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## The Relationship Between Bank Concentration and Interest Rates

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**Abstract:** The aim of this paper was to analyse the relationship between market concentration and market interest rate. Taking into thought the relationship between the level of concentration within a market and the level of competition, it can be deduced that an increment in concentration results in a decrease in competition. In order to test the above mentioned relationship, the authors used a panel dataset covering the period 2010Q1-2019Q4. The set includes quarterly data of all banks that operated in the Republic of Serbia. First of all, a correlation analysis was applied to determine whether there is a quantitative agreement between interest rates and concentration measures, and also a regression analysis i.e., econometric evaluation of panel regression models. In order to test the hypothesis, a total of 12 regression equations were applied. Results indicate that the concentration indicators have a statistically significant and negative impact on the overall active interest rate in only two regression models, which is inadequate to support the hypothesis that there exists a systematic influence of concentration in the banking industry on interest rates. As a conclusion, the regression analysis imposes that the variations of the total loan interest rate can be explained to the greatest extent by the systematic and robust influences of the key policy rate of the NBS and the interannual inflation rate for the given quarter, as well as by the robust tendency of a linear decline over time.

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## Introduction

Interest rates had fallen to extreme lows across advanced economies (until 2022), and they were projected to stay low. At the same time, market concentration, business profits and markups have been rising steadily. The rise in concentration has been associated with a substantial decline in productivity growth; furthermore, the productivity gap between leaders and followers within the same industry has risen (Liu, Mian & Sufi, 2022). The level of concentration is usually related to the competitiveness of a banking system, which affects the development and health of the particular country's entire economic system (Anđelinović, Milec, & Dumičić, 2022). The banking sector contributes to economic growth and that there is a positive causal relationship between banking sector and economic growth (Kondovski, 2021). Thus, bank profitability and bank stability are the most important targets of bankers and policymakers, particularly in some emerging economies where the stability of the whole economy is nearly dependent on the stability of the banking sector (Alnabulsi, Kozarević & Hakimi, 2023). In order to maintain that stability, current banking risk management is taking care of a significant number of traditional risks such as credit, liquidity, market, operational and other risks (Milojević & Redzepagic, 2021). The growing turbulence of the financial market inevitably leads to the strengthening of banking risks (Žunić, Kozarić & Dželihodžić, 2021). Following the last financial crisis, the issue of risk management has regained its importance (Jović & Đaković, 2022).

Rising competition among banks could pose a challenge and possibly change the level of overall risks, especially if the banks are small in size (Vujanović & Fabris, 2021). On the other hand, a high degree of competition in a relatively small market of banking services leads to that the struggle for each customer becomes an imperative in operating banks. The financial system of Serbia is highly bank-centric and euroised, which is a common specific feature of financial systems in developing countries (Jović, 2016). So, the questions are, is it possible to increase the number of customers and market share if bank has lower loan interest rate? Does market competitiveness affect market interest rates or the market will be more competitive if banks can offer different loan prices i.e., interest rates? In this paper the authors tried to get the answers to these questions using a dataset of banks that operated in the Republic of Serbia in the period 2010 - 2019.

The rest of the paper is organized as follows. The second part presents the literature review and the third part gives a description about the data set and regression model, with the next part being a discussion of the presented results, and, the final part is reserved for concluding remarks.

## Literature review

The literature on the measurement of competition can be divided into two major group models: the structural approach to model and non-structural models. The first one has its roots in the Industrial Organization Theory and the second one belongs to the New Empirical Industrial Organization. The structural approach to model competition embraces the Structure-Conduct-Performance (SCP) paradigm and the efficiency hypothesis (Bikker & Haaf, 2002a). The SCP hypothesis is trying to explain that market structure will affect the behaviour (conduct) of the firms and thus the changes in behaviour will affect the performance (Al Arif & Awwaliyah, 2019). So, the market structure and the level of competition would have influence on profitability (Gilbert, 1984; Hannan, 1991; Berger, 1995; Çelik & Kaplan, 2016; Athanasoglou, Brissimis & Delis, 2008;). Demsetz (1973, 1974), Brozen & Bittlingmayer (1982), Peltzman (1977), and McGee (1974) argue that concentration is not a random event but the result of the superior efficiency of leading companies. Companies that have a comparative advantage in production become large and thereby acquire a high market share, and as a consequence the market becomes more concentrated. This view, defined by the authors as the efficiency hypothesis, implies that market share implies greater efficiency of the company and is therefore positively correlated with profitability.

Non-structural models of competitive behaviour have been developed, these being the Iwata model, the Bresnahan model, and the Panzar and Rosse (P-R) model, and these New Empirical Industrial Organisation approaches test competition and stress the analysis of the competitive conduct of banks (Bikker & Haaf, 2002b). The specificity of the banking industry imposes a limitation regarding the data that would be necessary for the application of econometric approaches to measure market power, starting from a non-structural approach. Considering that and literature review, authors mostly use structural approach to model competition. This approach refers to using market shares contrary to prices in order to analyze market structure/competition which will be the case in this paper as well.

Corvoisier & Gropp (2002) tested whether the increase in concentration within the European banking sector had, to some extent, counteracted the escalation in competition resulting from regulation. They tested this by estimating a simple Cournot model of bank pricing. They constructed country and product specific measures of bank concentration and found that for loans and demand deposits increasing concentration may have resulted in less competitive pricing by banks, whereas for savings and time deposits, the model is rejected, suggesting increases in contestability and/or efficiency in these markets.

Mody and Peria (2004) analyzed the impact of foreign participation and market concentration impact on Latin America bank spreads during the late 1990s. Their sample included private banks, domestic and foreign banks. They categorized the determinants of spreads into three groups; bank-specific variables, system-wide measures of market structure and variables that control for the macroeconomic environment. The findings indicate a positive and direct correlation between bank concentration and higher spreads and costs.

In their study, Claeys and Vander Venet (2008) examine the factors that contribute to determinants of bank interest margins. This study investigates the bank interest margins prevalent in the Central and Eastern European transition countries (CEEC) during the period 1994 to 2001. The results of the study suggest that a number of bank-specific factors, including cost efficiency and capital adequacy, have a significant impact on bank margins as well as market concentration.

Perera, Skully and Wickramanayake (2010) employed the Structure-Conduct-Performance (SCP) model to assess to investigate whether any deviations in South Asian banks' interest margins can be attributed to market concentration after controlling for other bank-specific factors and exogenous environmental influences. In the model, the net interest margin was used as the dependent variable to represent pricing decisions of banks. Their sample consists of domestic commercial banks in Bangladesh, India, Pakistan and Sri Lanka over the period 1990 - 2004. The findings suggest that in spite of the fact that high market concentration itself does not ensure more extensive interest margins, the prevailing South Asian banks (with bigger market shares in loan and deposit) do appear able to extricate higher interest margins.

Increasing foreign participation and high concentration levels characterize the evolution of banking sectors' market structures in developing countries (Peria & Mody, 2004). The findings indicate that the presence of foreign involvement and concentration wield a noteworthy impact on the interest rate spreads imposed upon borrowers and consequently the process of financial intermediation in a convoluted manner. First, foreign banks charge lower interest margins and potentially foster financial intermediation. Second, greater foreign presence does not imply a general decline in spreads, but appears to influence the intermediation through lowering costs of operation. Finally, greater concentration raises spreads in an economically important manner.

De Haan and Poghosyan (2012) examined if bank size and the degree of concentration in the banking sector had impact on bank earnings volatility using quarterly data for non-investment banks in the United States for the period 2004Q1-

2009Q4. The mitigation of adverse ramifications resulting from the expansion of bank size, in terms of bank earnings volatility, diminishes proportionally (in absolute terms) with increasing levels of market concentration. The recent financial crisis has resulted in greater volatility for larger banks situated in concentrated markets, as determined by their research. They also found out that larger banks have lower earnings volatility compared to smaller banks and the negative impact of bank size on bank earnings volatility reduces when market concentration rises.

Bonini, Dell'Acqua, Fungo & Kysucky (2016) in their study examined the impact of banking industry concentration and credit relationship strength on various variables of interest. Specifically, they seek to identify potential associations between these two factors and relevant outcomes within their research scope. The cost of borrowing for firms is influenced by the combined impact of relationship lending. Their initial sample is composed of 15,917 loans for which they had information on at least one of the following variables: mark-up, amount, relationship with the bank and firm-level information. They have reliable information about the mark-up for 5,715 loans. Credit market concentration appears to favour an increase in the cost of funding.

The study conducted by Agoraki & Kouretas (2019) examines the impact of bank-specific, industry-specific and macroeconomic variables. The present study aims to investigate the impact of determinants and the regulatory environment on the net interest margin (NIM) within the context of the banking sector. The research examines the banking industries within South Eastern European countries during the period 1998 to 2007. Using both static and dynamic frameworks and advanced market structure measures, the empirical analysis reveals that net interest margin is affected by bank-specific determinants like equity capital, risk and bank size.

Gocer & Ongan (2020) reconsider the Fisher effect for the UK from a different methodological perspective. To this aim, the nonlinear ARDL model recently developed by Shin, Yu & Greenwood-Nimmo (2014), is applied over the periods of 1995M1-2008M9 and 2008M10-2018M1. Their model decomposes the changes in original inflation series as two new series: increases and decreases in inflation rates. Hence, it enables them to examine the Fisher effect in terms of increases and decreases in inflation separately. The empirical findings support asymmetrically partial Fisher effects for the UK in the long-run only for the first period. Additionally, this study attempts to describe and introduce a different version of the partial effect concept for the first time for the UK.

Liu et al. (2022) analysed the relation between interest rates, market power and productivity growth. Their study highlighted a new strategic force that delivers a unified explanation across 39 advanced economies for the presence of low interest rates, high market concentration, high profits, large productivity gaps between market leaders and followers, and low productivity growth. They introduce the possibility of low interest rates as the common global factor that can potentially explain the slowdown in productivity growth. Decreasing market control is not compelling in stimulating investment and growth when the interest rate is rather low. Their main result establishes that a slowdown in aggregate productivity growth is inevitable and is accompanied by a decline in investment and a rise in market power.

Addai, Tang, Gyimah & Appiah (2023) employ annual data on 552 commercial banks for the period 2011-2018 across fifty-two African countries. The results of the study indicate that bank intermediation margin in Africa is a function of pure spread variables that include bank concentration, credit risk, risk aversion, interest rate volatility, then income from non-traditional banking activities, specialization, other bank-specific (transaction size, operating cost) and macroeconomic variables (financial innovation and GDP). The results also suggest that there are some similarities and nuances for the determinants of bank intermediation margins across the domestic, regional African, and non-African banks.

## The model and data

Taking into consideration the relationship between the level of concentration within a market and the level of competition, it can be concluded that an increase in concentration results in a reduction in competition. Specifically, increased market power tends to limit the range of competitive participants and reduce the scope of market rivalry. The authors begin their analysis by considering that banks possessing a high market share would possess greater market power, leading to an attendant rise in interest rates on recently approved loans. Consequently, the hypothesis was defined in the subsequent manner:

*An increase in the concentration level of the banking market leads to increase in interest rates on loans.*

In September 2010, the National Bank of Serbia (NBS) created and has been publishing ever since the interest rate statistics in accordance with the methodology prescribed by the European Central Bank, which represents a time limit in the research. The data set includes 37 quarters i.e., 2010Q4-2019Q4. First of all,

a correlation analysis was applied to determine whether there is a quantitative agreement between interest rates and concentration measures, i.e. whether higher values of interest rates are associated with higher values of the measures. The interest rates used in the correlation analysis are on total loans to households and non-profit institutions that provide services to households -  $kam\_s$  and interest rates on total loans to non-financial business entities -  $kam\_p$ . Given that interest rates are published on monthly basis, a three-month average was calculated.

**Table 1: Concentration measures**

Variable	Measure	Notation
CR1	$CR_1 = \sum_{i=1}^1 xi$	cr1a
		cr1k
		cr1p
CR4	$CR_4 = \sum_{i=4}^4 xi$	cr4a
		cr4k
		cr4p
CR10	$CR_{10} = \sum_{i=10}^{10} xi$	cr10a
		cr10k
		cr10p
Herfindahl-Hirschman index	$HHI = \sum_{i=1}^N x_i^2$	hhi_a
		hhi_k
		hhi_p

Source: Authors

Considering that the correlation analysis did not give significant results and was not suitable for conclusions about the influence of variables, a regression analysis was used, i.e. econometric evaluation of panel regression models. In order to test the hypothesis, a total of 12 regression equations were applied. The interest rate used in the regression analysis as a dependent variable is the three-month average of the interest rate on total loans (households and business entities). Data on interest rates were used from the database of the National Bank of Serbia, as long as the control variables that were included in the model, while the concentration measures that were key independent variables were simultaneously included in the model - concentration ratio and Herfindahl-Hirschman index calculated by the authors. The general linear regression model is specified as follows:

$$kam_t = \beta_0 + \beta_{pk} X_t^{pk} + \beta_{time} + \beta_{tsq} t^2 + \beta_{kpr} X_t^{kpr} + \beta_{d_reer} X_t^{d_reer} + \beta_{inf} X_t^{inf} + \varepsilon_t$$

where  $kam$  interest rate on total loans to households and non-profit institutions that provide services to households and non-financial business entities in the pe-

riod  $t$ ,  $t=1, \dots, T$ ,  $pk$  are concentration measures that are simultaneously included in the model,  $t$  and  $t^2$  are controls for the linear and non-linear trend of interest rate decline in the observed time period,  $kpr$  three-month average NBS key policy rate,  $d_{reer}$  the three-month average of the appreciation of the real effective exchange rate (compared to the three-month average for the same quarter of the previous year),  $infl$  interannual inflation rate for a given quarter compared to the same quarter of the previous year and  $\varepsilon_t$  is a random error that includes the effects of all other variables that are not directly included in the model, including individual effects. Concentration measures (Table 1) were calculated based on total assets, total loans and interest income.

## Results and discussion

Table 2 shows the results of the correlation analysis between interest rates and concentration measures. It is assumed that in conditions of greater market concentration, there is less intensity of competition, which implies a negative impact on interest rates, i.e. the growth of loan interest rates. In the observed period, all measures of concentration have an upward trend. The sample includes interest rates on total loans to households and non-profit institutions that provide services to households -  $kam_s$  and interest rates on total loans to non-financial business entities -  $kam_p$  at the quarterly level, covering 37 quarters.

**Table 2: Correlation matrix**

	Total Assets	$kam_s$	$kam_p$		Total loans	$kam_s$	$kam_p$		Interest income	$kam_s$	$kam_p$
cr1a	Pearson			cr1k	Pearson			cr1p	Pearson		
	Corr.	-,399*	-,489**		Corr.	-,108	-,212		Corr.	,079	,073
	Sig.	,014	,002		Sig.	,526	,209		Sig.	,641	,669
cr4a	Pearson			cr4k	Pearson			cr4p	Pearson		
	Corr.	-,568**	-,688**		Corr.	-,475**	-,611**		Corr.	-,680**	-,777**
	Sig.	,000	,000		Sig.	,003	,000		Sig.	,000	,000
cr10a	Pearson			cr10k	Pearson			cr10p	Pearson		
	Corr.	-,698**	-,806**		Corr.	-,706**	-,804**		Corr.	-,832**	-,896**
	Sig.	,000	,000		Sig.	,000	,000		Sig.	,000	,000
hhi_a	Pearson			hhi_k	Pearson			hhi_p	Pearson		
	Corr.	-,559**	-,676**		Corr.	-,600**	-,718**		Corr.	-,732**	-,819**
	Sig.	,000	,000		Sig.	,000	,000		Sig.	,000	,000

\*\* . Correlation is significant at the 0.01 level (2-tailed).

\* . Correlation is significant at the 0.05 level (2-tailed).



Taking into account the correlation coefficients between loan interest rates and measures of asset concentration, it can be concluded that there is a quantitative agreement between the two groups of variables. Given that the Pearson coefficient is negative, it can be concluded that there is an inverse relationship i.e., that higher values of concentration are associated with lower values of interest rates.

The correlation coefficient *cr1a* is statistically significant at the level of 5%, while for the other variables the correlation coefficient is statistically significant at the level of 1% when the relationship between interest rates on loans and concentration indicators is observed. The Pearson's correlation coefficient has values between -0.399 and -0.806, and the relationship between the variables can be defined as moderate and very strong. The correlation coefficient is the highest between *cr10a* and *kam\_p* i.e., -0.806, while the lowest value is between *cr1\_a* and *kam\_s*. Considering the correlation between interest rates on loans to business entities - *kam\_p* and the indicator of asset concentration, the correlation is significant at the level of 1%. The correlation between *kam\_p* and *cr1a* is moderate, -0.489, *cr4a* and *hhi\_a* is strong, -0.688 and -0.676, while the highest correlation coefficient is between *kam\_p* and *cr10a* i.e., -0.806. The second group of concentration indicators is based on the total amount of approved loans, where the correlation coefficient between *kam\_s/kam\_p* and *cr1k* is not statistically significant. The correlation coefficient is statistically significant at the 1% level.

Considering the direction of the relationship in almost all correlations, it can be concluded that higher values of concentration based on the total amount of loans correspond to lower values of interest rates on loans granted to households. Also, looking at the statistically significant correlation coefficients between interest rates on corporate loans to and concentration indicators based on the total amount of loans, the relationship between the variables is in most cases strong and negative. Therefore, higher values of concentration based on the total amount of loans correspond to lower values of interest rates on loans to non-financial business entities. The third group of concentration indicators is based on interest income and the correlation coefficient with interest rates. There is no statistically significant correlation between interest rates and *cr1p*. Besides *cr1p*, all other correlations are statistically significant at the 1% level. Between the mentioned group of measures of concentration and interest rates where there is quantitative agreement, the value of the correlation coefficient indicates that the connection between the two variables is generally strong and moderate.

Based on the results shown in Table 2, it can be concluded that the values of concentration indicators and interest rates moved in the opposite direction. In periods of greater market concentration, interest rates were lower. Given the above,

there are not enough arguments to confirm the hypothesis. The above hypothesis is based on the assumption that in the conditions of greater market concentration, there is a lower level of competitiveness, and that banks with a large market share have a larger market power resulting in the growth of loan interest rates. However, interest rates on loans to households and businesses do not depend on the market structure, but are mostly influenced by the NBS key policy rate and the Euribor.

In the implementation of monetary policy, the reference interest rate (NBS key policy rate) is the initial interest rate according to which interest rates on dinar loans are determined. In the observed period, from 2010 until the beginning of 2013, the NBS key policy rate fluctuated in the range of 9.50 - 12.50%. Since February 2013, when the NBS key policy rate was 11.75%, the NBS decided to reduce the key policy rate and in December 2019 it stood at 2.25%, which is the lowest value in the observed period (2010Q4-2019Q4).

The NBS decisions on the level of the key policy rate in the observed period had a significant impact on the interest rates on loans to households, given that the share of euro-indexed and euro-denominated loans to households was 44%. When it comes to the Euribor and loans to households, the Euribor primarily affects housing loans that are almost entirely euro-indexed. Nevertheless, the Euribor has a greater influence on loans to business entities, bearing in mind that the share of euro-indexed and euro-denominated loans is 83%. Since 2013, according to the official announcement of the NBS, the drop-in interest rates on loans in euros has been more pronounced than the drop in the Euribor, and such a decrease in interest rates is the result of several factors: a decrease in the risk premium, an increase in the country's credit rating, as well as an increase in competition among banks in Serbia.

In order to test the hypothesis, a total of 12 regression equations were applied where concentration indicators were simultaneously included. The estimated effects of concentration indicators *cr1* and *cr4* based on total balance sheet assets, total loans and interest income on interest rates are shown in Table 3. Based on the results shown in the table, the following can be concluded:

- In five of a total of six regression models, the concentration indicators do not have a statistically significant impact on interest rates. The only concentration indicator that is statistically significant is within the m2 model i.e., *cr1k* based on loans that is significant at the 5% level.
- The coefficient of determination is  $R^2 = 0,99$  from which it can be concluded that 99% of the variability of the interest rate on total loans granted to

households and business entities is explained by the independent variables that are included in the model.

- The linear time trend is statistically significant at the 1% level in the above six regression models whose results are shown in the table, while the non-linear trend is also significant at the 1%, 5%, and 10% levels.

**Table 3: The influence of CR1 and CR4 on interest rates**

	m1	m2	m3	m4	m5	m6
	b/se	b/se	b/se	b/se	b/se	b/se
cr1_a	0.02 (0.05)					
cr1_k		-0.19** (0.07)				
cr1_p			0.01 (0.05)			
cr4_a				0.04 (0.03)		
cr4_k					-0.01 (0.03)	
cr4_p						0.04 (0.03)
time	-0.21*** (0.03)	-0.19*** (0.03)	-0.21*** (0.03)	-0.27*** (0.05)	-0.19*** (0.04)	-0.25*** (0.03)
t_sq	0.00** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00* (0.00)	0.00*** (0.00)
kpr	0.31*** (0.04)	0.34*** (0.04)	0.31*** (0.03)	0.31*** (0.03)	0.32*** (0.04)	0.31*** (0.03)
d_reer	0.02* (0.01)	0.03** (0.01)	0.02 (0.01)	0.02 (0.01)	0.02* (0.01)	0.02 (0.01)
infl	-0.07*** (0.02)	-0.10*** (0.02)	-0.07*** (0.02)	-0.06*** (0.02)	-0.08*** (0.02)	-0.07*** (0.02)
_cons	12.22*** (0.87)	14.95*** (1.18)	12.19*** (0.93)	11.82*** (0.86)	12.55*** (0.91)	11.42*** (0.98)
No. of Obs.	37.00	37.00	37.00	37.00	37.00	37.00
R-Squared	0.99	0.99	0.99	0.99	0.99	0.99

Source: Authors

- The key policy rate is statistically significant at the 1% level in all regression models and the estimated impact is positive. Growth of the reference interest rate of 1 pp. affects the growth of interest on total loans granted to households and the economy by an average of 0.31 pp.
- The appreciation of the real effective exchange rate has a statistically significant effect on the interest rate in three of the six regression models at the 5% and 10% significance levels.
- The estimated effect of inflation on interest rates on loans is negative at the significance level of 1% in almost all regressions. On average for all models in the table, an increase in inflation of 1% affects the drop in the interest rate on approved loans to households and the economy by -0.07 pp.

The next group of key independent variables included in the model are *cr10* and *hhi* concentration measures. The estimated impacts of the mentioned concentration indicators are shown in Table 4. Based on the results shown in the table, the following can be concluded:

- Observing the effects of concentration indicators on interest rates, only the *cr10k* indicator is significant, i.e. the cumulative market share of the first ten banks is? at the significance level of 10%. The estimated effect of the concentration indicator is negative, meaning that the increase in the concentration of the banking sector would affect the drop-in interest rates on total loans granted to households and business entities.

**Table 4: The influence of CR10 and HHI on interest rates**

	m7	m8	m9	m10	m11	m12
	b/se	b/se	b/se	b/se	b/se	b/se
cr10_a	-0.01 (0.03)					
cr10_k		-0.05* (0.03)				
cr10_p			0.03 (0.03)			
hhi_a				0.00 (0.00)		
hhi_k					-0.00 (0.00)	
hhi_p						0.00 (0.00)
time	-0.19*** (0.05)	-0.16*** (0.04)	-0.22*** (0.03)	-0.26*** (0.04)	-0.17*** (0.04)	-0.24*** (0.03)
t_sq	0.00 (0.00)	0.00 (0.00)	0.00*** (0.00)	0.00*** (0.00)	0.00 (0.00)	0.00*** (0.00)
kpr	0.32*** (0.03)	0.33*** (0.03)	0.31*** (0.03)	0.31*** (0.03)	0.33*** (0.04)	0.31*** (0.03)
d_reer	0.02* (0.01)	0.03** (0.01)	0.02 (0.01)	0.02 (0.01)	0.03** (0.01)	0.02 (0.01)
infl	-0.08*** (0.02)	-0.08*** (0.02)	-0.06*** (0.02)	-0.06*** (0.02)	-0.08*** (0.02)	-0.06*** (0.02)
_cons	12.89*** (1.59)	14.79*** (1.59)	10.71*** (1.61)	12.23*** (0.62)	12.84*** (0.86)	11.59*** (0.93)
No. of Obs.	37.00	37.00	37.00	37.00	37.00	37.00
R-Squared	0.99	0.99	0.99	0.99	0.99	0.99

Source: Authors

- The linear trend is statistically significant at the 1% level in all six regression models whose results are shown in the table.
- The estimated effect of the reference interest rate is positive and statistically significant at the 1% level in all regression models within the table. Growth of the reference interest rate of 1 pp. results in an increase in the interest rate on total loans granted to households and the business entities by an average of 0.32 pp.

- The appreciation of the real effective exchange rate has a statistically significant impact in three out of six regression models at different levels of significance and the estimated impacts differ significantly from the results in Table 3. On average for the three mentioned models, with an appreciation of the real effective exchange rate of 1 pp., there is an increase in interest rates on approved loans of 0.03 pp.
- At a significance level of 1%, it has been estimated that inflation has a negative effect. On average, an increase in inflation of one percentage point is observed and the findings indicate that there is a consequential decrease of 0.06-0.08 percentage points in the interest rates on the total loans extended to both households and the business entities.
- Bearing in mind the coefficient of determination, which is the same as in the previous six regression models, 99% of the variability of the interest rate on total loans granted to households and business entities is explained by the independent variables included in the model.

## Conclusion

Starting from the fact that in the conditions of a decrease in the level of market competition, banks with high market share will have greater market power, as a result of which there is an increase in interest rates on newly approved loans, regression was used on the data set for time period 2010Q4-2019Q4. In order to test the hypothesis, analysis that involve the implementation of a total of twelve regression models was applied where the concentration indicators were simultaneously included as key independent variables. The results suggest that the concentration indicators have a statistically significant and negative impact on the overall lending interest rate in only two of the 12 regression models, which is inadequate to support the hypothesis that there is a systematic influence of concentration in the banking industry on interest rates.

The findings of this study suggest that the variations observed in the total lending banking interest rate are predominantly attributable to the consistent and strong impacts exerted by the key policy rate of the National Bank of Serbia and the interannual inflation rates for the corresponding quarter, as well as by the robust tendency of a linear decline over time. Based on the results of the regression analysis, it can be concluded that there is no statistically significant impact of market concentration on the banking interest rate on total loans to households and non-profit institutions that provide services to households and non-financial business entities.

## References

1. Addai, B., Tang, W., Gyimah, A. G. & Appiah, K. O. (2023). Bank intermediation margins in transition banking domains: panel evidence from Africa. *Economic Change and Restructuring*, 1-39.
2. Agoraki, M. E. K. & Kouretas, G. P. (2019). The determinants of net interest margin during transition. *Review of Quantitative Finance and Accounting*, 53, 1005-1029.
3. Al Arif, M. N. R. & Awwaliyah, T. B. (2019). Market share, concentration ratio and profitability: evidence from Indonesian Islamic banking industry. *Journal of Central Banking Theory and Practice*, 8(), 189-201.
4. Alnabulsi, K., Kozarević, E. & Hakimi, A. (2023). Non-Performing Loans and Net Interest Margin in the MENA Region: Linear and Non-Linear Analyses. *International Journal of Financial Studies*, 11(2), 64.
5. Anđelinović, M., Milec, M. & Dumičić, K. (2022). Analysis of the assets, credits and deposits concentration within the Croatian banking system based on selected concentration indices. *Journal of Central Banking Theory and Practice*, 11(1), 131-150.
6. Athanasoglou, P. P., Brissimis, S. N. & Delis, M. D. (2008). Bank-specific, industry-specific and macroeconomic determinants of bank profitability. *Journal of international financial Markets, Institutions and Money*, 18(2), 121-136.
7. Berger, A. N. (1995). The profit-structure relationship in banking--tests of market-power and efficient-structure hypotheses. *Journal of money, credit and banking*, 27(2), 404-431.
8. Bikker, J. A. & Haaf, K. (2002a). Competition, concentration and their relationship: An empirical analysis of the banking industry. *Journal of banking & finance*, 26(11), 2191-2214.
9. Bikker, J. A. & Haaf, K. (2002b). Measures of competition and concentration in the banking industry: a review of the literature. *Economic & Financial Modelling*, 9(2), str. 53-98.
10. Bonini, S., Dell'Acqua, A., Fungo, M. & Kysucky, V. (2016). Credit market concentration, relationship lending and the cost of debt. *International Review of Financial Analysis*, 45, 172-179.
11. Brozen, Y. & Bittlingmayer, G. (1982). *Concentration, mergers, and public policy*. Free Press.
12. Çelik, T. & Kaplan, M. (2016). Testing the Structure-Conduct-Performance Paradigm for the Turkish Banking Sector: 2008-2013. *International Journal of Economics and Financial Issues*, 6(4).

13. Claeys, S. & Vander Venet, R. (2008). Determinants of bank interest margins in Central and Eastern Europe: A comparison with the West. *Economic Systems*, 32(2), 197-216.
14. Corvoisier, S. & Gropp, R. (2002). Bank concentration and retail interest rates. *Journal of Banking & Finance*, 26(11), 2155-2189.
15. De Haan, J. & Poghosyan, T. (2012). Bank size, market concentration, and bank earnings volatility in the US. *Journal of International Financial Markets, Institutions and Money*, 22(1), 35-54.
16. Demsetz, H. (1973). Industry structure, market rivalry, and public policy. *The Journal of Law and Economics*, 16(1), 1-9.
17. Demsetz, H. (1974). Toward a theory of property rights. *Classic papers in natural resource economics*, 163-177. Palgrave Macmillan, London.
18. Gilbert, R.A. (1984). Bank Market Structure and Competition. *Journal of Money, Credit, and Banking*. 16, pp. 617-645.
19. Gocer, I., & Ongan, S. (2020). The relationship between inflation and interest rates in the UK: The nonlinear ARDL approach. *Journal of Central Banking Theory and Practice*, 9(3), 77-86.
20. Hannan, T. J. (1991). Bank profitability and the threat of entry. *Journal of Bank Research*, 157-163.
21. Jović, Ž. & Đaković, M. L. (2022). Interbank Network as a Channel of Credit Contagion in Banks: Is Moral Hazard Transferable?. *Journal of Central Banking Theory and Practice*, 11(3), 117-135.
22. Jović, Ž. (2016). The Interaction Between FX and Credit Risk as an Example of Intersection of Monetary and Financial Stability Policy Goals—The Case of Serbia. *Journal of Central Banking Theory and Practice*, 5(2), 133-155.
23. Kondovski, H. (2021). The innovative impact of insurance for economic growth: the evidence from new eu member states. *Economics-Innovative And Economics Research Journal*, 9(2), 109-121.
24. Liu, E., Mian, A. & Sufi, A. (2022). Low interest rates, market power, and productivity growth. *Econometrica*, 90(1), 193-221.
25. McGee, J. (1974). Efficiency and Economies of Size. In: *Industrial Concentration: The New Learning*, ed. H. Goldschmid, H. M. Mann, and J. F. Weston, 55-97. Boston: Little, Brown, and Company.
26. Milojević, N. & Redzepagic, S. (2021). Prospects of artificial intelligence and machine learning application in banking risk management. *Journal of Central Banking Theory and Practice*, 10(3), 41-57.
27. Mody, A. & Peria, M. S. M. (2004). *How foreign participation and market concentration impact bank spreads: evidence from Latin America* (Vol. 3210). World Bank Publications.
28. Peltzman, S. (1977). The gains and losses from industrial concentration. *The Journal of Law and Economics*, 20(2), 229-263.



29. Perera, S., Skully, M. & Wickramanayake, J. (2010). Bank market concentration and interest spreads: South Asian evidence. *International Journal of Emerging Markets*, 5(1), 23-37.
30. Peria, M. S. M. & Mody, A. (2004). How foreign participation and market concentration impact bank spreads: evidence from Latin America. *Journal of money, credit and banking*, 36(3), 511-537.
31. Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). Modelling asymmetric cointegration and dynamic multipliers in a nonlinear ARDL framework. *Festschrift in honor of Peter Schmidt: Econometric methods and applications*, 281-314.
32. Vujanović, N. & Fabris, N. (2021). Does market competition affect all banks equally? Empirical evidence on Montenegro. *Journal of Central Banking Theory and Practice*, 10(2), 87-107.
33. Žunić, A., Kozarić, K., & Dželihodžić, E. Ž. (2021). Non-performing loan determinants and impact of covid-19: Case of Bosnia and Herzegovina. *Journal of Central Banking Theory and Practice*, 10(3), 5-22.