Testing Quiet Life Hypothesis in the Banking Sector

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ABSTRACT

The current research continues the series of studies aimed to analyze the issues in regards to bank efficiency in the Baltic banking market. The goal of the current paper is to empirically test the Quiet Life Hypothesis (QLH) and to investigate the relationship between market concentration and efficiency in the banking sector of Latvia, Lithuania and Estonia. Two QLH-related hypotheses are stated for the research purposes.

To achieve the established goal, the authors run a multiple regression analysis, using efficiency of an individual bank as a dependent variable. In turn, independent variables include market concentration proxied by Herfindahl-Hirschman Index (HHI) and bank-specific measures, such as market share, profitability and productivity.

Efficiency scores for individual banks were estimated applying Data Envelopment Analysis (DEA). Study is based on the sample data of 33 banks operating in the Baltic countries, covering the period of 2007-2013 (227 observations). Data processing was made with application of DEAFrontier and SPSS software.

In the result of the performed analysis the stated hypotheses are rejected. Thus, there is no empirical evidence that market power, and consequently, market concentration in the Baltic banking sector negatively impacts the efficiency of individual banks.

Keywords: Quiet Life Hypothesis, banking sector, Baltic States.

1. INTRODUCTION

The very popular topics in the academic environment are related to the exploration of two-tailed relationship between bank efficiency, profitability and market structure [1][2][3].

In 2004, Latvia, Lithuania and Estonia joined the European Union that, consequently, increased a competitive pressure in the banking sector. Considering that banks play a crucially important role in the financial system of all three Baltic States, the impact of increased competition on bank efficiency is an area of academic and business interest.

The conceptual approaches to investigation of the relationship between market concentration, competition and efficiency are based on the following hypotheses:

- Structure-Conduct-Performance (SCP) hypothesis assumes the direct positive link between market concentration and profitability and negative correlation between concentration and competition [4].
- Efficient Structure Hypothesis (ESH) implies that higher efficiency of market leaders determines higher concentration [5].
- Quiet Life Hypothesis (QLH) supports a negative relationship between market power and efficiency [6].

There is an empirical evidence for [1][7][8] and against the positive relationship between efficiency and competition [9][10][11]. The goal of the research is to test the "quiet life hypothesis" and, consequently, to determine the impact of market concentration on bank efficiency in the Baltic market.

Multiple regression analysis is applied for the research purposes. Efficiency of an individual bank is used as a dependent variable, while market concentration ratio and bank-specific variables are used as explanatory factors.

To measure bank efficiency Data Envelopment Analysis (DEA) is employed and DEA scores are estimated by means of DEAFrontier software. Herfindahl-Hirschman Index (HHI) is used as a proxy for bank market concentration.

The authors' stated research hypotheses are, as follows:

H1: There is a statistically significant negative correlation between market concentration and the efficiency of individual banks in the Baltic market.

H2: There is a statistically significant negative correlation between market share of individual banks and their efficiency scores in the Baltic market.

Testing of the hypotheses is performed on the sample data of banking sector of three Baltic States: Latvia (LV), Lithuania (LT), and Estonia (EE). Data set covers the period of 2007-2013. Data processing is conducted in SPSS 20.0 environment.

The present paper extends the range of studies aimed to investigate bank efficiency related issues in the Baltic banking market.

2. QUIET LIFE HYPOTHESIS IN BANKING

Many researchers make efforts to explore the factors affecting bank efficiency or to study the impact of bank efficiency on the market situation. The wide range of studies is aimed to test the relationship between efficiency and market power of banks.

The Quiet life hypothesis (QLH) developed by Hicks states that market power will reduce the pressure towards efficiency [6]. Banks with large market share tend to be less efficient, because focus their efforts mostly on risk reduction [12].

The stated hypothesis was tested by many researchers in different regions. Google Scholar search with the key words "quiet life hypothesis" yielded over 190000 papers. Some examples of the recent studies are presented in the Table 1.

Table 1.

Testing QLH in the banking industry

Source	Period	Region/ Sample	Result of QLH test
Koetter, Vins 2008 [13]	1996-2006	Germany/ 457 banks	supported
Fu, Heffernan 2009 [14]	1985-2002	China/ 14 banks	rejected
Maudos, Guevara 2007 [15]	1993-2002	EU15	rejected
Punt, van Rooij 2009 [16]	1992-1997	EU/696 banks	rejected
Fang, Marton 2011 [17]	1998-2008	SEE/208	rejected
AL-Muharrami, Matthews 2009 [18]	1993-2002	Arab GCC/ 52 banks	supported
Al-Jarrah, Gharaibeh 2009 [19]	2001-2005	Jordan/ 16 banks	rejected
Tetsushi *et al.* 2012 [20]	1974-2005	Japan/ 26 banks	supported
Coccorese, Pellecchia 2010 [21]	1992-2007	Italy/ 714 banks	supported

Bank efficiency sometimes is measured by single performance ratios, such as returns-to assets (ROA) or returns-to-equity (ROE). Relationship between bank efficiency and profitability, expressed by traditional performance ratios, was tested empirically by many researchers [22][7][23]. However, the results of the previously conducted studies are controversial.

Frequently applied method to measure bank efficiency is Data Envelopment Analysis (DEA) [24][25][26][27][22]. It becomes quite popular in the Baltic States as well [28][29][30]. In particular, the study aimed to test the hypothesis about the relationship between DEA efficiency and traditional performance measures did not reveal a significant correlation between DEA scores and ROA [30].

Different ratios are used also for assessing the level of competition in the banking sector. The most frequently competition is proxied by concentration ratios, such as CR3 or CR5 [31][3][20][32]. These ratios are calculated as a market share of 3 or 5 largest banks in the market. Herfindhal-Hirschman Index - the sum of squared market shares of each bank representing the sector – another commonly applied measure of competition [33] [34][35][11][20]. Market share of banks usually is expressed in terms of assets [30], sometimes in terms of loans or deposits [3]. Other measures used as proxies for competition in the market are Lerner index of competition [17][1][15], H-statistic developed by Panzar and Rosse [9][36][37] and Boone indicator [38][8].

3. RESEARCH METHODOLOGY

Research sample consists of 33 banks operating in the banking sector of the Baltic States. The number of banks slightly varies over the period of 2007-2013. As for 2013, 9 banks, 8 banks and 16 banks represent the banking sector of Estonia, Lithuania and Latvia, respectively. Branches of foreign banks are not included into the sample. Central Banks of the countries are removed from the sample. Besides, a distressed asset management company Reverta is removed from the Latvian sample. Financial data needed for research purposes are extracted from BankScope database.

To achieve the research goal and to determine the relationship between market concentration and efficiency in the Baltic banking sector, the authors run a multiple regression analysis. The analyzed functional relationship takes the following form:

$$EFF_i = f(CONC, SIZE_i, PROFIT_i, PRODUCTIVITY_i) \quad (1)$$

where
EFF_i is an efficiency score measured for an individual bank in each country;
CONC is a measure of banking market concentration within the country;
$SIZE_i$ is a bank-specific measure expressed by the volume of total assets;
$PROFIT_i$ is a profitability of an individual bank;
$PRODUCTIVITY_i$ is a productivity of an individual bank.

To measure bank efficiency, the authors use Data Envelopment Analysis (DEA). The method was introduced in 1978 by Charnes *et al.* [39] and based on the concept of productive efficiency. Efficient companies form the efficient frontier, while other companies are in the certain distance from this line or surface. Measuring this distance allows evaluating relative inefficiency of other companies within the reference set. Efficiency score is estimated as the ratio of weighted outputs to weighted inputs. To find the weights, optimization task is solved for each company in order to maximize its efficiency score.

The maximal value for DEA score is 1 that indicates 100% efficiency. The lower values indicate relative inefficiency of analyzed banks.

Specification of DEA model is determined by the following characteristics:

- The goal of the optimization task: cost minimization or .profit maximization. Thus, there are two types of DEA efficiency model based on the orientation: input-oriented and output-oriented.

- Scale assumptions employed in the model: constant returns to scale (CRS) or variable returns to scale (VRS).

- Specification of a conceptual approach to business that denotes a combination of model variables (inputs and outputs).

In the current research input-oriented DEA model under VRS assumption is applied. Selection of variables is based on the intermediation approach that treats a bank as an intermediary between depositors and borrowers [40]. To run DEA model, the volume of bank deposits is used as a single input and total loans are treated as outputs.

To measure concentration within the banking sector, the authors use Herfindhal-Hirschman Index (HHI). Dynamics of HHI in the banking sector of the Baltic States is presented in the Table 2 [41].

Table 2.

HHI in the Baltic banking sector

	Latvia	Lithuania	Estonia
2013	0.1037	0.1892	0.2483
2012	0.1027	0.1749	0.2493
2011	0.0929	0.1871	0.2613
2010	0.1005	0.1545	0.2929
2009	0.1181	0.1693	0.3090
2008	0.1205	0.1714	0.3120
2007	0.1158	0.1827	0.3410

The highest value of HHI over the period of seven years is demonstrated by the Estonian banking sector followed by the Lithuanian banking sector.

The maximum value of index is equal to 10000 points. The lower the index the closer is the market to monopoly. USA agencies, for instance, use the following criteria to interpret HHI in the market [42]:

- Unconcentrated Markets: HHI below 1500 points

- Moderately Concentrated Markets: HHI between 1500 and 2500 points

- Highly Concentrated Markets: HHI above 2500 points

It means that Latvian banking sector with HHI values ranged between 1000 (0.1000) and 1200 (0.1200) points is considered to be low-concentrated despite the fact that more than 60% of total banking assets belong to the five largest banks (CR5 = 64% as for 2013) [41]. In turn, Estonian banking market is the most concentrated one. However, dynamical change of HHI indicates the growth of competition.

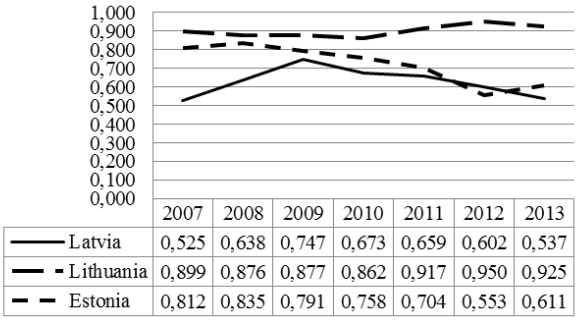
The size of individual banks is measured by the volume of total bank assets. We use the natural logarithm of values (lnA) in order to increase the consistency among the initial data. Profitability of an individual bank is measured by return-on-equity ratio (ROE) and net interest margin (NIM). Productivity of an individual bank is measured by cost-to-income ratio (C/I).

One of the assumptions of the regression analysis is that independent variables are not intercorrelated. To define the relationship between explanatory factors, correlation analysis is performed by the authors in SPSS environment. Concentration measure (HHI) was not included into the data set, because it represents a market structure as a whole.

Testing of the stated hypotheses is based on the assessment of regression coefficients. To confirm the first hypothesis (H1), there should be a significant negative correlation between efficiency (DEA score) and concentration (HHI). The inverse relationship between efficiency and the market share of a bank in terms of assets (SIZE, lnA) provides a confirmation of the second hypothesis (H2).

4. RESULTS

Application of DEA model yielded efficiency scores of individual banks in Latvia, Lithuania and Estonia. Average efficiency scores over the period of 2007-2013 are presented in the Figure 1.



	2007	2008	2009	2010	2011	2012	2013
Latvia	0,525	0,638	0,747	0,673	0,659	0,602	0,537
Lithuania	0,899	0,876	0,877	0,862	0,917	0,950	0,925
Estonia	0,812	0,835	0,791	0,758	0,704	0,553	0,611

Figure 1. DEA efficiency in the banking sector of the Baltic States, 2007-2013 [estimated by the authors]

Lithuania demonstrates the highest efficiency, while Latvian banking sector is characterized by the lowest efficiency. This fact can be explained not only by the inefficiency of Latvian banks in comparison with the neighbor countries. Quoting Farrell [43]: "*A firm's technical efficiency is relative to the set of firms from which the function is estimated. If additional firms are introduced into the analysis, they may reduce, but cannot increase the technical efficiency of a given firm.*" The number of banks in the Latvian banking sector is twice larger than the number of banks in Estonia or Lithuania.

The results of the correlation analysis applied for bank-specific data of Latvian, Lithuanian and Estonian banks are presented in the Table 3, 4 and 5. Statistical significance of the correlation coefficients is marked with "*" (correlation is significant at the 0.05 level) and "**" (correlation is significant at the 0.01 level).

Table 3.

Correlation matrix for bank-specific measures for Latvian sample data

	SIZE	NIM	ROE	C/I
SIZE	1	-0.193*	0.071	-0.314**
NIM	-0.193*	1	0.445**	-0.387**
ROE	0.071	0.445**	1	-0.530**
C/I	-0.314**	-0.387**	-0.530**	1

There is a strong negative correlation between cost-to-income ratio and all other indices. Thus, C/I ratio can be used as a single variable only. Besides, ROE has significant positive with net interest margin. It means, in turn, that we cannot simultaneously use ROE and NIM. Due to the fact that we need the variable SIZE for testing our second hypothesis, but it correlates with NIM, we choose ROE as a predictor for the regression analysis. Thus, the regression equation for Latvian sample incorporates DEA score as dependent variable and HHI, SIZE (lnA), and ROE as explanatory variables.

Table 4.

Correlation matrix for bank-specific measures for Lithuanian sample data

	SIZE	NIM	ROE	C/I
SIZE	1	-0.411**	0.080	-0.513**
NIM	-0.411**	1	-0.268*	0.261*
ROE	0.080	-0.268*	1	-0.314*
C/I	-0.513**	0.261*	-0.314*	1

Based on the results of the correlation analysis on Lithuanian sample data, cost-to-income ratio should be excluded from the regression model as well. The form of the regression equation is the same as for Latvian sample: HHI, SIZE and ROE are considered to be predictors.

The results of the correlation analysis performed for Estonian sample data (Table 5) yield two combinations of explanatory factors for a regression model: HHI, SIZE, ROE and HHI, NIM, CI. However, the second combination does not include the variable SIZE and it is not analyzed further.

Table 5.

Correlation matrix for bank-specific measures for Estonian sample data

	SIZE	NIM	ROE	C/I
SIZE	1	-0.253	0.292*	-0.572**
NIM	-0.253	1	0.278	-0.228
ROE	0.292*	0.278	1	-0.690**
C/I	-0.572**	-0.228	-0.690**	1

The regression diagnostics of each model is presented in the Table 6. It includes R-squared (R^2), adjusted R-squared (Adj. R^2), F-test of the overall fit (F Sig.) and Durbin-Watson statistics (DW).

Table 6.

Regression statistics

Sample	R^2	Adj. R^2	F Sig.	DW
Latvia	0.860	0.856	0.000	1.028
Lithuania	0.980	0.979	0.000	1.913
Estonia	0.834	0.824	0.000	2.142

For a confidence level of 95 per cent, if „significance F" is less than 0.05, then the null hypothesis is rejected (there is a statistically significant association between dependent variable and independent variables). The significance F for all models is equal to 0.000. R-squared is larger than 0.8 in all cases, indicating that over 80 per cent of the variability in the bank efficiency is explained by these models.

Critical values for Durbin-Watson statistics are determined for p = 3 (number of independent factors) and the appropriate number of observations for each particular country (n). However, the analysis of Durbin-Watson statistics indicates the autocorrelation in the residuals for Latvian sample data: DW_{LV} (1.028) is lower than its lowest critical value (D_L = 1.61). In turn, for Lithuanian and Estonian sample data DW is greater than its upper critical value: DW_{LT} (1.913) > D_U = 1.70; DW_{EST} (2.142) > D_U = 1.67. Thus, there is no autocorrelation in residuals.

Statistics on regression coefficients for three models is presented in the Tables 7, 8 and 9. Constant is excluded from the regression models. Dependent variable is DEA score.

Table 7.

Statistics on regression coefficients: Latvian sample data

Predictors	B	Sig.	VIF
HHI	217.838	0.196	56.136
SIZE	2.798	0.035	56.146
ROE	-0.184	0.020	1.017

For HHI variable regression coefficient is not statistically significant (p = 0.196 > 0.05). The variance inflation factor (VIF) indicates multicollinearity problem (VIF > 10) [44]. However, HHI and SIZE are included into the model, assuming the positive relationship among them and accepting this limitation.

Applying regression analysis for Lithuanian sample data (Table 8), it yields statistically significant coefficient for HHI and non-significant coefficients for SIZE and ROE (p > 0.05).

Table 8.

Statistics on regression coefficients: Lithuanian sample data

Predictors	B	Sig.	VIF
HHI	430.411	0.000	69.763
SIZE	1.040	0.283	70.072
ROE	-0.022	0.217	1.047

Analyzing Estonian sample data (Table 9), only SIZE has statistically significant regression coefficient (p = 0.026 < 0.05).

Table 9.

Statistics on regression coefficients: Estonian sample data

Predictors	B	Sig.	VIF
HHI	15.240	0.881	37.454
SIZE	4.864	0.026	37.796
ROE	0.276	0.178	1.057

The results of the regression analysis indicate the fact that, using selected measures, we cannot reliably predict DEA score of an individual bank. Even removing HHI or SIZE from the data set, it is possible to overcome the multicollinearity

problem, but the regression coefficient for ROE still is not statistically significant (see Table 10).

Table 10.
Statistics on regression analysis (predictors: SIZE, ROE vs. HHI, ROE)

Model summary	Statistics	LV	LT	EE
Predictors: SIZE, ROE	R^2	0.855	0.970	0.827
	F Sig.	0.000	0.000	0.000
Coefficients	Sig. SIZE	0.000	0.000	0.000
	Sig. ROE	0.020	0.166	0.176
	VIF	1.017	1.040	1.033
Predictors: HHI, ROE	R^2	0.854	0.980	0.816
	F Sig.	0.000	0.000	0.000
Coefficients	Sig. HHI	0.000	0.000	0.000
	Sig. ROE	0.020	0.260	0.091
	VIF	1.017	1.036	1.024

Probably, using another profitability ratio instead of ROE, the quality of the model can be improved. However, it is not the purpose of the current research. We have enough empirical evidence for testing the stated hypothesis. In all three cases we have positive relationship between market concentration and efficiency and between market share of an individual bank and its efficiency. It means that QLH-related hypotheses H1 and H2 are rejected.

5. CONCLUSIONS

The present study was aimed to test Quiet Life Hypothesis (QLH) in the Baltic banking market. To achieve the research purposes, the author tested two hypotheses and run multiple regression analysis in order to investigate the relationship between the efficiency of individual banks and two variables: concentration level in the market (H1) proxied by HHI and size of banks (SIZE) expressed with the natural logarithm of the volume of bank total assets (H2). The criteria used to confirm the stated hypotheses were the positive regression coefficients for variables HHI and SIZE. The analysis was performed on the sample data for each country separately.

The regression models did not yield the reliable results due to the statistically insignificant regression coefficients in most cases. However, based on the signs of regression coefficients it is possible to make an unambiguous conclusion that Quiet Life Hypothesis should be rejected. There is no evidence of negative impact of bank size on its DEA score, as well as market concentration does not have a negative influence on bank efficiency.

The expansion of the present study, using different DEA model specifications (with other input-output combinations) or measuring market competition with other ratios, causes a significant scientific interest. Besides, the process of predicting bank efficiency with bank-specific measures should be investigated.

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