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Article

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Leading Indicators' Applicability to Forecast Profitability of Commercial Bank: Case Study from Lithuania

Darius Rauličkis, Daiva Jurevičienė

Abstract

Purpose of the article: Profitability is one of the most important ratios for performance measurement in any competitive commercial bank and key source to fund future working capital and investments needs. This leads to necessity to investigate topics related to profitability and applicability of factors, which would enable to capture latest trends in economy. In scientific literature, leading economic indicators (in addition to financial and lagging/coinciding economic indicators) are suggested as able to capture trends of economic development. However, there is still a discussion going on applicability of these indicators as well as on financial ratios and economic indicators. The problem is relevant from theoretical and practical point of view.

Methodology/methods: Quantitative factors for forecasting commercial banks' profitability were identified and tested employing methods of detailing, grouping and quantitative analysis (GMM estimator) in empirical research

Scientific aim: To identify applicability of leading economic indicators for bank's profitability forecasting.

Findings: Regression analysis of models using blend of bank, industry, economic ratios improves explanatory power in both dimensions – time (higher scores received for all forecasting horizons) and alternatives (different models that use different blends of determinants). Such improvement was found for all forecasting horizons (one, two and three-quarters) resulting improved explanatory power for one, two and three quarters in comparison to models without leading economic indicators.

Conclusions: Leading economic indicators can help to better capture forward-looking signals, however, to avoid volatility in forecasts they should be employed with careful analysis of their methodologies and in combination with bank and industry specific, lagging and coinciding economic factors.

Keywords: profitability, leading economic indicators, commercial banks

JEL Classification: G21, C53

Introduction

Profitability is important performance measure and its forecast as part of financial controlling is essential not only to ensure competitive returns but also to comply with regulatory requirements and be resilient to potential losses resulted due to financial turbulences. Taking this importance into account, management of commercial banks as well as supervisory authorities underline necessity to periodically review forecasting techniques to catch up to newest methods and economic tendencies. In recent scientific literature, leading economic indicators are suggested as useful factors to capture latest economic trends for forecasting. Financial or other types of economic indicators, so called, lagging and coinciding, may reflect more past performance of commercial bank resulting slower reaction to changes in real economy. Therefore, increased interest in empirical evidences on leading economic indicators is observed in scientific literature. However, financial ratios and lagging/ coinciding economic indicators are most commonly used and rarely include leading economic indicators in analysed researches of profitability. In spite of this, it forms a demand for particular theoretical comparisons, evidences and practical solutions for forecasting of profitability i.e. to use the leading economic indicators, theoretical researches and empirical tests are needed.

Researchers pay attention to the following important problems of profitability forecasting: What are the most appropriate factors to forecast profitability? What models of profitability assessment are commonly used and what is their applicability? What models of profitability assessment are most commonly used and which of the factors are considered as most appropriate in estimation of profitability? What are common problems in profitability assessment and how they could be solved? Worth noting, it is still being debated which factors might be most appropriate for

assessment of profitability. As the problem is relevant in theoretical view as well as for practitioners, this article aims to identify applicability of leading economic indicators in forecast of profitability.

The article is structured as follows: analysis of theoretical background, literature review, description of methodology and execution of empirical case study. Research methods used in the article are detailing, grouping, comparison methods, regression analysis. The main hypothesis – under empirical research of case study, leading economic indicators are significant factors that help to forecast profitability of commercial banks.

1. Literature Review

Nature of Profitability. According to theory of neoclassical economics, maximization of profit is main goal of any privately-owned firm enabling to compensate shareholders for taking risks, employees and creditors for services, cover investment costs for maintain business model in the future (Knight, 1921; Schumpeter, 1934; Keynes, 1936, Vaggi, Groenewegen, 2003). There is a clear distinction between profit and profitability (Qingbin, 2005). Profit is measured by difference of income and costs (static, retrospective), whereas profitability is ratio that shows historical proportions of profit and reflects future profit potential (dynamic, indicating). In addition, much more comprehensive conclusion in such measures is made when information is based on comparisons with other ratios, periods, peers, alternatives and macroeconomic information (Petria *et al.*, 2015). Therefore, several different ratios of profitability are being used in academic literature to achieve sufficient comparability. Most often profitability is compared with income, assets and capital of entity. Such classification is also resulted by various estimation techniques of profitability that helps various stakeholders

to make better decisions. For instance, sales profitability is of special focus for sales personnel because it shows effectiveness of sales division. Second group of ratios, asset profitability, receives a significant attention from management aiming to improve management of assets. Finally, profitability of capital is usually main performance indicator for shareholders and management that describes success of investment to the firm. Due to such importance, the article will focus entirely on capital profitability measured by return on equity (ROE).

Methods to Forecast Profitability. Qualitative methods usually include conclusions from expert judgement such as management conclusions, assessment of sales personnel, surveys of clients or assessment of expert groups (Delphi method). These methods are normally used when there is need to supplement quantitative judgements or there is no possibility to use quantitative methods (Ibiyemi *et al.*, 2016). Quantitative methods may aim to estimate causality, based on past information, other times series analysis. Such tools improve quality of management decisions because it defines simplified facts, main features and trends of the forecasted object (Waller, Fawcett, 2013).

One of the main tools used in quantitative analysis is regression. it gives opportunity to make analysis of cause-effect relationships. In order to validate indicators' use in profitability forecasting this article focuses on quantitative regression analysis. The factor analysis can be defined as a multivariate statistical procedure that has several uses: to reduce a number of variables into a smaller set of factors, to identify interconnectedness of variables and financial phenomenon, to validate reasoning behind choices. In accordance to Brett *et al.* (2012) study, the financial ratios and economic indicators' analysis may use several steps of exploratory factor analysis protocol, which provides researchers with starting reference point in developing clear decision criteria. According to researches

for profitability forecasts, the most important groups of criteria for factor selection are identified: scientific evidences, availability of data, interpretation power and descriptive/predictive features (Theobald, 2012; Brett *et al.*, 2012, Evans, Lindner, 2012).

Determinants of Bank Profitability. History of scientific researches on factors to forecast profitability of commercial banks is closely related to development of finance and accounting standards, data availability and assessment tools. Recently, in spite of increased interdependencies of economies and financial markets, macroeconomic ratios have been started to apply in estimations and improved ability to capture systemic factors. This part of the article provides literature review for each group of factors and aims to identify their applicability for profitability forecast. In general, profitability of commercial banks might be impacted by many internal and external factors Profitability factors are often divided into bank specific, industry specific and economic in scientific literature (Pasiouras, Kosmidou, 2007; Athanasoglou *et al.*, 2008; Dietrich, Wanzenried, 2011). Furthermore, in reference to Organization for Economic Co-operation and Development (2012), economic indicators can be also divided into lagging, coinciding and leading.

Applicability of bank specific factors. In practice, bank specific factors are used most widely in forecasting and budgeting. In accordance with research of European Central Bank (2010, 2015), these factors can be divided into income, effectiveness, risk and financial leverage. In academic literature, as it will be described in following chapters, profitability is usually determined by management's skills to generate excessive income or decrease costs through development of business model, managing risks and increasing leverage. For sustainable profitability, it is important to find right balance between profitability and risk of chosen business model. Using leverage in business model should be also carefully

considered depending on market situation and economic cycles i.e. higher leverage determines higher profitability during growth period and lower during economic downturn. Such double edge result can be found due to leverage impact to capital structure and costs during different phase in economic cycle. More comprehensive description of each factor is provided below.

Own funds. Currently there are several theories competing to explain relationship between profitability and capital. First, signalling theory, describes that the higher equity ratio is (or equivalent) the better signal is transmitted to the market which then determines higher market value of the company, decrease in funding costs and rise of profitability (Trujillo-Ponce, 2012). Another, theory of expected costs of bankruptcy, also support positive relationship between capital and profitability – the more risk is taken by the firm the more capital it needs to hold to outweigh expected and unexpected losses but if not held – might impact decrease of profitability in long-term (Athanasoglou *et al.*, 2008). However, the theory of risk-profit partly contradicts the first ones and describes that when share of borrowed capital is increased – risk and profitability are increased as well due to more effective use of own capital - usually own capital is defined as more expensive than borrowed (Hoffmann, 2011; Gounder, Sharma, 2012). This implies that there could be even negative relationship between capital and profitability.

Funding structure. Besides own capital, banks also use external funding sources which altogether determines funding structure. Most popular external sources to fund business model are deposits, issued debt securities, loans. *Etc.* According to Trujillo-Ponce (2012) deposits is one of the cheapest and most commonly used fund sources. The higher is the share of deposits in funds structure the better profitability might be expected and determine positive relationship with profitability (Bonner *et al.*, 2013).

Funding price. Following Dietrich, Wanzenried (2011) funding costs, measured in basis points, should have included as independent variable as well. This is important, as banks earn profit by not only generating return on assets but also minimizing costs of funding those assets. Furthermore, such ratio would help to avoid potential subjectivity of costs when comparing particular banks, business models and national specifics. In general, it is assumed that decrease in funding costs should increase profitability in long term.

Credit risk. Credit risk is usually defined as one of the highest risks in commercial banking and one of the key ratios to forecast profitability. Therefore, to represent credit risk in researches asset quality ratios can be used such as provisions divided by net interest income (Iannotta *et al.*, 2007; Athanasoglou *et al.*, 2008; Dietrich, Wanzenried, 2011). The higher credit risk is the higher probability of related losses and decrease profitability.

Liquidity risk. Liquidity risk is another type of most important risks faced by commercial banks. When banks hold insufficient amount of high quality liquid assets (HQLA), they are more vulnerable for sudden liquidity shocks i.e. sizable and unexpected withdrawal of deposits. Therefore, one of the most important ratios used to defy liquidity risk is ratio of HQLA and potential short-term obligations (Delechat *et al.*, 2012). Regulators are also paying high attention to banks' liquidity expressed by liquidity and liquidity coverage ratios. In accordance to the theory of risk-profit, the more HQLA bank holds the higher profit should be expected (decreased liquidity risk in long-term). However, this is only the case when bank does to hold too much of these assets which can generate additional economic costs due to lower return from secure investments in comparison to return required by shareholders. In general, taking into account researches made by Iannotta *et al.* (2007), Pasiouras, Kosmidou (2007), Bordeleau, Graham (2010),

a negative relationship should be expected between liquidity risk and profitability.

Business model. Nowadays a significant variety of banking business models can be found in the market. These different models can be roughly differentiated by using interests' income share in total amount of income (Dietrich, Wanzenried, 2011). Smaller income share of interests and commissions would imply that the firm's business model is based not on traditional banking concept. On the other hand, in accordance with Valverde, Fernández (2007) income from off-balance assets may also contribute to long-term profitability by providing partial diversification effects to total income. Therefore, it is hard to define expected impact to profitability.

Operational effectiveness. Operational effectiveness is one of the most commonly used key performance indicators in banking sector. There is a wide variety of ratios offered by academic literature to measure it. In accordance with Pasiouras, Kosmidou (2007), Dietrich, Wanzenried (2011), cost to income ratio is most often used in the industry. The essence of this ratio is rather very simple – to indicate in percentage points, how much does it costs to generate particular income. In abovementioned literature, the indicator is usually found to have negative relationship with profitability i.e. when cost efficiency rises the profitability rise as well.

Growth. Yearly growth of loans or assets is also very often used to measure success of commercial banks (Athanasoglou *et al.*, 2008; Trujillo-Ponce, 2012). It represents potential of profit – growth of assets, which will generate profits in upcoming quarters. Another important reason to use the ratio is economy of scale. When commercial bank is growing in the same type of assets, it becomes more cost efficient to distribute fixed costs per asset unit. Furthermore, growth gives opportunity to specialize some of experts and achieve better expertise in particular matters. However, the effect is not linear and sometimes it gives opposite effect

to profitability. When bank becomes bigger and more complex – there are additional costs related to this – higher standards from regulators, partners and customers (Regehr, Sengupta, 2016).

Effective tax rate. Ratios of profitability after tax can be also affected by tax system applied for particular country, sector and business model. In order to capture such effects in the forecasting model, representing variable should be added as well. Effective tax rate can be measured by ratio described as ratio of tax costs and earnings before taxes (EBT). In accordance with Dietrich, Wanzenried (2011), such ratio could have a negative relationship with profitability.

Applicability of industry specific factors. **Concentration.** Industry concentration is usually measured by a Herfindahl–Hirschman index, which is calculated as the sum of the squares of all banks' market shares in terms of total assets in percentage (Brezina *et al.*, 2016). It indicates potential competition for commercial bank in the sector and determine profitability under theories of market power and efficient market structure (Goddard *et al.*, 2004). If HHI index equals to 10'000 – it indicates that there is only one bank in the market, whereas when the index is approaching to zero – shows increasing number of commercial banks in the market. It is said that market is highly concentrated if index is above 0.18 and not concentrated if below 0.1. It is expected positive relationship between HHI index and profitability.

Bank size. Though growth of assets might capture some features of bank size, however, separate variable should be defined to capture current status of economies or diseconomies of scale. Academic literature suggests measuring as the natural log of total assets (Hoffman, 2011). It is expected to find positive relationship with banking profitability (Naceur, Omran, 2011).

Applicability of economic factors. Economic indicators are commonly used to forecast banking profitability and are able to

capture characteristics of external factors but not influenced by management decisions. As previously described, these indicators can be classified into lagging, coinciding and leading. Such division is related to ability to provide forward-looking signal in forecasting various ratios of commercial banks including profitability. Further, description of ratios falling within the classification provided.

Applicability of economic factors: coinciding and lagging. There are numerous of empirical evidences in academic literature stating that coinciding and lagging are valuable in economic and financial researches. Such indicators are useful to forecast long-term trends of economy or its components (Dietrich, Wanzenried, 2011). As most common indicators are used nominal and real GDP, effective tax rate, interest term structure, unemployment, real estate prices, *etc.*

Growth of economy. In academic literature real GDP growth is suggested to use due to its ability to forecast changes in economic cycle, which usually determines demand for loans and other products or services provided by commercial banks (Demirgüç-Kunt, Huizinga, 1999; Athanasoglou *et al.*, 2008; Dietrich, Wanzenried, 2011). In other words, cyclical turmoil of economy may cause decreased demand of bank services and at the same time may increase credit risk. Based on this and numerous empirical evidences, positive relationship between real GDP growth and profitability can be expected. Worth noting, that when GDP is studied in real terms (not nominal) inflation indicator should not be separately studied (García-Herrero *et al.*, 2009).

Monetary policy. Dietrich, Wanzenried (2011) were the first ones who studied term structure of interest rate relationship with profitability of banking sector and concluded on significant relationship of these variables. Though position of interest rates is usually hedged in banks through derivatives (interest rate swaps or IRS, other), it is too costly to eliminate risk related to interest rates fully.

Part of such risk is caused by one of the main functions of commercial banks related to assets (such as loans) – transformation of assets terms i.e. while receiving funding for shorter term (e.g. deposits), banks transform it to longer term assets (e.g. long-term loans). Therefore, as one of profit sources, the ratio usually has positive impact to profitability (Dietrich, Wanzenried, 2011) i.e. the steeper term structure of interest rate is the more income is received from long-term loans while funding is by deposits with lower interests. In academic literature, the three-month interbank rate (3M EURIBOR), and the slope of the yield curve (the difference between the 10-year government bond yield and 3M EURIBOR) is suggested as one of best measures of monetary policy (Borio, Gambacorta, Hofmann, 2017).

Unemployment rate. In economic literature, the unemployment rate is offered to be as one of the most significant macroeconomic variables for explaining changes in profitability. The relationship is found through demand for new loans and credit risk. Increase of unemployment could harm through other side as well – such as liquidity (Horváth *et al.*, 2014). Therefore, negative relationship is expected.

Real estate prices. Due to the fact major part of commercial banks base their business model on services related to real estate (e.g. housing, commercial real estate), bank profitability is highly dependent of development of real estate prices as well (Santos Costa Gaspar 2015). Furthermore, banks are impacted by real estate prices through decrease of risk mitigation techniques (in traditional banks real estate remain major asset class, which is used as collateral). Therefore, positive relationship is expected.

Applicability of economic factors: leading. In accordance with conclusions made by Evans, Lindner (2012), Economic Cooperation and Development (2012), Albrice (2014), forecast of ratios such as profitability should include search for predictive factors.

Therefore, to achieve better forecasting power, leading economic indicators can be used which proved its value in other type of economic researches in the U.S., Europe and Asia. Such researches ground ability to forecast behaviour of economics, in particular, economic cycle (Frankel, Saravelos, 2011), trends in sectors (Nippala, Paivi, 2012), other economic leading indicators such as derived from stock exchange market may be useful as well (Izani, Rafli, 2004).

Other part of researches has been describing features of these factors (Fritsche, Stephan, 2002) which showed that there is no single indicator, which could potentially describe market trends. However, inclusion of leading economic indicator among others may results more accurate estimations. Finally, researches such as Izani, Rafli (2004) give us identification that on average lag between leading and coinciding economic indicator may be equal to one to three months. However, the same academic literature discloses some drawbacks as well – they are relatively sensitive and may overshoot the trends, exposed to seasonality, ignorance of past changes and shifting levels of datasets. Therefore, these factors are usable only together with other indicators such as financial and lagging or coinciding economic.

Economic sentiment and confidence. In economic, market and financial researches, such indicators provide valuable evidences to review economic growth and profitability. An improvement in these ratios usually leads market researchers and participants to be more optimistic about the future following with higher investments and expenditure. Such ratios are a composite of sectoral confidence indicators with different weights (Eurostat, 2017). In accordance to researchers of ECB (European Central Bank, 2010, European Central Bank, 2015) such ratios could capture positive trends within economy and higher demand for services, increased purchasing power. Therefore, it is expected positive relationship.

Stock market. Stock market values as a leading indicator has relatively high number of evidences within academic literature (Altissimo, Marchetti, 2000; Sayari, Shamki, 2016). Such indicator might signal in advance of further economic development, which may affect clients and assets values of commercial banks. Leading indicators may include value of national and regional stock exchange, market capitalization. Positive sign of relationship between these indicators and profitability is expected.

Surveys of industries. Such surveys are usually produced every month or quarter by national bureaus of statistics (Eurostat, 2017). Depending on sector or industry (services, industrial, retail, wholesale or construction) it focuses on areas which are most important to define economic cycle – past performance, status and future expectations related to production, orders, inventories, pricing, permits, demand and employment. In other words, they are factors to determine potential growth of economy, business conditions and private households. In spite of the fact that profitability of commercial banks is sensitive to changes in these economic areas, the hypothesis is stated that they are useful for forecasting of bank profitability as well. For instance, industrial leading indicators may show negative trend which is not yet represented in financial accounts of borrowers but may expose commercial banks to higher than expected credit losses.

2. Methodology

To measure applicability of factors for profitability forecast in the article, descriptive and econometric analyses are used. Descriptive statistics is used to describe the basic features of the data and provide simple summaries about the measures. Further, to determine the explanatory variables that would be best to use in the regression model, a cross-correlogram of the variables will carried out. Finally,

lly, the econometric approach will be examining application of defined model.

Prior to describing model, several characteristics of data related to profitability should be acknowledged. First, main problems in assessment of determinants might be endogeneity of factors – factors could influence each other in many direct and indirect ways. In addition, causality could go opposite way as well as both directions. For instance, increasing profitability of commercial banks could lead less efficient operations (García-Herrero *et al.*, 2009). Nevertheless, some characteristics of profitability will be too difficult to identify in model and result as unobserved heterogeneity. If the characteristic is not captured – correlation between some of the coefficients of explanatory variables and the error terms could be found which may finally bias these coefficients. Finally, in accordance with few studies executed (Athanasoglou *et al.*, 2008; Dietrich, Wanzenried, 2011), profitability of commercial banks has tendency to persist over time.

In econometric analysis, different panel data modelling techniques are used to define determinants of profitability. For instance, pooled ordinary least squares (OLS) technique can be used in which differences between the observations and estimations are minimized in terms of sum of squares (Pasiouras, Kosmidou, 2007). However, characteristics of the model are likely to violate the classical assumptions underlying in the OLS model. First, the distribution of financial data is often heavy-tailed and skewed which violate the assumption of OLS on present normal distribution of data. Furthermore, OLS also assumes no correlation between explanatory variables and error item (erogeneity) and homoscedasticity, however, it might not hold for specified model. To overcome the mentioned problems, to measure profitability researchers in academic literature suggest using generalized method of moments (GMM) techniques. In comparison to OLS,

GMM techniques do not make assumptions on normality or skewness and overcome the problem of endogeneity of variables or serial correlation with the disturbance term (Athanasoglou *et al.*, 2008; Dietrich, Wanzenried, 2011). In accordance with the above-mentioned, the equation used for the study as follows (the table 1 in the annex summarizes the definition of the variables used and the expected sign in the regression given by equation):

$$Y_{i,t+1} = \alpha + \sum_{j=1}^J \beta_j X_{i,t}^b + \sum_{l=1}^L \beta_l X_{i,t}^d + \sum_{k=1}^M \beta_m X_{i,t}^m + u_{it} + \partial Y_{i,t},$$

$$u_{it} = \mu_i + v_{it}, \quad (1)$$

where:

$Y_{i,t+1}$	dependent variable ROE for bank i at time t with $i = 1, \dots, N$ and $t = 1, \dots, T$; the N denotes the number of cross-sectional observations and T the length of the sample period,
α	scalar, which measures a constant term,
β	vector of $k \times 1$ slope parameters that estimate the sign of the explanatory variables,
X_{it}^b	bank-specific explanatory variables divided into $1 \times k$ vectors,
X_{it}^d	industry-specific explanatory variables divided into $1 \times k$ vectors,
X_{it}^m	macroeconomic variables divided into $1 \times k$ vectors,
u_{it}	a one-way error disturbance term capturing – a bank-specific or fixed effect (μ_i) and a remainder or idiosyncratic effect that vary over time and between banks (v_{it}),
$Y_{i,t}$	a one-period lagged dependent variable of bank i at time t to reflects profitability persistence over time, hence, a dynamic model is used,

∂ coefficient of the one-period lagged dependent variable measures the adjustment speed of banks' profitability to equilibrium. A value between 0 (high speed of adjustment and imply a relatively competitive market structure) and 1 (slower mean reversion and, therefore, less competitive markets) indicates that profitability is persistent and will eventually return to the equilibrium level but some degree of profit persistence exists.

To verify results of the regression analysis several reliability tests should be carried out as well. First, the goodness of fit can be checked by the coefficient of determination (R^2 and adjusted R^2) which shows number that indicates the proportion of the variance in the dependent variable that is predictable from the independent variable(s). The adjusted R^2 , in addition, adjust to the phenomenon of the R^2 , which automatically and spuriously increases when additional explanatory variables are added to the model. Furthermore, for specific variables p-value will be used in significance hypothesis testing. In addition, to test for constant variance the Lagrange multiplier (LM) test statistic which is the product of the R^2 value and sample size. As an alternative The Durbin- Watson (D-W) statistic will be used to detect the presence of autocorrelation (a relationship between values separated from each other by a given time lag) in the residuals (prediction errors) from a regression analysis.

3. Sample /Data

The sample includes data 2002–2015 of one and the biggest Lithuanian retail commercial bank (AB Swedbank). The final sample covers quarterly data for 14 years, which includes each totally ratio and indicator. There are totally 52 observations for 12 bank specific

and 31 economic ratios in the dataset. Bank specific variables depend on the data published by the commercial bank. The sources of data: bank specific data from commercial bank's financial statements, industry specific and economic indicators from databases of Statistics Lithuania (stat.gov.lt), European statistics bureau (EuroStat), European Central Bank (ECB) and Nasdaq Baltic. There was a raised requirement to have complete information about the study variables in selection of sample. Data points presenting abnormal values were eliminated from the sample as outliers.

Descriptive statistics. Before entering the regression analysis, descriptive statistics (mean, standard deviation, skewness and kurtosis, minimum and maximum) were conducted to state the mean differences among the variables within the observed period. The Table 1 describes that means for bank specific variables fall between [0.02; 6.18], industry specific between [0.18; 14.88], lagging/coinciding [0.001; 0.029] and leading [16.83; 1004.62]. However, this table also reports standard deviation values for all the variables. In addition, it can be seen that all variables are non-normally distributed.

Correlation matrix. The analysis of correlations reports that various correlations are present between the explanatory variables and the dependent variable, in between explanatory variables. However, correlations do not imply causation but gives an important indication on the relationship between the variables. In accordance to academic standards, a correlation of -1 represents a perfect negative correlation (variables move in exactly the opposite direction), whereas variables move in the same direction when a correlation of 1 is present. The correlation matrix is a basic method to detect potential multicollinearity. The problem of multicollinearity arises when certain explanatory variables are highly correlated. Therefore, in selection of factors it should be made sure that no multicollinearity is present.

Table 1. Descriptive statistics.

Acronym (ratio)	Exp. sign	Mean	Median	Min	Max	St. dev	Skewness	Ex. kurtosis
Dependent variable								
ROE		0.103972	0.145932	-0.589069	0.366274	0.171579	-1.99202	5.11828
Bank-specific factors								
CAR (Own funds)	+	0.193752	0.177100	0.104000	0.388900	0.0751420	1.29619	0.969741
Deposits/equity (Funding structure)	+	6.17663	5.77993	4.31271	9.35315	1.45610	0.605431	-0.837283
Deposits /loans	+	0.931144	0.897877	0.667127	1.31335	0.153722	0.555231	0.0307805
FIR	-	0.693579	0.587212	0.231832	1.91527	0.0125726	0.339789	-1.05478
Prov/NII	-	0.415300	0.0190379	-2.60891	14.3911	2.45492	4.78987	24.7817
Liquidity ratio	+	0.359133	0.387000	0.000000	0.484000	0.125547	-2.32926	4.11626
NII/total income	+	0.387811	0.390508	0.252186	0.480718	0.0633461	-0.528996	-0.683092
CIR	-	0.693579	0.587212	0.231832	1.91527	0.334532	1.80166	3.31804
Growth of assets	+	0.0183138	0.00959667	-0.110643	0.171964	0.0506217	0.648775	1.53025
Tax/EBT	-	0.177926	0.150148	0.000000	1.73773	0.258058	5.70628	32.1181
Industry-specific variables								
HHI	+	0.179231	0.181925	0.154500	0.193900	0.00976826	-0.765678	-0.241474
Ln of assets	+	14.8759	15.3056	13.9379	15.7095	0.751697	-0.325719	-1.79832
Lagging and coinciding macroeconomic								
Growth of real GDP	+	0.0125500	0.0160000	-0.124000	0.0470000	0.0276831	-3.01056	12.8601
Diff.10Y gov. bond yield and 3M EURIBOR	+	0.0293475	0.0369000	0.00100000	0.0481000	0.0166311	-0.583386	-1.26517
Unemployment rate	-	0.107600	0.113000	0.0380000	0.182000	0.0443568	-0.0359651	-1.14230
Housing prices change	+	0.00503000	0.00910000	-0.200000	0.110000	0.0489894	-1.56387	6.39906
Leading macroeconomic								
ESI	+	101.545	103.100	69.9000	118.200	11.6061	-1.07673	0.880542
CI	+	-16.8250	-15.5000	-51.0000	9.00000	15.8226	-0.593893	-0.283070
ReWho	+	6.12250	4.20000	-11.8000	23.0000	10.4893	0.0563506	-1.44089
Re_Food	+	5.95250	4.95000	-18.4000	26.9000	10.6329	-0.234140	0.164831
Ind_index	+	1.96750	3.70000	-19.0000	15.1000	8.49245	-0.755554	-0.0905140
Ind_Manu	+	3.17750	4.50000	-22.3000	19.1000	9.23920	-0.755114	0.380147
Ind_s_t	+	-8.35750	-7.60000	-37.2000	9.40000	11.5529	-0.906202	0.636886
Ind_s_PP	+	3.79500	6.40000	-36.4000	20.4000	13.1996	-1.20201	1.37199
Ind_s_OBL	+	-33.9350	-33.1000	-75.6000	-3.40000	17.7288	-0.487189	-0.0204657
Ind_s_EO	+	-33.6350	-36.6500	-75.3000	25.0000	22.5678	0.964697	1.13521
Ind_s_IL	+	-0.670000	0.250000	-17.3000	19.0000	7.91018	0.283653	-0.308286
Ind_s_EP	+	8.21000	10.8000	-31.4000	26.8000	13.9680	-1.20070	1.14433
Ind_s_Epr	+	3.36500	2.45000	-27.1000	31.9000	14.7058	-0.300384	-0.337870
Ind_s_EE	+	-4.95250	0.950000	-47.8000	9.30000	14.6304	-1.64473	1.75354
...

Source: Own elaboration.

Table 2. Regression analysis: concluding on models based on bank and industry. lagging. coinciding and leading economic indicators factors.

	ROE _{t+1}			ROE _{t+2}			ROE _{t+3}		
	Ind	Coeff.	P-v.	Ind	Coeff.	P-v.	Ind	Coeff.	P-v.
Bank specific	C	-1.0221	0.086	C	-0.1337	0.073	C	-2.7350	0.016
	AssetGr	0.5750	0.002	FIR	-5.3364	0.046	Ln(Assets)	0.1576	0.018
	NII/TotalIncome	0.5717	0.053	ROE	0.6511	0.000	Deposits/Equity	0.0792	0.001
	ROE	0.3812	0.000	Tax/EBT	-0.0953	0.012			
	Tax/EBT	-0.3115	0.000	Deposits/Equity	0.0510	0.002			
	Deposits/Loans	-0.2331	0.014						
	Deposits/Equity	0.0279	0.007						
	Adj. R ²	0.8132		Adj. R ²	0.4912		Adj. R ²	0.3854	
Bank and industry specific, macro	C	0.9114	0.027	C	0.8119	0.004	C	-0.0474	0.900
	HHIm	-6.3860	0.004	HHIm	-3.9957	0.007	HHIm	-4.8738	0.000
	RealGDPchng	1.9130	0.000	RealGDPchng	2.0429	0.000	RealGDPchng	4.3423	0.000
	Unemployment	-1.2446	0.003	CIR	-0.3261	0.000	Liquidity	-0.3492	0.000
	AssetGr	0.3711	0.030	Liquidity	-0.2109	0.003	Tax/EBT	-0.1252	0.000
	Tax/EBT	-0.3618	0.000	Tax/EBT	-0.1336	0.000	CIR	-0.0985	0.000
	Deposits/Loans	-0.3409	0.001	Deposits/Equity	0.0493	0.000	Deposits/Equity	0.0642	0.000
	CIR	-0.2581	0.000				Ln(Assets)	0.0528	0.026
	Liquidity	-0.2479	0.000						
	Ln(Assets)	0.0592	0.045						
	Deposits/Equity	0.0334	0.000						
	Adj. R ²	0.9008		Adj. R ²	0.5344		Adj. R ²	0.7947	
Bank and industry specific, macro and leading	C	-5.4700	0.000	C	0.3044	0.013	C	0.3794	0.007
	REPriceChng	-1.3233	0.001	CAR	-0.5324	0.000	RealGDPchng	1.9738	0.000
	AssetGr	-0.9990	0.005	Deposits/Equity	-0.0406	0.002	NII/TotalIncome	-0.7541	0.006
	Liquidity	0.7391	0.000	SRV_S_CNI	0.0080	0.000	AssetGr	-0.4722	0.006
	OMXVchng	-0.7012	0.000	OMXVvalue	0.0003	0.014	Tax/EBT	-0.0604	0.018
	NII/TotalIncome	0.5060	0.006				SRV_S_CNI	0.0113	0.000
	Deposits/Loans	-0.4626	0.000				CNS_S_CNI	0.0066	0.000
	Ln(Assets)	0.2432	0.000				CNS_S_OBE	-0.0060	0.000
	Tax/EBT	-0.2265	0.000				IND_S_PP	-0.0052	0.003
	Deposits/Equity	0.1235	0.000				CI	0.0046	0.022
	Provision/NII	-0.0403	0.000						
	CNS_S_CNI	-0.0126	0.000						
	SRV_S_CNI	0.0118	0.000						
	IND_S_PP	-0.0092	0.000						
	RE_FOOD	-0.0078	0.007						
	CNS_S_OBE	0.0069	0.000						
	RE_S_EE	-0.0057	0.000						
	RE_S_EPR	0.0050	0.000						
	OMXVvalue	0.0032	0.000						
	SRV_S_ED	0.0031	0.019						
	Adj. R ²	0.9719		Adj. R ²	0.7450		Adj. R ²	0.9022	

Source: Own elaboration.

4. Results

The summarised results of regression analysis are reported in Table 2. Models were based on three different blends of determinants for bank profitability (ROE). The first group of models was based on entirely bank specific ratios and has no indicators, which may represent external factors. Second group, in addition to bank specific factors includes industry specific and lagging /coinciding economic indicators. Finally, the last group employed all possible factors including leading economic indicators.

5. Discussions

Based on regression analysis of models using bank specific ratios, it was concluded that there are several ratios which might help to forecast ROE for particular period – asset growth, tax/EBT, NII/Total Income, ROE with lag 1, deposits/equity, deposits/loans ratios, funding interest rate and $\ln(\text{assets})$. Such ratios show that banks' profitability is mainly determined by growth of bank assets, business model, previous profitability, and ability to turn funding into assets, conditions of taxes, funding structure and price. In addition, it was found that though such ratios have high explanatory power only for one quarter, for two or three quarter's length – explanatory power decays significantly (adj. R^2 from 0.81 to 0.39).

In further modelling, it was found that adding industry specific and lagging /coinciding economic indicators significantly improve model's ability to explain the dependent variable. Indicators of concentration of market (HHI market), change in real GDP and unemployment rate in addition to bank specific ratios were emphasized as important. Such improvement was found for all forecasting horizons (one, two and three quarters) resulting explanatory power (adj. R^2) for one, two and three quarters accordingly: 0.90, 0.53 and 0.79.

Finally, adding leading economic indicators, further improves ability to explain ROE giving important explanatory role for bank specific bank specific (Asset Growth, Liquidity, NII / Total Income, CAR, Tax / EBT, Deposits / Equity, Provision / NII, Deposits / Loans), industry (bank size represented by \ln of Assets), lagging/coinciding economic indicators (changes in real estate prices and growth of economy) and leading economic indicators (consumer confidence, expected changes in service, industry, retail and construction sectors and changes in OMXV stock exchange market). From the Table 2, it can be also seen that including leading economic indicators into modelling improved explanatory power in both dimensions – time (higher scores received for all forecasting horizons) and alternatives (different models which use different blends of determinants). This resulted in adj. R^2 for one, two and three quarter periods accordingly: 0.97, 0.75, 0.9.

6. Conclusions

Profitability analysis and forecasting is essential for securing adequate return for shareholders, comply with regulatory requirements and accumulate reserves for future turbulences in economy. Against this background, the purpose of this article was to confirm or reject hypothesis that leading economic indicators can be useful factors to describe and forecast profitability of commercial banks. After review of related theory and execution of empirical study, the article can conclude on following:

In analysis of academic literature, leading economic indicators were found to have interpretation power adequate to forecast profitability. Main evidences were found in numerous researches on leading indicators, though not specifically on profitability. Furthermore, these indicators are well described in methodologies of statistical bureau (Eurostat, Stat.gov.lt) and publicly available

which gives a major prerequisite to share its semantics.

Taking into account results of the empirical study, it was indicated that leading economic indicators, in addition to other ratios and indicators, can improve explanatory and forecasting power for periods of one, two and three quarters (the longer forecasting horizon the better improvement was found). This finding confirms conclusions provided by some authors studying other fractions of economic science, that leading economic indicators might have significant value in forecasting economic trends, gives a valuable indication on applicability of leading economic indicators in analysis of profitability.

Worth noting, in line with other evidences found in academic literature, it was confirmed that using only leading indicators might cause volatile predictions. Therefore, these indicators should be used with careful

analysis of methodologies and in combination with bank, industry specific and other economic factors.

The main limitation of the conclusions – validation of applicability of leading economic indicators in profitability forecasting requires further empirical studies in broader scale, surveys of experts. Therefore, considering it, further empirical researches are needed to confirm usage of such indicators in forecasting of profitability.

Abovementioned findings of the article provides empirical input for further academic debates on factors, which may be useful for assessment of profitability. As the problem is relevant in theoretical view as well as for practitioners, this article also gives useful indication for commercial banks on publicly available data, which can be used in analysis of profitability.

References

- Albrice, D. (2014). Opinion Article on Leading Indicators. *Asset Insights Database*. Retrieved from: http://www.assetinsights.net/Glossary/G_Leading_Indicator.html.
- Altissimo, F., Marchetti, D. J., Oneto, G. P. (2000). The Italian business cycle: coincident and leading indicators and some stylized facts. *Giornale degli economisti e Annali di economia*, 60, pp.147–220.
- 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), pp. 121–136.
- Bordeleau, E., Graham, C. (2010). The Impact of Liquidity on Bank Profitability. Working Paper, 38, Bank of Canada, Ontario.
- Brett, W., Brown, T., Onsmann, A. (2012). Exploratory Factor Analysis: A Five-step Guide for Novices. *Australasian Journal of Paramedicine*. Retrieved from: <http://ro.ecu.edu.au/cgi/viewcontent.cgi?article=1373&context=jephc>.
- Borio, C., Gambacorta, L., Hofmann, B. (2017). The influence of monetary policy on bank profitability. *International Finance*, Vol. (20), pp. 48–63.
- Brezina, I., Pekár, J., Čičková, Z., Reiff, M. (2016). Herfindahl–Hirschman index level of concentration values modification and analysis of their change. *Central European Journal of Operations Research*, 24, pp. 49–72.
- Bonner, C., van Lelyveld, I., Zymek, R. (2013). The determinants of banks' liquidity buffers and the role of liquidity regulation. Working paper, 30, De Nederlandsche Bank, Brussels.
- Delechat, C., Arbelaez, C. H., Muthoora, M. P. S., Vtyurina, S. (2012). The Determinants of Banks' Liquidity Buffers in Central America. *International Monetary Fund journal*, 12, pp. 301.
- Demirgüç-Kunt, A., Huizinga, H. (1999). Determinants of commercial bank interest margins and profitability: some international evidence. *The World Bank Economic Review*, 13(2), pp. 379–408.
- Dietrich, A., Wanzenried, G. (2011). Determinants of bank profitability before and during the crisis: Evidence from Switzerland. *Journal of International*

- Financial Markets, Institutions and Money*, 21(3), pp. 307–327.
- Evans, J. R., Lindner, C. H. (2012). Business Analytics: The Next Frontier for Decision Sciences. *Decision Line*, 43(2), pp. 4–6.
- European central bank (2010). *Beyond roe-how to measure bank performance*. Appendix to the report on EU banking structures. Retrieved from: https://www.google.lt/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwjGy8Wf_sHWAhVmMJJoKHWMDDbQQFgZMAA&ul=https%3A%2F%2Fwww.ecb.europa.eu%2Fpub%2Fpdf%2Fother%2Fbeyondroehowtomeasurebankperformance201009en.pdf&usg=AFQjCNGXTII9lfsN85wirvwhelRfY-gbtQ.
- European Central Bank (2015). *Financial Stability Review*. Retrieved from: <https://www.ecb.europa.eu/pub/pdf/other/financialstabilityreview201511.en.pdf>.
- Eurostat – Statistical office of the European Union (2017). Data retrieved from: <http://ec.europa.eu/eurostat/data/database>.
- Frankel, J. A., Saravelos, G. (2011). Can Leading Indicators Assess Country Vulnerability? Evidence from the 2008–09 Global Financial Crisis. *Harvard Kennedy School. NBER Working Paper*. Retrieved from: <http://www.hks.harvard.edu/fs/jfrankel/areleadingindicatorsuseful.pdf>.
- Fritsche, U., Stephan, S. (2002). Leading Indicators of German Business Cycles – An Assessment of Properties. *Journal of Economics and Statistics*, 222, pp. 289–315.
- García-Herrero, A., Gavilá, S., Santabárbara, D. (2009). What explains the low profitability of Chinese banks? *Journal of Banking & Finance*, 33(11), pp. 2080–2092.
- Gaspar, J. V. S. C. (2016). The impact of real estate market in financial stability: commercial banks exposure (*Master's thesis, FEUC*).
- Goddard, J. A., Molyneux, P., Wilson, J. O. (2004). Dynamics of growth and profitability in banking. *Journal of Money, Credit, and Banking*, 36(6), pp. 1069–1090.
- Gounder, N., Sharma, P. (2012). Determinants of bank net interest margins in Fiji, a small island developing state. *Applied Financial Economics*, 22(19), pp. 1647–1654.
- Horváth, R., Seidler, J., Weill, L. (2014). Bank capital and liquidity creation: Granger-causality evidence. *Journal of Financial Services Research*, 45(3), pp. 341–361.
- Hoffmann, P. S. (2011). Determinants of the Profitability of the US Banking Industry. *International Journal of Business and Social Science*, 2(22), pp. 222.
- Iannotta, G., Nocera, G., Sironi, A. (2007). Ownership structure, risk and performance in the European banking industry. *Journal of Banking & Finance*, 31(7), pp. 2127–2149.
- Ibiyemi, A. O., Ibiyemi, A. O., Adnan, Y. M., Adnan, Y. M., Daud, M. N., Daud, M. N. (2016). The validity of the classical Delphi applications for assessing the industrial sustainability-correction factor: an example study. *Foresight*, 18(6), pp. 603–624.
- Izani, I., Rafli, C. A. O. (2004). The Lead-Lag Pattern of Leading, Coincident and Lagging. *Investment Management and Financial Innovations*. Retrieved from: http://businessperspectives.org/journals_free/imfi/2004/imfi_en_2004_02_Izani.pdf.
- Keynes, J. M. (1973). 1936. *The General Theory of Employment, Interest and Money*, Vol. (7).
- Knight, F. H. (1921). *Risk, uncertainty and profit*. New York: Hart, Schaffner and Marx.
- Naceur, S. B., Omran, M. (2011). The effects of bank regulations, competition, and financial reforms on banks' performance. *Emerging markets review*, 12(1), pp. 1–20.
- Nippala, E., Päivi, J. (2012). Management of Construction: Research to Practice Leading indicators for Forecasting Civil Engineering Market Development. University of Tampere. Retrieved from: http://www.vtt.fi/files/sites/infra2030/3_leading_indicators_for_forecasting_civil_engineering_market_development.pdf.
- Organization for Economic Co-operation and Development (2012). *OECD System of Composite Leading Indicators*. Retrieved from: <http://www.oecd.org/std/leading-indicators/41629509.pdf>.
- Pasiouras, F., Kosmidou, K. (2007). Factors influencing the profitability of domestic and foreign commercial banks in the European Union. *Research in International Business and Finance*, 21(2), pp. 222–237.

- Petria, N., Capraru, B., Ihnatov, I. (2015). Determinants of banks' profitability: evidence from EU 27 banking systems. *Procedia Economics and Finance*, 20, pp. 518–524.
- Regehr, K., Sengupta, R. (2016). Has the relationship between bank size and profitability changed? *Economic Review-Federal Reserve Bank of Kansas City*, 101(2), pp. 1.
- Sayari, K., Shamki, D. (2016). Commercial Banks Profitability and Stock Market Developments. *Journal of Applied Finance and Banking*, 6(4), pp. 43.
- Schumpeter, J. A. (1934). *The theory of economic development*. Harvard University Press.
- Theobald, D. (2012). 29+ Evidences for Macroeolution: Scientific Proof, Scientific Evidence, and the Scientific Method. Retrieved from: <http://www.talkorigins.org/faqs/comdesc/sciproof.html>.
- Trujillo-Ponce, A. (2012). What Determines the Profitability of Banks? Evidence from Spain, *Accounting and Finance*, 53(2), Retrieved from: www.aeca.es/pub/on_line/comunicaciones_xvcongresoaecca/.../75b.pdf.
- Vaggi, G., Groenewegen, P. (2003). Joan Robinson, 1903–83 and Edward Chamberlin, 1899–1967: Theory of the Firm. In *A Concise History of Economic Thought*, pp. 283–287.
- Valverde, S. C., Fernández, F. R. (2007). The determinants of bank margins in European banking. *Journal of Banking & Finance*, 31(7), pp. 2043–2063.
- Waller, M. A., Fawcett, S. E. (2013). Data science, predictive analytics, and big data: a revolution that will transform supply chain design and management. *Journal of Business Logistics*, 34, pp. 77–84.
- Qingbin, C. (2005). A dynamic model for profitability analysis of construction firms: towards complexity, learning and uncertainty. Dissertation AAI3191446. Retrieved from: <http://docs.lib.purdue.edu/dissertations/AAI3191446/>.

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