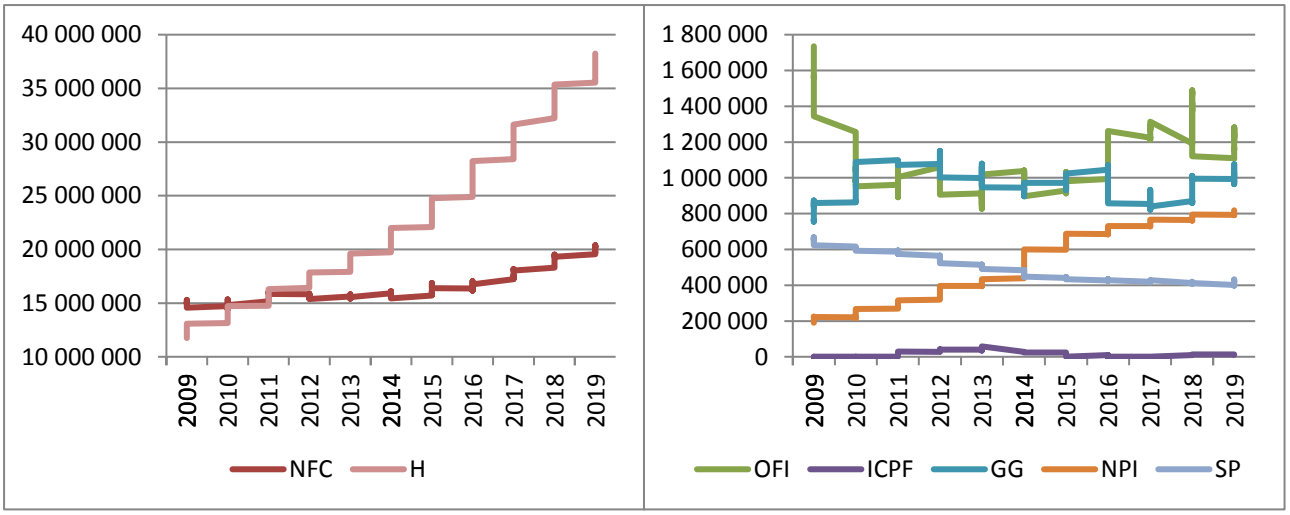
Notes: H = Households, NFC = Non-financial corporations, OFI = Other financial institutions, ICPF = Insurance corporations and pension funds, GG = General government, NPI = Non-profit institutions serving households, SP = Sole proprietors.

Source: Own adjustment based on NBS data

Figure 1 shows that households have the largest share, 61.93%, in the volume of loans provided by Slovak banking sector. Non-financial corporation is the second largest group with 32.35% share. The other groups are significantly smaller than these two groups. Insurance corporations and pension funds group has the lowest value of provided loans with 0.02%.

Figure 2 shows the development of loans provided by the Slovak banking sector to entities within the euro area. We decided to show the results separately for households and non-financial corporations, as their volumes significantly exceed other loans provided.

Figure 2: Development of loans divided by groups provided by Slovak banking sector



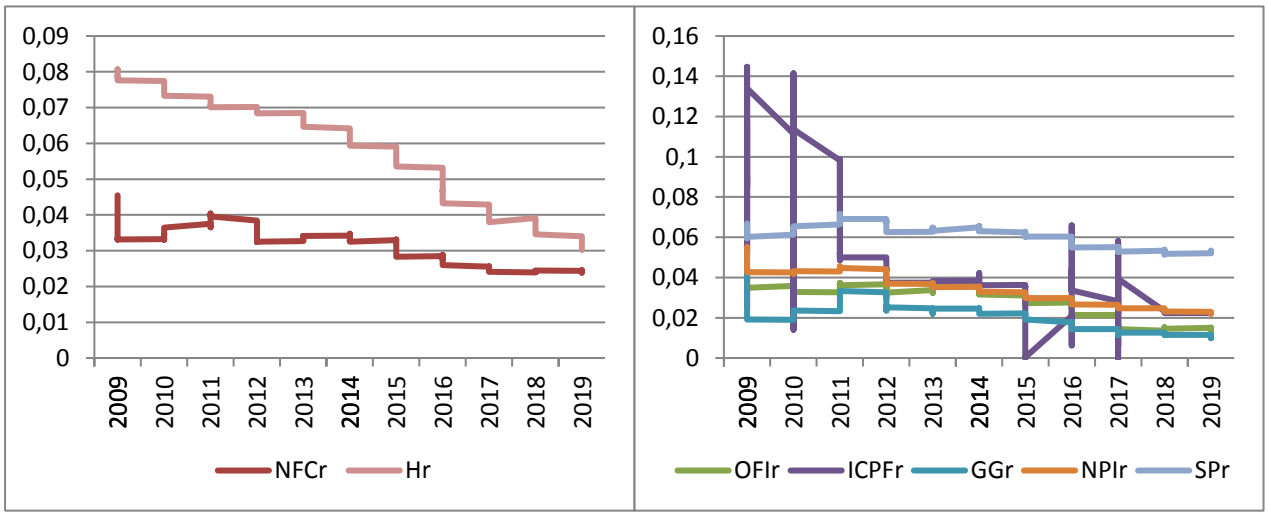
Notes: H = Households, NFC = Non-financial corporations, OFI = Other financial institutions, ICPF = Insurance corporations and pension funds, GG = General government, NPI = Non-profit institutions serving households, SP = Sole proprietors. Loans volumes are in thousand EUR.

Source: Own adjustment based on NBS data

The development in Figure 2 shows that the largest volume of loans was provided to households. The volume of loans of this group was rising steadily during the analysed period. We can also see a stable increase in volumes for loans provided to non-profit institutions serving households group. Sole proprietors gradually decreased during the observed period. The lowest volumes of loans were provided to insurance corporations and pension funds and we can observe highest volatility in the group of other financial institutions. Lending to most economic sectors increased in 2019. The strongest growth was in loans to households and non-financial corporations. There was a year-on-year declined in insurance corporations and pension funds group.

Figure 3 shows the development of interest rates for each group. The NBS also publishes data about development of interest rates for individual groups of credit transactions. During the analysed period, the lowest average interest rate was provided for the general government group. There is a significant decline in interest rates for the insurance corporations and pension funds group. Sole proprietors group has the highest average interest rate, which can be the reason why they are unattractive for consumers.

Figure 3: Development of interest rates divided by groups provided by Slovak banking sector

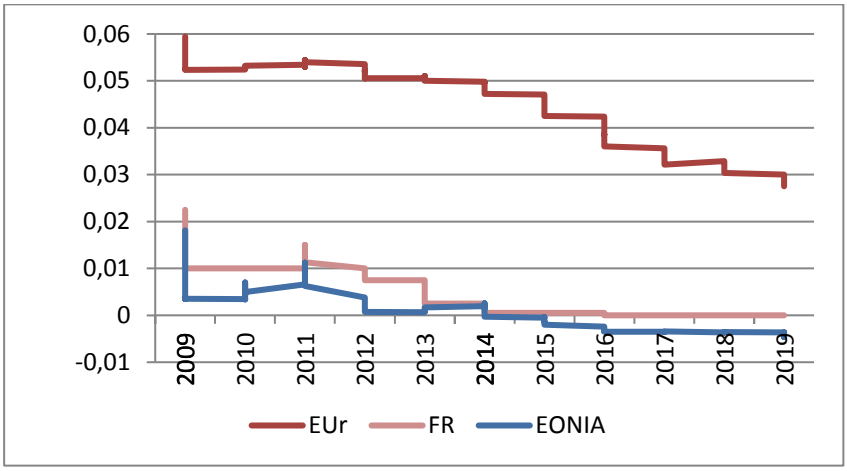


Notes: Interest rate for Hr = Households, NFCr = Non-financial corporations, OFIr = Other financial institutions, ICPFr = Insurance corporations and pension funds, GGr = General government, NPIr = Non-profit institutions serving households, SPr = Sole proprietors.

Source: Own adjustment based on NBS data

Figure 4 represents a comparison of the three types of interest rates, the average value of interest rate provided for the euro area by the Slovak banking sector (EUr), the fixed rate (FR) and the Euro Over Night Index (EONIA) provided by the European Central Bank, and shows the development of these three interest rates. The fixed rate, as a key interest rate set by the Governing Council, presents interest rate on the main refinancing operations, which provide the bulk of liquidity to the banking system. According NBS, EONIA is the effective overnight reference rate for the euro. It is computed as a weighted average of all overnight unsecured lending transactions undertaken in the interbank market.

Figure 4: Development and comparison of three interest rates



Notes: EUr = Interest rate for eurozone, FR = fixed rate, EONIA = the Euro Over Night Index.

Source: Own adjustment based on ECB and NBS data

In Figure 4, the graph shows the development of the EONIA which reveals that the overnight rate has tracked the ECB policy fixed rate closely. In the Figure 4, we would like to draw attention to the impact of these interest rates on the development of the interest rate at which Slovak banks provide loans to the euro area, following the average interest rate value of groups described above. In 2019, NBS banking supervision responded to developments in the Slovak banking market, which was reporting a prolonged uptrend in retail lending and a downtrend in interest rates in the whole euro area. Maddaloni & Peydró (2011) claim that low monetary policy rates may be a crucial factor for risk-taking as funding liquidity for banks is mostly short-term, and thus depends on monetary policy, and the presence of significant bank agency problems may have turned the abundant liquidity into an excessive softening of lending standards.

The paper is organized into four main sections. Following this introduction, that describes credit market and monetary policy development in Slovakia, Section 2 outlines the methodology, along with noting the data. The results and discussion are presented in Section 3. The conclusion is provided in Section 4.

2 Methodology and data

This study analyses the relationship between loans granted by Slovak banking sector and three types of interest rates. Outstanding amounts of loans and their average interest rates are divided into eight groups, households (H), non-financial corporations (NFC), other financial institutions (OFI), insurance corporations and pension funds (ICPF), general government (GG), non-profit institutions serving households (NPI), sole proprietors (SP) and summarized data for the whole eurozone (EU). These data consist of short-term loans, long-term loans with maturity period over 1 year and up to 5 years and long-term loans over 5 years maturity in thousand EUR and their average annualised agreed interest rate. Data were obtained by statistics of National Bank of Slovakia in an aggregated form. All the monitored data are analysed on monthly basis in thousand euros for the monitored period from 2009 to 2019. Our sample consists of 132 data for each observed variable. In addition to the mentioned interest rate for each group of borrowers, we also take into account the fixed interest rate published by European Central Bank and the

interbank overnight lending reference rate, EONIA, published by European Money Markets Institute (EMMI). When we adjusted the fixed rate by ECB, and there was a specific day when this interest rate changed, then we calculate an average of the two values which were valid for a specific month. As the EONIA is reported for each day, we adjusted the data as average monthly data calculated from daily values for the study.

The aim of the analysis of this study is to quantify the impact of the change in monetary policy, by considering three interest rates, on the amounts of loans granted by Slovak banks. The analysis will be performed in three steps. Firstly, we briefly describe variables that summarize a given data set of amounts of loans. As the second part of the analysis, we follow the least squares regression method, which is typically used to estimate the regression coefficients in a multiple linear regression model. We were inspired by Maddaloni & Peydró (2011) who use loans as the explanatory variable and included interest rates among the explanatory variables for their model. As the final form of our linear regression model we follow the regression specification:

$$\mathbf{Y_i} = \boldsymbol{\beta_0} + \boldsymbol{\beta_1 x_{i,1}} + \boldsymbol{\beta_2 x_{i,2}} + \boldsymbol{\beta_3 x_{i,3}} + \boldsymbol{\varepsilon_i} \quad (1)$$

where Y_i represents dependent variable amount of total loans for each of eight groups of loans. The amount of loans is influenced by independent variables, $x_{i,1}, x_{i,2}, x_{i,3}$, which represent three interest rates, average annualised agreed interest rate for each group, fixed rate and EONIA. β_0 is the estimated intercept and $\beta_{i,1}, \beta_{i,2}, \beta_{i,3}$ are estimated values of regression coefficients. The symbol i represents the number of observations and is ε an error term.

For the testing of all eight groups, we develop the fundamental ideas of hypothesis testing for eight models. The null hypothesis states that there is no relationship between the two variables and the alternative hypothesis is reveals there is a statistically significant relationship between the tested variables. The data will be tested at a 95% confidence level, which means that we will not reject the null hypothesis if the p-value is higher than 5%. If the opposite case occurs, that the p-value is less than 5%, we reject H0 and accept an alternative hypothesis that expresses a statistically significant relationship between the given variables tested. To express the dependence of changes between individual variables, we will use the correlation coefficient R. It expresses the strength of the statistical dependence between two quantitative variables.

As the third part of analysis for this paper, we decided to follow statistical technique one-way analysis of variance (ANOVA) developed by statistician Ronald Fisher. ANOVA is an extension of the two-sample hypothesis testing for comparing means to more than two samples and to analyse the differences among eight groups in this study. Specifically, it tests the null hypothesis:

$$\mathbf{H_0}: \boldsymbol{\mu_1} = \boldsymbol{\mu_2} = \boldsymbol{\mu_3} = \cdots = \boldsymbol{\mu_8} \quad (2)$$

where μ represents group mean for various number of groups, specifically eight groups for this study. If the one-way ANOVA returns a statistically significant result, we accept the alternative hypothesis, which is that there are at least two group means that are statistically significantly different from each other. The crucial part of the ANOVA process involves checking to three ANOVA assumptions; independence of samples, homogeneity of variances and normally distributed data.

3 Results and discussion

In this paper, we analyse a relationship that examines the significance in changes in the interest rate on the Slovak credit market. First part of analysis consists of the elementary descriptive statistics of the eight groups of loans that we observe. Second part, we examine eight regression models and their estimate values and, as the last part of the analysis, we bring results of ANOVA method. The descriptive data analysis was performed in MS Excel software, as well as the development graphs in Introduction section, the least squares regression method was executed in the R software and we use IBM SPSS Statistics software for ANOVA method.

3.1 Descriptive data analysis

Table 1 shows results, the summary statistics that are calculated separately for each of eight groups to compare those groups via mean, standard deviation, minimum and maximum values. We examine eight different groups which we defined in the previous section. The number of observations consists of 132 values in each group, presenting monthly average values of loans amount for eleven years, from 2009 to 2019.

Table 1: Descriptive statistics of eight groups of loans

Group	Number of observations	Mean	Std. deviation	Minimum	Maximum
1	132	42 240 634.18	9 625 934.95	30 295 717,00	61 777 310,00
2	132	16 501 286.47	1 588 751.13	14 412 027.00	20 396 153.00
3	132	1 115 063.11	205 409.08	827 546.00	1 735 112.00
4	132	14 432.26	14 424.32	20.00	57 995.00
5	132	954 667.22	91 636.16	754 971.00	1 150 947.00
6	132	511 747.52	217 846.36	190 041.00	818 399.00
7	132	499 290.27	82 496.66	397 357.00	668 185.00
8	132	22 644 147.32	7 921 482.88	11 743 447.00	38 239 299.00

Notes: Group 1 = Whole eurozone (the sum of all other groups), Group 2 = Non-financial corporations, Group 3 = Other financial institutions, Group 4 = Insurance corporations and pension funds, Group 5 = General government, Group 6 = Non-profit institutions serving households, Group 7 = Sole proprietors, Group 8 = Households. Loans volumes are in thousand EUR

Source: Own research.

As we have already stated in Introduction section, the group with the lowest average amount of loans is Group 4. The highest average amount of loans represents Group 1 as a summary of all of the groups. A low standard deviation, for Group 4, indicates that the data points tend to be close to the mean of the data set, while a high standard deviation, Group 1 and Group 8, indicate that the data points are spread out over a wider range of values. The lowest values for minimum and maximum are recorded in Group 4 and besides the Group 1, we consider households as a group with the highest minimum and maximum values.

3.2 Results of linear regression method

In this part of the paper, we focus on a more detailed analysis of the relationship between amount of loans granted by Slovak credit market subjects and three interest rates through the linear

models' regression described in previous section. As the impact of the interest rate change may be reflected mainly in the following month, we lagged all three interest rate values by one period, a month. Results of regression analysis are presented in Table 2 and show which interest rates are important in models. By summarizing these models in program R, we can see which variables are statistically significant.

Table 2: Coefficient regression results

Model	Intercept	IR	FR	EONIA	Multiple R-squared	Adjusted R-squared
Group 1	9.138e+07 (1.383e+06)***	-1.080e+09 (3.146e+07)***	-2.996e+08 (8.317e+07)	4.798e+08 (1.098e+08)**	0.9679	0.9671
Group 2	28736186 (1211395)***	-388479692 (38725182)***	-64985059 (42403362)	252004302 (69242938)***	0.6986	0.6915
Group 3	1547828 (85838)***	-19580170 (2911582)***	23726634 (8290180)**	4972243 (10999191)	0.2971	0.2806
Group 4	22797 (3005)***	-255638 (48688)***	650368 (655610)	485438 (743399)	0.1840	0.1649
Group 5	855144 (46667)***	4983682 (2193010)*	239129 (4291679)	-4120973 (5874819)	0.05405	0.03188
Group 6	1588485 (47938)***	-31579126 (1557283)***	-1687224 (2373828)	14623329 (2974344)***	0.9586	0.9576
Group 7	447405 (48707)***	-243528 (792278)	13917627 (1437284)***	731525 (1977872)	0.8726	0.8696
Group 8	51788287 (479246)***	-508416469 (8766110)***	79437557 (39963020)*	-48495150 (48345334)	0.9897	0.9894

Note: This table reports estimation of regression coefficients of observed data. Standard errors are in parentheses. Statistically significant coefficient is highlighted by one of the significance codes: (***) 0.001 (**) 0.01 (*) 0.05 respectively. IR = interest rate (different for each group), FR = fixed rate, EONIA = the Euro Over Night Index, Group 1 = eurozone (the sum of all other groups), Group 2 = Non-financial corporations, Group 3 = Other financial institutions, Group 4 = Insurance corporations and pension funds, Group 5 = General government, Group 6 = Non-profit institutions serving households, Group 7 = Sole proprietors, Group 8 = Households.

Source: Own research.

According to results in Table 2, we claim that the most important of observed interest rates is an average annualised agreed interest rate for particular group of loans in Groups 1 to 4, Group 6 and Group 8. These coefficients are statistically significant and negative, which indicate a negative relationship between variables. We found that higher value of interest rate has a highly significant negative effect on loans granted by Slovak credit market. There is low or no significance in Group 5 and Group 7, general government and sole proprietors. We observe that all interest rates are indifferent, with low or no significance, in providing loans to general government. Results show that fixed rate is significant only in Group 3 and Group 7, and there is a low statistically significance in Group 8. EONIA is statistically significant in Group 1, 2 and 6 and has no significant impact in Group 3, 4, 5, 7 and 8. The increase in the value of the EONIA indicator indicates a positive impact, in all statistically significant models. Table 2 informs about the multiple and adjusted coefficient of determination R-squared. It evaluates percentage of the variability explained by models. There are relatively high differences between the models. We observe the highest values, more than 95%, in Group 1, 6 and 8. The lowest value of the indicator is in Group 5.

Table 3 shows results of diagnostic tests to confirm the basic econometric assumptions. For all models, we test the normality of residues with the Jarque-Bera test, heteroskedasticity with Breusch-Pagan test, autocorrelation with the Durbin-Watson test, vif factor to test multicollinearity between variables, and we provide resettest to test correct model specification. Table 3 gives us an overview of provided diagnostic test results. There were several violations in each model which we tried to fix applying first differences into models.

Table 3: Diagnostic tests results

Model	Normality	Heteroskedasticity	Autocorrelation	Multicolinearity	Correct model specification
Group 1	No (Yes)	Yes (No)	Yes (No)	Yes (No)	No (Yes)
Group 2	Yes (No)	Yes (No)	Yes (Yes)	Yes (No)	No (Yes)
Group 3	No (No)	Yes (No)	Yes (No)	Yes (No)	Yes (No)
Group 4	Yes (No)	Yes (No)	Yes (Yes)	Yes (No)	Yes (Yes)
Group 5	Yes (No)	Yes (Yes)	Yes (No)	Yes (No)	No (Yes)
Group 6	Yes (No)	Yes (No)	Yes (No)	Yes (No)	No (Yes)
Group 7	No (No)	Yes (No)	Yes (No)	Yes (No)	No (Yes)
Group 8	No (No)	Yes (Yes)	Yes (Yes)	Yes (No)	No (Yes)

Note: The results in parentheses are calculated with the first differences. Group 1 = eurozone (the sum of all other groups), Group 2 = Non-financial corporations, Group 3 = Other financial institutions, Group 4 = Insurance corporations and pension funds, Group 5 = General government, Group 6 = Non-profit institutions serving households, Group 7 = Sole proprietors, Group 8 = Households.

Source: Own research.

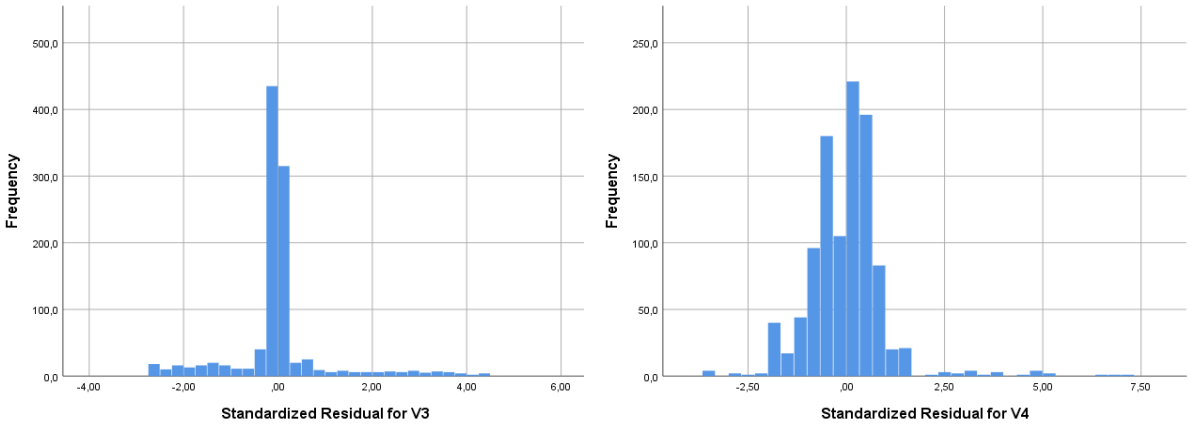
After using the first differences, we can observe that all diagnostic tests were without violation, we can observe in Group 1, thus for loans granted for the whole euro area. All other models are violated by at least one of the conditions of the econometric test, and that is the normality of residues of the models.

3.3 Results of ANOVA method

The one-way analysis of variance is used to determine whether there are any statistically significant differences between the means of our eight unrelated groups. We test the null hypothesis according to description in Methodology section. We use one-way ANOVA between groups, separately for the amount of loans and interest rates. Associated with testing the null hypothesis, we analyse the data set with one-way ANOVA in IBM SPSS program. As a dependent variable we select the amount of loans and then, secondly, interest rates and use eight groups as a factor.

The first step of the analysis is testing the assumption of normality which means that the means of loans and interest rate variables are distributed normally. We determine the residuals of the score and then plot those residuals on the histogram and investigate whether that diagram assumes the shape of a normal distribution or not. We standardize residuals and put them on the x-axis. The results of histograms, separately for the amounts of loans and interest rates for these loans, are shown in Figure 5.

Figure 5: Histograms for testing normality



Note: V3 = Amounts of loans V4 = Interest rates for these loans

Source: Own research

Figure 5 shows distribution of our residuals and how these deviates from the norm and it needs to show a relatively look alike to a bell curve. We can assume there is relatively acceptable normal distribution and normality has been assumed in this data set. The next step is to assess the homogeneity of variance assumption, whether the variance and the scores are the same for each of eight groups and check the significance value for the Levene's test in Table 4.

Table 4: Test of homogeneity of variances

	Levene Statistic F- statistics/ Significance value	Brown-Forsythe F- statistics/ Significance value
Loans	292.7481062/0.000	1603.526261/0.000
Interest rate	67.03541978/0.000	526.8202343/0.000

Note: Sig. = significance value

Source: Own research

For the whole analysis of this study, we consider the value of alpha at 0.05 and we compute a 0.95 confidence interval for testing hypothesis. If the significance value is greater than 0.05, we do not have violated the assumption of homogeneity of variance. In this case, we can conclude that our data are violating the assumption of homogeneity of variance. Because we violated the assumption of homogeneity of variance, we cannot interpret this value. As in this case, if the data fail the Levene's test, we can use Welch's t-test for two groups, or Brown-Forsythe's ANOVA for more than two groups. Results of Brown-Forsythe's are shown in Table 5.

Table 5: Brown-Forsythe test for more than two groups

	Brown-Forsythe F- statistics	Sig.
Loans	1603.526261	0.000
Interest rate	526.8202343	0.000

Note: Sig. = significance value

Source: Own research

In Table 5, as we have ANOVA for the Brown-Forsythe. The value is lower than 0.05 and the assumption have been violated again. If independent groups are not similar in this regard, spurious findings can be yielded. ANOVA should not be conducted on continuous variables that violate the assumption of homogeneity of variance. As a last part of the ANOVA, we assess the significance level of the ANOVA. If the significance value is less than or equal to 0.05, there is a significant difference among our means, however this test does not tell us which group is different from other group. As you can see on Table 6, overall significant value is 0.000 which is less than 0.05 thus indicating that we have a statistically significant result somewhere in our group.

Table 6: ANOVA, Sum of squares between groups and within groups

	Between groups	Within groups	Sig.
Loans	2.2174E+17	2.07029E+16	0.000
Interest rate	0.190842422	0.196340764	0.000

Note: Sig. = significance value

Source: Own research

Since our overall ANOVA was significant but the assumption of homogeneity of variance between variables for both, amounts of loans and their interest rates separately, is violated, we assume that null hypothesis must be rejected and therefore we must proceed to a nonparametric test on one-way ANOVA. We test K-independent samples, with “k”, as a number of levels, and we follow Kruskal-Wallis H test as a nonparametric alternative to a one-way ANOVA, which is the most commonly used in studies. Kruskal-Wallis H test ranks the data and then it calculates the mean of those ranks. It is used for comparing two or more equal or different group sample sizes. We show the results of this test for loans and interest rate in Table 7.

Table 7: Mean ranks results

Group	Mean rank of loans	Mean rank of interest rate
1	982.6818	643.1363636
2	763.5682	382.1553030
3	559.4848	329.4431818
4	66.5	562.6590909
5	496.2273	150.0795455
6	265.7273	448.9015152
7	264.5606	890.375
8	829.25	821.25
Asymp. Sig. of Kruskal-Wallis	0.000	0.000

Note: Asymp. Sig. = Asymptotic significance

Source: Own research

Results show that high ranked in this case means a higher overall score the groups achieve, so we assume that Group 1 of loans and Group 7 of interest rate have the highest values, and Group 4 of loans and Group 5 of interest rates have the lowest values. We assume that the Kruskal-Wallis gives us the asymptotic significance level at 0.000 in both cases which is highly significant. Overall, this indicates that there is a significant difference between these groups. There is the

most significant difference between the whole euro area and insurance corporations and pension funds, of amounts of loans, and sole proprietors and general government in interest rate groups.

4 Conclusion

Since its establishment, the National Bank of Slovakia has played the role of an independent central and issuing bank and one of the sole competences of this institution was setting the basic interest rate for other commercial banks. The position of the NBS developed simultaneously with the change of competencies, especially in the period after Slovakia's entry into the euro area. The European Central Bank sets the interest rates at which it lends to commercial banks in the eurozone, thus controlling money supply and inflation. Commercial banks try to attract as many clients as possible, so they are constantly creating new products for them and simplifying the conditions for their provision. Low interest rates compel banks to compete for loans therefore banks are able to offer attractive interest rates which appeal to customers. Interest rates have vital importance for economic decision making. The aim of this paper is to analyze the development of consumer loans and three interest rates which can affect the amount of granted loans in the Slovak banking market, using monthly based data over the period from 2009 to 2019.

Results of least squared regression method show statistically significance for average annualised agreed interest rate for particular group in almost every model. This significance was negative, indicating that higher value of interest rate, except of EONIA rate, has a negative effect on loans granted by Slovak credit market subjects. The level of the interest rate does not influence the loans for general governance, but on the other hand, the results show the lowest value of the coefficient of determination. The highest value of coefficient of determination was observed in models for whole euro area, non-profit institutions and households. The ANOVA method results tell us that homogeneity of variances assumption has been violated and thus we assume that null hypothesis must be rejected, and we proceed to a nonparametric test on one-way ANOVA, Kruskal-Wallis test with highly asymptotic significant results. According these results, we assume that there is significant difference between the whole eurozone and insurance corporations and pension funds from the perspective of amounts of loans. In terms of the interest rate there is the most significant difference between sole proprietors and general government groups.

The contribution of the study is that it can be implicated on analysing credit market of other countries. In conclusion, we can state that in further research it would be interesting to pay more attention to the negative interest rate and monetary policy in connection with COVID-19.

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