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RELATIONSHIP BETWEEN CONCENTRATION AND FINANCIAL STABILITY: EVIDENCE FROM THE UKRAINIAN BANKING SECTOR

The theoretical and empirical studies concerning relationship between concentration and financial stability are analyzed and the necessity of such research conducting in Ukraine is proved. To identify the relationship between concentration and financial stability in the banking sector of Ukraine, the using of Granger test is suggested. Such indicators as regulatory capital to risk-weighted assets and return on assets have been chosen to reflect changes in Ukrainian banking system financial stability; for the analysis of market concentration there have been selected the concentration ratio. The relationship between concentration and financial stability in the banking sector of Ukraine is established; and there have been proved that this relationship depends on the economic cycle stage. In the period 2003–2008 concentration increase of Ukrainian banking system caused growth of capital adequacy ratio. For the period 2009-2017 "banking stability → concentration" hypothesis has been proved.
Keywords: concentration, financial stability, banks, Grainger causality, concentration ratio, regulatory capital to risk-weighted assets, return on assets.

Introduction. Today, Ukrainian banking system is on the new stage of its development that is connected with overcoming of negative influence of the world financial crises and reforming of banking sector with the aim of providing stable and effective banking activity in Ukraine. This process is complicated by instable internal political and economic environment.

In the current conditions of Ukraine's development, which is characterized by significant changes in social, legal and economic environments, and related with the raising of life standards, deepening market-based economy and also with reforming of the financial sector, special attention should be given to the competition level in the banking sector, that can cause negative consequences to its financial stability. The effectiveness of the national economy development depends on the steady and efficient functioning of banking system. So in the banking sector, unlike other sectors of the economy, the interaction between competition and financial stability must be searched.

Literature review. In spite of concentration-financial stability nexus had been present before the outbreak of the global financial crisis, the systemically important financial institution (SIFI) concept abruptly increased the interest of researchers in exploring their relationship and regulatory tools. There are plenty of theoretical research, such as of Allen and Gale (2000), Boyd and De Nicolo (2002), Franklin Allen and Douglas Gale (2003), Thorsten Beck, Asli Demirgüç-Kunt and Ross Levine (2005), MSc. Arjan Tushaj, Valentina Sinaj (2011), Bogdan Capraru, Alin Marius Andrie (2015), Juan Carlos Cuestas, Yannick Lucotte, Nicolas Reigl (2017), which investigate the relationship between competition, concentration and banking stability depends on market structure, probability of contagion, moral hazard etc. Empirical studies are based on regression estimation, in which depended variable reflects financial stability and there is concentration among explanatory variables.

However, there is no conclusive opinion regardless how concentration affects financial stability. On the one hand, less competition result in less risk-taking, on the other hand high concentration leads to SIFI appearance. It should be noticed that results of the studies depend on the period of research and on the country/area.

The aim of the study is to analyze the causality relationship between concentration and financial stability in the banking sector of Ukraine and assess the sensitivity of this relationship to the economic cycle stage.

The analysis of theoretical and empirical studies concerning relationship between concentration and financial stability should be conducted to substantiate hypothesis of the research and regression' variables (table 1).

Table 1

Comparison of concentration (competition)-financial stability nexus researches

Researcher	Data (countries, period, variables)	Results
Theoretical models		
Allen and Gale (2000)	A model of financial contagion through the interbank market (perfect competition).In that case a small aggregates hock in liquidity demand in a particular region can lead to systemic risk.	
Boyd and De Nicolo (2002)	Greater competition among banks reduces the interest rates that borrowers pay, increases the profitability of their ventures, and hence reduces the incentive to take risk. Thus, increased competition among banks leads to increased financial stability.	
Allen and Gale (2003)	The issue of regulation and its effect on competition and financial stability is complex and multi-faceted. Careful consideration of all the factors at work both at a theoretical and empirical level is required for sound policy.	
Saez and Shi (2004)	Banks are limited in number they may have an incentive to act strategically and provide liquidity to the bank that had the original problem. This will prevent the contagion and make the banks providing funds in this way better off. (Concentration →Stability)	
Empirical studies		
Beck, Demirgüç-Kunt and Levine (2005)	69 countries from 1980 to 1997. Depended variable: crisis dummy that takes on the value of one if there is a systemic and the value of zero otherwise. Explanatory variables: Real GDP growth, Terms of trade change, Real interest rate, Inflation M2/reserves, Depreciation, Credit growth, Moral Hazard Index, Concentration, Regulatory measures, Historical Determinants, Fraction of Entry.	Crises are less likely in economies with more concentrated banking systems even after controlling for differences in commercial bank regulatory policies, national institutions affecting competition, macroeconomic conditions, and shocks to the economy. Regulatory policies and institutions that thwart competition are associated with greater banking system fragility.
MSc. Arjan Tushaj, Valentina Sinaj (2011)	Albania (2000-2010). Depended variables: Z-index, Nonperforming loans, crisis dummy. Explanatory variables: GDP growth, Inflation, CR3, CR5, HHI.	Less competition induce higher loan rates and more rents earned by the bank: a higher loans rate will increase the default probabilities of the borrowers. While the loan market is more affected by moral hazard on the part of borrowers, a higher loan rates charged by banks, will induce them to adjust their investment policies in favor of more risk. (Concentration →Fragility)
Capraru and Andrie (2015)	EU banking systems: 923 commercial banks from 27 EU countries for the period 2001-2009. Depended variable: Z-score Explanatory variables: banking specific variables (microeconomic level), banking system specific variables, macroeconomic variables, competition and concentration variables CR5, HHI	In the pre-crisis period, in the case of the old member states, competition had positive implications on financial stability in the case of structural indicators (CR-5 decrease → Stability increase), while as of the new member states, competition negatively influence the financial stability for all structural indicators (CR-5 decrease → Stability decrease).
Cuestas, Lucotte, Reigl (2017)	Baltic countries (2000-2014). Depended variable: Z-score, ZROE, Loan loss reserves, Impaired loans. Explanatory variables: Lerner index 3-year, MA Lerner index, Funding-adjusted Lerner index, Left-censored Lerner index, Bank size, Non-interest income / Total income, GDP growth, Inflation.	Lower competition has a stabilizing effect on the banking sector. However, above a certain threshold, the lack of competition is likely to exacerbate the individual risk-taking behavior of banks, and could be detrimental to the stability of the banking sector in Baltic countries.

Source: own work

Indeed, theoretical models provide conflicting conclusions about the relationship between the concentration and the competition of the banking industry and financial sustainability in banking sector. Allen and Gale (2000) proves that perfect competition has negative impact on financial stability and contagion effect. Saez and Shi (2004) have got similar results: "banks are limited in number may have an incentive to provide liquidity to the bank that had the original problem." In contrast, Boyd and De Nicolo (2002) have argued that increased competition among banks leads to increased financial stability. As a result Allen and Gale (2003) agree that the problem is rather complex and thorough analysis should be done to develop efficient policy instruments[1].

The empirical studies, which are given in Table 1, suggest that a less concentrated banking sector with many banks is more prone to financial crises than a concentrated banking sector with a few banks. Thorsten Beck, Asli Demirgüç-Kunt and Ross Levine (2005) have analyzed the data from 69 countries for the period 1980 to 1997 and found, that "crises are less likely in economies with more concentrated banking systems"[2]. However, the financial crisis led to a re-examination of concentration-stability relationship assessment results. Some post crisis researchers conclude, that concentration lead to financial fragility, because of high interest rates and moral hazard on the part of borrowers (MSc. Arjan Tushaj, Valentina Sinaj, 2011)[3]. Deniz Anginer, Asli Demirguc-Kunt, Min Zhu (2012) analyzing banks in 63 countries from 1997 to 2009 found that greater competition encourages banks to take on more diversified risks, making the banking system less fragile[4].

Others argue that lower competition has a stabilizing effect on the banking sector, but for some threshold (Juan Carlos Cuestas, Yannick Lucotte, Nicolas Reigl, 2017). In case of threshold intersection, the banks will be inclined to excessive risk-taking.[5] And some studies are sensitive of the financial crisis episode (Bogdan Capraru, Alin Marius Andrie, 2015)[6].

Taking into account inconclusive results of the theoretical and empirical studies, country-specific features in relationship between concentration and financial stability for the Ukrainian banking system should be identified, especially in the modern conditions when quantity of banks rapidly decreases. (Fig. 1)

So, as we can see from the figure, during 2000-2008 the amount of banks had a tendency to constant growth, so the quantity of bank rose from 153 banks on the beginning to 184 banks to the end in accordance. But from 2009 the bank quantity started to fall down and till 2014 this decrease wasn't very sharp. In the period 2014-2017 the quantity of banks had reduced practically in two times. Such structural changes in Ukrainian banking system affects the concentration level that finally can influence on the banking system financial stability.

In our opinion, to identify the relationship between concentration and financial stability in the banking sector of Ukraine it is expedient to use Granger test, that allows to investigate causality between two variables in a time series.

So, the first step in our research is to choose indicators that will reflect changes in concentration and financial stability of national banking sector.

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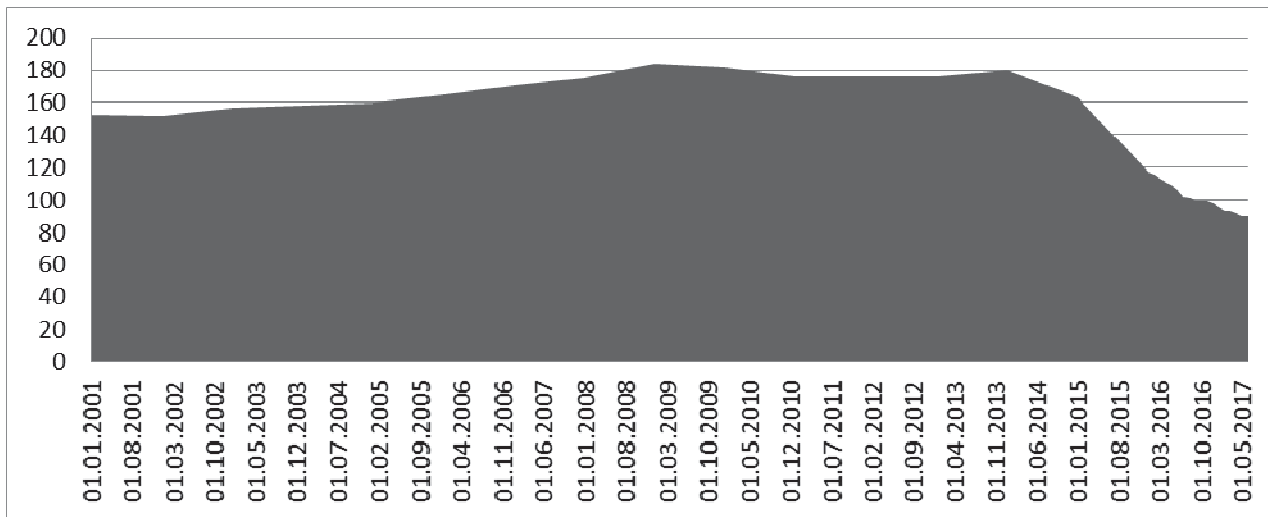
Fig. 1. Bank amount dynamics for the period 2000-2017

Source: own work[1]

Data and methodology. We have to underline that IMF have worked out the system of the financial soundness indicators (FSIs) to provide insight into the financial health and soundness of a country's financial institutions as well as corporate and household sectors. According to this system, there are worked out 25 indexes for estimation of bank financial stability.[2] However, taking into account the availability of data for period 2002-2017, there have been chosen three financial soundness indicators: regulatory capital to risk-weighted assets, return on assets, return on equity. The description of chosen indicators is given in table 2.

Table 2

Financial soundness indicators, chosen by authors

Financial soundness indicators	Characteristic
Regulatory capital to risk-weighted assets (Capital Adequacy Ratio)	The capital adequacy of deposit takers. It is a ratio of total regulatory capital to its assets held, weighted according to risk of those assets.
Return on assets (ROA)	A financial ratio that shows the percentage of profit that a company earns in relation to its overall resources (total assets); a key profitability ratio which measures the amount of profit made by a company per dollar of its assets.
Return on equity (ROE)	The amount of net income returned as a percentage of shareholders equity. It reveals how much profit a company earned in comparison to the total amount of shareholder equity found on the balance sheet.

Our research requires, firstly, the choice of indicator, which allows assessing, on the one hand, the ability of the banking institution to increase equity capital, and, on the other hand, the degree of risk of active operations. In our mind, the indicator, which most fully allows quantifying the stability of the banking system, is the ratio "regulatory capital to risk-weighted assets".

Secondly, we have to choose profitability ratios that measure a company's ability to generate earnings relative to sales, assets and equity. In the IMF FSIs system suggested two main profitability ratios: return on assets and return on equity. But in our research we'll use only ratio "return on assets", as unlike other profitability ratios, such as return on equity (ROE), its measurements include all of a company's assets – including those which arise from liabilities to creditors as well as those which arise from

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[1] Key performance indicators of banks in Ukraine. <http://www.bank.gov.ua/>
[2] Financial Soundness Indicators and the IMF (2015) <https://www.imf.org/external/np/sta/fsi/eng/fsi.htm>

contributions by investors. So, return on assets gives an idea as to how efficiently management use company assets to generate profit.

It should be noted that for the analysis of market concentration among domestic and foreign researchers the most popular is the concentration ratio [1]:

$$CR_k = \sum_{i=1}^{k} S_i \,, \tag{1}$$

where CR_k– concentration index, S_i – the share of the *i* bank in the market, k – number of the largest banks.

The limitation of the required data and the simplicity of calculation make the concentration ratio the most common in empirical studies. It allows taking into account the concentration of the market by the largest banks, while ignoring the results of small and medium market participant activities. The concentration ratio is indicator that allows us to estimate the market concentration and meet the requirements for constructing the model and the available database in period 2002-2017.

The second step is to compare trends in the dynamics of the regulatory capital to risk-weighted assets, return on assets and the concentration ratio in order to conduct a preliminary empirical analysis. We have to underline that the concentration ratio has been calculated under three system important banks according to the National bank of Ukraine methodology of their identifying. (Fig. 2)

According to the data on Figure 2, we can suggest the relationship between concentration and stability in the banking sector of Ukraine. However, the configuration of the curves shows that this relationship depends on the economic cycle stage.
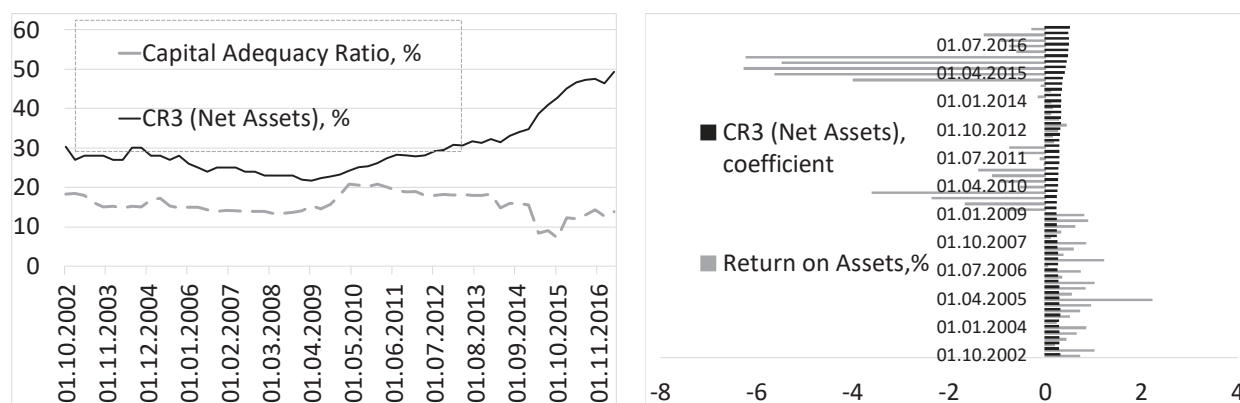

Fig. 2. Dynamics of the concentration indexes and financial stability indicators in Ukraine (2002-2017)

Source: own work[2]

And, at least, to estimate the causal relationships between concentration and financial stability, we use the Granger test, which will test the hypotheses for the equations:

$$Concentration_t = C + a_1 \, Concentration_{t-n} + b_1 \, BankStability_{t-n} + \varepsilon_t \tag{2}$$
$$BankStability_t = C + a_1 \, BankStability_{t-n} + b_1 \, Concentration_{t-n} + \varepsilon_t \tag{3}$$

where $Concentration_t$ – concentration variable for period t (CR-3); $BankStability_{t-n}$ – stability variable (capital adequacy ratio, return on assets); n – time lag (in this study is 1 quarter).

The zero hypothesis is that the coefficients in the lags of the 2nd variable are zero or non-significant: b_1=0.

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[1] Bikker, J., A., Haaf, K. (2002) Measures of Competition and Concentration in the Banking Industry: a Revue of the Literature. *Economic and Financial Modeling, 46*
[2] Key performance indicators of banks in Ukraine. <http://www.bank.gov.ua>

Consequently, if the zero hypothesis is confirmed for the regression equation (2), the financial stability of the banking sector is not affected by the concentration in the industry. If the zero hypothesis is confirmed for the regression equation (3), the concentration does not affect the stability of the banking system. In the case where the zero hypothesis is confirmed for both regression equations, there is another factor affecting both of the studied variables.

Estimation results. The results of the Granger's causality test between concentration and stability in Ukraine are presented in Table 3.

Table 3

Granger causality test between stability-concentration relationships for the banking system of Ukraine (01.01.2003-01.04.2017)

Period	Variables explanation	Banking stability → Concentration (1)				Concentration → Banking stability (2)			
		R^2	Value F	Coefficient (b_1)	P value (b_1)	R^2	Value F	Coefficient (b_1)	P value (b_1)
01.01.2003-01.04.2017	CR-3 and AR (%)	0,97	4,05E-44	-0,03	0,61	0,73	8,51E-17	-0,03	0,37
	LN (CR-3) and LN(AR)	0,97	4,96E-42	-0,01	0,75	0,64	2,1E-13	-0,09	0,29
01.01.2003-01.10.2008	**CR-3 and AR (%)**	0,70	1,33E-06	0,104	0,66	**0,81**	**9,99E-09**	**0,206**	**0,014**
	LN (CR-3) and LN(AR)	0,73	4,3E-07	0,07	0,63	**0,82**	**5,92E-09**	**0,36**	**0,012**
01.01.2003-01.04.2010	CR-3 and AR (%)	0,79	2,22E-10	0,148	0,361	0,66	1,99E-07	-0,125	0,15
	LN (CR-3) and LN(AR)	-	-	-	-	0,67	1,12E-07	-0,185	0,168
01.01.2009-01.04.2017	CR-3 and AR (%)	**0,99**	**4,31E-29**	**-0,125**	**0,061**	0,73	1,34E-09	-0,086	0,13
	LN (CR-3) and LN(AR)	0,99	7,04E-30	-0,037	0,111	0,64	8,97E-08	-0,234	0,124
01.04.2010-01.04.2017	CR-3 and AR (%)	**0,985**	**5,44E-24**	**-0,271**	**0,004**	0,74	2,09E-08	-0,070	0,44
	LN (CR-3) and LN(AR)	**0,984**	**7,48E-24**	**-0,074**	**0,0189**	0,64	1,19E-06	-0,298	0,244
01.01.2003-01.04.2017	CR-3 and ROA (coefficient)	**0,99**	**1,42E-47**	**-0,004**	**6,23E-05**	0,607	2,58E-12	-0,205	0,94
01.01.2003-01.10.2008		0,704	1,05E-06	-0,005	0,418142	0,04	0,254	7,07	0,108
01.01.2009-01.04.2017		**0,988**	**2E-30**	**-0,003**	**0,0019**	0,501	1,14E-05	0,948	0,78

Source: own work

The results of the Granger causality test suggest bidirectional relationships between stability-concentration. Moreover, the results are sensitive to the period has been analyzed that represent the economic cycle stage. In a growth stage (01.01.2003– 01.10.2008) statistically significant positive impact capital adequacy ratio on banking concentration has been proved. In other words, in period 01.01.2003– 01.10.2008 in Ukrainian banking system concentration increase caused growth of capital adequacy ratio. It can be explained by the foreign capital expiation in the Ukrainian banking system. Mergers and acquisitions in this period resulted in increase of concentration. At the same time, foreign banks were more capitalized because of high risk-management standards and because of significant risk of the investments in Ukraine. However, there is no statistically significant relationship between banking concentration and return on assets for the period 01.01.2003– 01.10.2008. In spite of concentration increase, competition level could be very high, that's why CR-3 index did not affect banking profitability.

For the period 01.01.2009-01.04.2017 the zero hypothesis can be rejected on 90% level. During this period CR-3 has increased significantly, because the amount of banks in Ukraine reduced twice. Such decreasing can be explained with lots of reasons. However, the main of them, on our mind, is the policy of the National bank of Ukraine, which is directed on the liquidation of "pocket" as well as insolvent or not transparent banks. "Pocket" bank is that one which depends on one owner implementing its banking activity and as result, such situation leads to high share of insider operations, low liquidity and high credit risk. So, for the period 01.01.2009-01.04.2017 "banking stability → concentration" hypothesis has been proved. This situation is clarified by the policy of the National bank of Ukraine (NBU). The stress testing of Ukrainian banks conducted by the NBU allows regulator to identify insolvent banks, which causes a deterioration of the banking system performance. The liquidation of such banks leads to increased concentration in the industry.

Conclusions. The causality relationship between concentration and financial stability in the banking sector of Ukraine has been analyzed. To assess financial stability of the banking system in Ukraine two indexes has been proved. They are capital adequacy ratio (regulatory capital to risk-weighted assets) and return on assets. In addition, we used CR-3 ratio to measure the concentration in the banking industry. Implementing the Granger causality test, we identify bidirectional relationships between stability and concentration. In the stage of economic as well as banking growth capitalization (stability) follows for concentration changes. In contrast, in a crunch and depression stages deterioration in banking stability (capitalization and losses) leads to concentration increase. General and Ukrainian specific factors of this phenomena have been characterized. In further research the channels by which mentioned above relationships are revealed should be identified.

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