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# Influence of regulatory capital requirements on the self-financing capacity of a banking company

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**Abstract:** This paper explores activities of the banking companies in the new regulatory environment of the European banking system. For this purpose, the dynamic panel data models are estimated by utilizing the system GMM estimator. The research sample consists of 35 publicly listed groups of banks operating in the period from 2000 to 2016, selected by size of assets. The chosen banking companies are unquestionably market makers on the bank-centric economy of the EU. Hence, the research is in line with other current empirical works regarding the post-Basel III Standard adjustment of the banking industry as a whole. The model results show that the required increase in capital position affects the lack of bank credit activity towards the non-financial sector. The banks can maintain the higher regulatory capital ratio and self-finance the required growth by increasing the volume of share capital. Asymmetric information about the bank's net worth discourage public investors to get into the shareholders position, which results in further bank lending constraints and reduced profitability. Potential growth of the revenue from non-credit risk operations cannot compensate for the negative pressure on the real value of the banking firm. From the policy-making perspective, the paper concludes that the resolution of structural problems of non-performing credit assets under new regulatory conditions should contribute to restoring the confidence of the investment public towards the self-financing capacity of the banking industry as well as bring the banking system back to the traditional client-oriented business model.

**JEL Classifications:** C33, D53, F65, G21

**Keywords:** Return on equity, capital requirements, credit assets, dynamic panel models

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## 1. Introduction

The unresolved problems caused by the global financial crisis have further encouraged regulatory authorities to implement the Basel III Standards (BIS, 2010) in a rigorous manner, facing banks with the new capital requirements. The European Parliament and the Council have introduced prudential restrictions on the banking system of the European Union (EU Regulation (EU) No. 575/2013 of 26 June 2013). The basic arguments for introducing new capital requirements are to promote financial stability by reducing probability of banking difficulties. Additional capital requirements should lead to a reduction in banking risks and increased banking system stability, especially during the financial crisis. One of the most important features of the financial structure of banks lies in the fact that their level of capital is regulated, that is, banks are forced to maintain a minimum level of capital based on the risk of the assets in their possession. By imposing limits on the level of capital, financial regulation may have contributed to the belief that

bank capital is the least acceptable cost-effective source of financing and should be reduced to a minimum.

The standard goal of modern finance is to reach the risk adjusted higher return in function of increasing value. Unlike corporate success measures, the goal of any banking firm is to increase the return on equity with well-known regulatory constraints, although regulation itself does not necessarily mean controlling capital volatility in the function of avoiding risk of failure. This confusion, coupled with a sanitation warranties that provide subsidies to increased debt financing, may be at the heart of the problem of increasing the financial leverage in banks and jeopardizing prudent financial reasoning. Many authors argue that the financial principles may also apply to banking firms (Miller, 1995; Pfleiderer, 2010; Admati De Marzo, Hellwig & Pfleiderer, 2010; Moussu, Ohana & Tröge, 2011). A higher level of debt increases the return on equity, but also increases the required rate of return as a measure of risk for shareholders that become bigger. For confirmation of this hypothesis, Kashyap, Stein and Hanson (2010), as well as Miles, Yang and Marcheggiano (2011) provide evidence of a positive relationship between the risk of banking stocks and their prices on one side, and the greater share of financial leverage in the financing structure on the other side. However, many papers also document the negative link between leverage and bank performance during the crisis. Banks with a larger share of the financial leverage record larger value adjustments of the given placements (Chesney, Stromberg & Wagner, 2010), the likelihood of failure is greater and the market share, return on equity (Berger & Bouwman, 2009) and return on shares are lower (Beltratti & Stulz, 2012). Demircuc-Kunt, Detragiache and Merrouche (2010) also investigated the existence of a positive relationship between bank capital and value of shares during the crisis, particularly for large banks. Finally, despite the fact that the new regulatory environment led to capital improvements, the price-to-book ratio value remains low for many banks, especially in Europe (Bogdanova, Fender & Takáts, 2018).

The aim of this paper is to analyse the growth determinants of European banking industry in the new regulatory environment of Basel III Standards. More precisely, the research paper investigates the consequences of reduction of credit activity and changed business model on external financing capacity. Return on equity is the key indicator of the value of the banking shares, in particular on the efficient financial markets. Thus, to complying with the new regulatory capital environment, our main research hypotheses have been developed:

- Lack of credit activity leads to reduction in profitability of shareholders equity reducing the real value of the banking firm.
- The new regulatory capital requirements have a negative impact on the possibility of bank firms' self-financing growth as a whole, especially in bank-centric economies.

Our research can help to better understand the banking industry 's reactive impact on a simple measure of increasing capital requirements. The complexity of banking sector behaviour patterns in changed regulatory conditions can contribute to a better understanding of the same problem by policy makers and regulators itself. The results of this research are certainly directed to public investors and banking management structures in the context of further regulatory alignment in order to preserve financial stability as a whole.

The paper consists of five sections. After introduction, the literature review is presented in the second section, which is followed by the selection of the used data and definition of

the empirical framework in the third section. In the same section is presented methodology as well as the rationale behind the choice of the dynamic panel model. The fourth section contains results of the research. Finally, in the fifth section we summarise the results and their implication.

## 2. Overview of previous research

In necessity to meet the regulatory capital requirements, a banking firm may decide to issue additional capital. The common opinion is that they are unwilling to enter into capital increase because equity is the most expensive source of financing. However, the economic theories that deal with the capital structure suggest a somewhat different approach by offering the argument that bigger capital makes the capital and the financed debt safer. The basis comes from Modigliani-Miller theory claiming that the overall risk of a firm depends on the structure of its own assets, rather than how it is financed. Admati et al. (2010) rightly point out that the return on equity contains a risk premium that needs to decline if banks have more capital. Therefore, the weighted average cost of capital (WACC) remains unchanged if the capital to assets ratio increases.

Economic theories that provide an explanation of the high cost of issuing additional capital identifies a basic reason for the same in confronting banks with imperfections on the stock market. An additional unit of capital increases the risk for the bank shareholders, implying a higher fee for that risk (Myers, 1977) while reducing the risk of debt repayment, namely the debt value increases in favour of the creditor. As a result, existing shareholders are reluctant to issue additional capital. According to Myers and Majluf (1984), markets demand higher capital premium after new issues. Existing shareholders have better information on bank performance than new external investors who can interpret capital issuance as a signal that existing capital is currently overestimated. Finally, banks with better prospects do not issue additional capital, they are more likely to wait for better returns in the future.

The authors have described this effect as asymmetric information between investor and management. Bolton and Freixas (2006) argue that external capital has a high price just because of the asymmetric information about the net value of a banking firm, and the problem becomes even more difficult during the crisis. As a result, bank loans become limited due to increased capital requirements.

By using the segmentation of deposits and capital markets, recent papers are trying to explain why the use of high financial leverage is more attractive for banks. Allen and Carletti (2013) add in their model bankruptcy cost constraints, showing that equity capital is more expensive source of financing than deposits. Especially in balance when bankruptcy costs are significant, and banks are only financed with deposits and make specialization in lending to one sector. When bankruptcy costs are low, investment diversification into different sectors is optimal with high realized yields.

DeAngelo and Stulz (2013) focused on the role of banks in securing liquidity and showed that high financial leverage is optimal if there is a market premium for liquidity requirements. Miles et al. (2011) also stated that Modigliani-Miller theorem is not viable due to two main disturbances, such as tax relief for debt release, as well as undervalued guarantees in favour of debt. In other words, a bank may have tendency for debt financing because of lower costs of this financing due to tax-deductible expenses. The author's

estimate is that optimum bank capital should be around 20% of risk weighted assets (RWA), whereas according to them the idea that banks must reduce lending to meet larger capital requirements is not fully adjusted. An additional argument is that even in the absence of sanation warranties, a high financial leverage may also be acceptable due to embedded financial discipline in debt financing (Calomiris & Kahn, 1991; Diamond & Rajan, 2000).

Previous arguments in favour of the lower ratio of capital are interpreted by Admati et al. (2010) as a lack of empirical support, representing the absence of social costs in function of imposing larger capital requirements. Still, many empirical studies have identified a high cost of external capital, and any increase in capital costs is transferred to the final debtor i.e. the clients of the bank firm (BCBS, 2010). Higher capital requirements, especially in the newly established regulatory environment reduce the return on equity, and the reason for this is a decrease in net profits due to debt replacement with more expensive capital. To keep ROE unchanged, banks are forced to raise interest rate (King, 2010). Higher interest rates may result in reduced lending, and thus lowering economic activity as a whole.

Finally, if banks decide to meet increased capital requirements by issuing additional capital, it is almost certain to expect a fall in credit activity and an increase in the risk of bank loans. The latter can have an effect even on reducing financial stability because banks can transfer the risk to financial institutions that are out of excessive capital pressure (shadow banking) (Plantin, 2014).

### 3. Data selection and empirical framework

In this part of the paper, we examine the impact of the new regulatory capital requirements on the self-financing capacity of the banking industry on the EU financial market. The analysis is performed for 35 groups of banks operating in the period from 2000 to 2016, selected by size of assets.

#### 3.1. Research sample

A sample of this research was formed pursuant to data obtained from the Reuters database, referring to the balance sheet data of each selected group, as well as business indicators and individual relevant regulatory capital positions predefined by the Basel III Standards. The total share of observed groups of banks in the total assets of the European Monetary Union (EMU) credit institutions was approximately 78.9 percent at the end of 2016\*. The total assets of the observed banks amounted to EUR 23,514,793 million, while the total assets of the EMU credit institutions amounted to EUR 29,810,935 million on December 31, 2016.

Besides the size of the assets and the significance of a particular group that is defined by experiential knowledge, an additional basic criterion for selection of a particular group in the observation sample is also the public listing or criterion of listed shares of an individual group of banks in the European Union capital markets, for which the Orbis

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\* A selected sample of banks is shown in the Appendix A, Table A1. All other research results and figure are also presented in the Appendix in the relevant tables.

database (Bankscope) was used as an additional verification. According to the criterion of public quotation, large regional development banks that essentially do not operate according to market criteria were omitted from the sample, although they are subject to the same banking regulation in question. Thereby, a maximum relevance, unbiased and objectivity is secured during the statistical analysis, presentation, and finally in making the relevant judgements as the results of previous empirical processing. Data and associated indicators are from the consolidated annual reports of observed banking groups, published under International Financial Reporting Standards (IFRS).<sup>\*</sup> Issues regarding mergers and acquisitions that are contained in the same consolidated reports for the period 2000 - 2016 were not considered relevant for the same research problem. In conclusion, the selected banking companies are unquestionably taking the position of market makers on a single EU banking market.

### 3.2. Description of model variables

The dependant variable of this survey is the equity capital profitability rate (**ROE**) expressed as a percentage. It is in direct relation with market trends of banking shares and determines the possibility of the self-financing growth of bank assets. Independent variables are directly or indirectly related to the ability of a banking firm to meet regulatory capital requirements and the following ones are selected<sup>†</sup>:

- **RWA/TA** - analytical ratio of Risk Weighted Assets and Total Bank Assets (*Risk Weighted Assets/Total Bank Assets*). This dynamically observed indicator reflects the propensity of an individual bank towards the credit risk,
- **FR** - Net Fee and Commissions Revenue (*Fee Revenue*). It represents an individual banking firm non-interest income expressed in percentage, and
- **NII/OpINC** - ratio that gives us information how much non-interest income is participating in banking firm operating income (*Non-Interest Income/Operating Income*). It concerns a very important indicator of banks' activities that do not include lending and other forms of core business, such as transaction banking, market mediation services, up to so-called *asset and wealth management* and other forms of financial services. The same activities do not include banking business core credit risk contained in interest rate margins, hence indirectly affecting the movement of bank assets and the entire profitability of banks.

Indicators of the macroeconomic environment of the observed banking groups are primarily related to the EU area. Although global banking groups have revenue outside the EU as well, their dominant business activities are taking place in the EU economic area. Macro indicators as the control variables are<sup>‡</sup>:

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<sup>\*</sup> Consolidated financial statements contain business information about all members of individual banking groups and thus avoid any possible error in estimating the size and share of individual observed banking firm parameter

<sup>†</sup> The description of all variables and the expected impact of independent variables are given in the Appendix A, Table A2.

<sup>‡</sup> The observed indicators have been downloaded from the common database of the European Central Bank - ECB (<http://sdw.ecb.europa.eu/>), as well as from the common statistical database EUROSTAT (<http://ec.europa.eu/eurostat/data/database>).

- **UNPLEU** - The unemployment rate in the EU-28 countries, expressed in percentage, and
- **GDP** - The GDP growth of the EU-28 countries, expressed in percentage.

In addition to the abovementioned bank and macroeconomic environment variables, and for the purpose of empirical analysis of the subject research, it has been necessary to define the period of announcement and enforcement of prudential regulations of capital requirements on the basis of which banks' behavior and alignment would be observed. Namely, one of the basic assumptions of this research is that any regulatory modeling of banking business, primarily in the function of securing financial stability, produces direct causal effects on the structure and volume of bank assets. The basic breakdown of the variables has been made for 2010 (announcement of the Basel III Standards), as well as for the year 2013 (implementation of the Basel III Standards), 2015 (implementation of the Liquidity Cover Ratio - LCR) and 2016 (implementation of the Capital Conservation Buffers), which altogether represent the years of enforcement. In this way two other variables of empirical research are formed:

- **DLA** - Announcement of regulatory measures. The announcement period of regulatory measures - i.e. when the value of the variable is 1 - starts in 2010 and lasts until the end of the observed period. For all other years the value of this variable is 0, and
- **DLE** - Enforcement of regulatory measures. The period of enforcement of the regulatory measures (value of the variable is 1) begins in 2013 and lasts until the end of the observed period. For all other years the value of this variable is 0.\*

The general features of the observed research sample variables were determined by descriptive statistics as shown in Table A3.

The dynamic analysis of the dependent variable (ROE) was made as the calculation of the average value for all banking groups at the level of each of the observed year (Table A4). Although the number of observations is not the same at the level of the entire sample, which can slightly reduce the credibility of the approximation through the calculation of the average annual value, we still have enough data to obtain a simpler insight into the very dynamics of the observed portfolio of banks, as well as the movement of average ROE value in the unit of time. By the expiry of the expansive movements of bank assets growth, a drastic fall in the profitability of the observed banking groups' equity principal occurs (Figure B1). Very stable profitability growth starting with 2003 recorded its first negative correction in 2007, after which at the end of 2008 it fell sharply to only 3.40%. Profitability increase of approximately 6.5% in 2009/2010 did not obviously encounter a real base in business quality and the same business performance measure deteriorated to unprecedented -9.94% at the end of 2012. Further movement of the return rate was marked by modest growth, although the same in 2015 grew to a solid 8.41%. Starting from the very unstable or respectively cyclical trend of bank assets with a negative tendency after 2008, it can certainly be expected that the return on equity will remain yet below pre-achieved levels.

In addition to the basic analysis of the return on equity dependent variable dynamics, it is necessary to determine whether there are differences in the arithmetic means of the

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\* Research sample data analysis was performed using the STATA 14.2. statistical package.

banking group variables before and after the announcement of regulatory changes, specifically before and after the application of the same measures, using a two-way t-test.

The dependent variable of the observed sample of banks (ROE) indicates a statistical significance of differences in arithmetic means before and after the announcement of regulatory measures, as well as before and after the enforcement of measures. The obtained results (Table A5) are expected and confirm the basic assumptions of the research on the significance of the selected variables and the expected influence of regulation on the banking industry.

As the dependent variable, the independent variable ratio of credit (weighted) assets in total assets (RWA/TA) also shows statistical significance as well as average fall in value. After the announcement of regulatory measures, it was reduced from 0.49 to 0.40, while significant corrections in average growth followed even after the enforcement of measures, i.e. from 0.48 to 0.38. It is logical to expect a more stringent regulatory regime of creditworthiness and reduced lending to small and medium-sized companies (SMEs) and project financing with higher risk weights, as well as further regulatory compliance with the relative reduction in the share of credit risk assets.

Further analysis of the observed independent variables of the banking firm revenue structure also indicates the importance of regulatory framework changes. Unlike the credit assets ratio variable, the independent variable of average net income from fees and provisions - before and after the establishment of the new regulatory framework - did not show statistical significance of differences in arithmetic means. FR - recorded an average decline after the announcement of the regulatory measure from 32.9 percent to 30.3 percent, and a slightly higher than average increase of +1.7 percent after the enforcement of the measure.

Independent variable of non-interest income in total operating income of the banking firm (NII/OpINC) shows statistical significance before and after the establishment of the new regulatory framework. The average value of this variable before the announcement of the regulatory measures amounted to 0.49, whereas after the announcement of the measures it increased to 1.2. Finally, the average value of this variable amounted to 1.38 with the enforcement of regulatory measures. Considering the importance of the same variable as an indicator of the banking firm selected business model, it is clear from the results of the analysis that all banking groups statistically significantly increased the share of services or non-credit activities in the overall business operations. Thus, the rise in the share of transaction banking, market intermediation and other forms of financial services reduces further on core credit activity. Changing the business model and market position in conditions of increased market uncertainty, can lead to a decline in profitability of banking business as a whole.

Before the formation of the final model, it was necessary to check the correlation between the selected variables. According to the present knowledge, an appropriate test for detection of multicollinearity in panel models does not exist, whereas the empirical studies for discovery of the multicollinearity-related issues use coefficients between pairs of potential independent variables. Based on the correlation matrix results (Table A6), it can be concluded that there are no pairs of variables which could cause multicollinearity with the simultaneous inclusion in the model if we consider that there is no coefficient that exceeded the value of 0.5. The results from Table A7 suggest a significant correlation between the dummy variables, which is expected and will not be separately considered. In



the same way, the expected multicollinearity problem can be seen by the simultaneous inclusion of the unemployment variable and gross domestic product in the empirical models. Although the relationship between these two macro variables is logical and expected, the model estimates will be made by substituting them alternately.

Following the performed descriptive statistics - the t-test of the difference in the arithmetic mean of the selected empirical research variables and the correlation matrix results - it is necessary to define the model of influence of the prudential regulation of capital requirements influence on the return on equity.

### 3.3. Model

Although the econometric analysis is improving and becoming more accurate, empirical research has shown that the data being analysed have simultaneous temporal and spatial components. Such data containing the temporal and spatial components of some variables are called panel data.

According to Verbeke (2004), the main advantage of the panel data compared to time series or cross-sectional assemblies is that they allow the identification of certain parameters or questions without the need to limit the assumptions. Panel data allow analysis of changes at individual level, so one of the main advantages of panel analysis is the ability to model individual dynamics. The panel analysis also highlights the heterogeneity control at individual level, and the difference between the observed units is assumed. Models that do not have this feature can have negative implications in the context of the bias estimation (Wooldridge, 2002). Various authors argue that panel models possess greater variability, estimation efficiency, lower possibility of multicollinearity occurrence and greater number of degrees of freedom. Panel data analysis extracts maximum information from a limited number of observations over a given period and maximizes the number of degrees of freedom. In this way, the higher efficiency of model parameters is assured with less restrictive assumptions.

The advantage is also reflected in reducing the size of econometric problems present in classical econometric researches. Škrabić Perić (2012) points out that the advantages of panel analysis and the panel data enable the definition and testing of more complicated econometric models and that panel data also reduce the multicollinearity problem. On the other hand, panel data model constraints arise when basic assumptions of panel analysis are disturbed, such as distortions in measurement, time series dependence, short-term observation within time series, availability problem, or lack of panel data at certain times. Some of the econometric problems inherent in time-bound data - heteroskedasticity, and time series -autocorrelation should also be noted.

For the purposes of this research, panel analysis was performed using a static and dynamic panel, as well as using a dynamic panel with a GMM estimator. For each static and dynamic panel, fixed effects - Fe and random effects - Re analyses were also performed, while a dynamic panel with a GMM estimator was performed with one or two steps (the Arellano-Bond dynamic panel-data estimation GMM-type; one-step/two-step). Considering that the observed variables of this empirical research are of dynamic nature, the static panel models are not appropriate for estimating the same variables due to the absence of autocorrelation, i.e. the dependence of the present value of a variable on its previous value (Škrabić Perić, 2012). Therefore, dynamic panel models have been selected

for further analysis and the basic model for the selected variables can be written as follows:

$$y_{it} = \mu + \gamma \cdot y_{i,t-1} + \beta_1 \cdot x_{it}^1 + \beta_2 \cdot x_{it}^2 + \dots + \beta_k \cdot x_{it}^k + \alpha_i + \varepsilon_{it}, \quad (1)$$

$$i = 1, \dots, N, \quad t = 1, \dots, T$$

Where,  $i$  is the unit;  $t$  is time;  $\mu$  is a constant member;  $\gamma$  parameter of dependent variable with the lag;  $\beta_1, \beta_2, \dots, \beta_k$  are parameters of exogenous variables;  $x_{i,t}$  are independent variables;  $\alpha_i$  is a specific error for  $i$ -th bank; and  $\varepsilon_i$  represents the error of relation of the  $i$ -th bank.

The number of observation units (bank groups) exceeds the number of observation periods that meet the requirement for the Arellano-Bond estimator. Due to the presence of the standard error bias for the GMM estimator in two steps, additional panel model analysis made the choice of a dynamic panel with a GMM estimator in one step. The analysis also found that the number of instruments does not exceed the number of cross sections, so the properties of the GMM estimator system are not compromised. To keep the number of instruments under control, a one-step dependent variable is used as an instrument.

Finally, Arellano-Bond's one-step estimator with the use of robust standard error will be used for testing the research hypothesis. Due to the use of a number of variables in the proposed model, the same variables could not be included in the model at the same time. In the function of verifying the hypothesis, the basic model had to be expanded by introducing the dummy variable of the announcement and enforcement of regulatory measures. By using the robust standard error in a model for which the Sargan test cannot be used, the validity of the models is estimated on the basis of the autocorrelation test of the first differences of the second-order residuals.

#### 4. Results of research and discussion

To test our research hypothesis the basic model can be written using equation 2 (MODEL1) and equation 3 (MODEL2) by using different control variables:

$$\Delta ROE_{it} = \mu + \gamma \cdot \Delta ROE_{i,t-1} + \beta^1 \cdot \frac{\Delta \text{LogRWA}}{TA_i}_t + \beta^2 \cdot \Delta FR_{it} + \beta^3 \cdot \frac{\Delta \text{LogNII}}{OpINC_i}_t + \beta^4 \cdot GDP_{it} + \alpha_i + \varepsilon_{it}, \quad (2)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

$$\Delta ROE_{it} = \mu + \gamma \cdot \Delta ROE_{i,t-1} + \beta^1 \cdot \frac{\Delta \text{LogRWA}}{TA_i} \cdot t^1 + \beta^2 \cdot \Delta FR_{it} \cdot t^2 + \beta^3 \cdot \frac{\Delta \text{LogNII}}{OpINC_i} \cdot t^3 + \beta^4 \cdot \Delta UNPLEU_{it} \cdot t^4 + \alpha_i + \varepsilon_{it} \quad (3)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

Table A8 presents the results of the regulatory capital requirements on the possibility of banking firm self-financing growth. All models satisfy the second-order autocorrelation test of the first residual differences AR (2) and specifically the test at the significance level of 5% does not reject the null hypothesis regarding no correlation of second order first residual differences, indicating that there is no autocorrelation between the residuals in the model. It can be concluded that the models are well-specified. The coefficients with the dependent variable from the previous period are statistically significant and contribute to the reduction of the dependent variable of the current period, which is in line with expectations and basic assumptions.

The results of the basic MODEL1 and MODEL2 show the lack of significant influence of the ratio of credit assets in the total bank assets (RWA/TA) on the profitability of ownership equity. Furthermore, the research clearly shows the change in the business model of observed groups of banks through the significance and direction of the independent variable share of non-interest income in total operating income (NII/OpINC). Moreover, independent variable fees share and various commissions in total banking firm revenue (FR) also significantly contribute to reduction of total profitability.

Namely, the results of the above-mentioned bank indicators clearly point to the conclusion that banking firms have redirected their business model to operation that do not involve credit activity. There is no credit risk contained in the interest rate margin as the mainstay of the overall profitability of banking business, but quite the contrary, the contribution of profitability lays in other categories of the banking revenues. It can therefore be clearly stated that the so-called non-credit activities (e.g., transactional banking, brokerage services, and other forms of financial services) indirectly affect the movement of assets as well as the entire banks profitability. An increase of the same banking activity leads to a fall in the required return on equity, reducing the real value of the banking firm and finally determining the external financing capacity. Without significant increase of the credit assets as the part of the total bank assets - particularly due to a lack of financing of the small- and medium-sized companies (SMEs) and more risky projects - there is no serious activity of the banking industry in the function of boosting the credit cycle and domestic product growth as well as profitability of the industry as a whole.

The control variable of the macroeconomic environment of GDP growth does not show any statistical significance, as there is, among other things, no increase in the banking sector's credit activity. However, the introduction of the unemployment rate UNPLEU as the control variable in the basic MODEL2 shows statistical significance when compared to GDP, but with low economic significance in the context of the research problem.

In the next steps, the basic model was expanded by introducing the variable of regulatory announcement (DLA), as well as by introducing a variable of regulatory measure enforcement (DLE). In accordance with the pre-defined models, testing will also be done according to defined changes in control variables of banks' macro-business operations.

An extended model can be written using the equation 4 (MODEL3):

$$\Delta ROE_{it} = \mu + \gamma \cdot \Delta ROE_{i,t-1} + \beta^1 \cdot \frac{\Delta \text{LogRWA}}{TA_i} \cdot t^1 + \beta^2 \cdot \Delta FR_{it}^2 + \beta^3 \cdot \frac{\Delta \text{LogNII}}{OpINC_i} \cdot t^3 + \beta^4 \cdot DLA_{it}^4 + \beta^5 \cdot GDP_{it}^5 + \alpha_i + \varepsilon_{it} \quad (4)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

i.e. by using the unemployment rate control variable in the equation 5 (MODEL4):

$$\Delta ROE_{it} = \mu + \gamma \cdot \Delta ROE_{i,t-1} + \beta^1 \cdot \frac{\Delta \text{LogRWA}}{TA_i} \cdot t^1 + \beta^2 \cdot \Delta FR_{it}^2 + \beta^3 \cdot \frac{\Delta \text{LogNII}}{OpINC_i} \cdot t^3 + \beta^4 \cdot DLA_{it}^4 + \beta^5 \cdot \Delta UNPLEU_{it}^5 + \alpha_i + \varepsilon_{it} \quad (5)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

Coefficients of banks' business indicators presented as growth rates of non-credit activities have the same negative sign and are statistically significant as in the previous models, while the ratio of the growth of credit assets in total assets also remained statistically without significance. Moreover, by introducing the variable of regulatory announcement (DLA) into MODEL3 and MODEL4, the results clearly show the positive impact of the same.

Namely, it is obvious that the banking sector's reaction occurs already by the announcement of changes in regulatory environment, i.e. there is a statistically significant positive impact on the profitability of the ownership equity. The reaction of a banking company in a unit of time is reflected primarily through the internal strengthening of the capital structure, with the recapitalization of existing shareholders of the banking companies through retained earnings, the hybrid and subordinated conversion of debt into equity, which in the same market conditions and without a change in the business model ultimately has a positive impact on the return on equity.\*

Although the announcement of regulatory measures contributes to the increase in return on equity, it can be concluded from the results of Table A5 that there is a statistically significant negative difference between the average return on equity before and after the

\* Banks with a high ratio of non-performing loans and with low regulatory capital ratio increased equity mostly by capitalization of present owners or the debt-to-equity swap (e.g. Banca Monte dei Paschi di Siena increased its capital by EUR 3.8 billion, while UniCredit increased its capital by EUR 13 billion in Italy's biggest public offering).

announcement.

The problems of losing the real (market) value of a banking firm are causing further stagnation or reduction of traditional credit (risk-weighted) activities primarily as a function of reaching regulatory capital requirements. Potentially available alternative sources of bank assets growth financing through various forms of debt (hybrid) titles more or less regulatory acceptable, could ultimately lead to an increase in the cost of capital, transfer of the same to customer structure through increase of the interest margin and weakening of the credit cycle, enhancing the procyclicality of the entire banking system.

The extended models by introducing the variable of regulatory enforcement (DLE) can be written as follows (MODEL5 and MODEL6), in the equation 6:

$$\Delta ROE_{it} = \mu + \gamma \cdot \Delta ROE_{i,t-1} + \beta^1 \cdot \frac{\Delta \text{LogRWA}}{TA_i} t^1 + \beta^2 \cdot \Delta FR_{it}^2 + \beta^3 \cdot \frac{\Delta \text{LogNII}}{OpINC_i} t^3 + \beta^4 \cdot DLE_{it}^4 + \beta^5 \cdot GDP_{it}^5 + \alpha_i + \varepsilon_{it} \quad (6)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

and by using the unemployment rate control variable in the equation 7:

$$\Delta ROE_{it} = \mu + \gamma \cdot \Delta ROE_{i,t-1} + \beta^1 \cdot \frac{\Delta \text{LogRWA}}{TA_i} t^1 + \beta^2 \cdot \Delta FR_{it}^2 + \beta^3 \cdot \frac{\Delta \text{LogNII}}{OpINC_i} t^3 + \beta^4 \cdot DLE_{it}^4 + \beta^5 \cdot UNPLEU_{it}^5 + \alpha_i + \varepsilon_{it} \quad (7)$$

$$i = 1, \dots, N, t = 1, \dots, T$$

The introduction of regulatory enforcement variable (DLE) into models did not prove to be statistically significant, although coefficients have gained positive sign as in previous models. Therefore, the previously described "urgent" reaction of the banking system as a function of internal strengthening of regulatory capital, further lack of credit activity and a negative contribution of the service activities to the profitability of equity, negatively affect the overall capacity of self-financing of the banking sector even after the announcement of a new regulatory environment.

The coefficient and lack of significance along with gross domestic product growth macro variable for all models confirms the inadequate impact of banking sector credit activity on its profitability, whereas the introduction of the unemployment growth rate macro-variable in the model caused it to become significant. Namely, for all observed models from Table A8, the unemployment growth rate shows statistical significance and a positive sign. From this it can be concluded that there is a statistically significant correlation between the rate of return on capital and the growth of the unemployment rate, although its economic significance in the context of the relevant empirical research is small or even

negligible. Its basis might have in internal recapitalization of banking groups and regulatory initiated mergers and acquisitions within the banking industry in times of recession and crisis due to erosion of ownership equity from regular operations accumulated losses.

All of the above stated and described through the results of the model is in line with the underlying assumptions of this research, so we can confirm the main hypotheses of this paper: lack of credit activity decreases the profitability of shareholders equity and reduces the real value of a banking company while the new regulatory capital requirements have a negative impact on the possibility of bank firms' self-financing growth as a whole, especially in bank-centric economies.

## 5. Concluding remarks

A lack of understanding of the bank's societal character, trends in performance of the competitive environment, inability and clientelism of management boards have caused a series of micro and macro banking crises with serious consequences on the functionality, stability and security of banking business (Ercegovac, 2016). The pre-crisis period was marked by the growth of indebtedness of financial institutions, i.e. by increasing the use of non-equity funds to the level that caused the individual entities as well as the whole system to become very fragile. The expansion of the financial leverage used to finance the growth of bank assets by using complex financial instruments outside the traditional credit-deposit intermediation mechanisms has peaked in the early 2000s, with particular emphasis on off-balance sheet items. Although the use of the financial leverage may be somewhat justified by the specific function of banks in securing liquidity for businesses and credit management through the diversification process, the excessive use of other resources to meet the profit motives of bank shareholders the banking firm becomes prone to shocks and the risk of insolvency. As a consequence of the crisis and falling credit activity due to the growth of non-performing loans (NPLs), the profitability of capital is decreasing as financial markets pressurized the drop in the share prices of the banking sector. The overall process consequently leads to additional losses, a fall in capital values and a reduction in the availability of credits, as well as to determining the bank's capacity to find external regulatory acceptable equity sources of funding.

Regulatory practices until the onset of the global financial crisis has not proved to be effective in securing an adequate size of its own resources to cover unexpected losses arising from materialization of structural risks. Continuing the reform of the supervision framework of financial institutions, regulators should first and foremost expand and strengthen supervisory resources over banking institutions involved in non-traditional activities. The Basel III Standards therefore cannot be the only answer because the recent financial crisis started outside the traditional banking intermediation. In particular, Basel III Standard does not intervene in bank business models but only imposes certain limits on capital and liquidity that are entirely dependent on the bank's business risk. An improved approach to regulating the level of core capital is certainly a strong step forward in the desired direction of systemic risk mitigation, raising the level of transparency of the operations of each financial institution. Thus, regulating the entire financial system by reducing systemic risk to a minimum become the next big challenge for regulators.

The announcement and implementation of new capital requirements coincides with and is enforced by the culmination of the financial crisis, with a significant impact on the

profitability and real value of the banking firm. Our model demonstrates negative relations between the fee income and the profitability of the shareholders' value, which indicates the transition of banking companies towards new products and services and a move out of traditional lending and trading activities. Prudential authorities were ready to take over the risk of regulatory measures to squeeze excessive asset growth and reduce the opportunities of banking companies in speculative activities on financial markets and bring the banking system back to the traditional client-oriented business model. Finally, the primary objective of regulatory authorities is the stability of the banking sector.

Required regulatory capital buffers are necessary in the long-term stability of the European banking sector. Enhanced monitoring and resolution of structural problems of non-performing credit assets under new regulatory conditions should contribute to restoring the confidence of the investment public toward the self-financing capacity of the banking industry as a whole.

Internalization of losses in the currently changed conflict relation "*banking shareholders-taxpayers*" can further contribute to the reaffirmation of traditional credit-deposit financial intermediation with lower rates of bank assets growth and moderate cyclical nature of economic activity in banking-centric economies.

The biggest and most important limitation of the survey is the unavailability of the listing prices of shares of the banking firms. For the same reason, it was not possible to include the real market value of the banking sector in the model calculation. It would be worthwhile to further model the movement of banks' market underlying value in terms of changing regulatory conditions as a logical continuation of this research.

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## Appendix A

TABLE A1. SELECTED SAMPLE OF BANKS, in EUR million, on December 31, 2016

BANK NAME	COUNTRY	ASSETS	CAPITAL	ROE (%)	CAPITAL ADEQUACY (%)
Allied Irish Banks, PLC	Ireland	95.622	13.148	13,30	17,60
Banca Monte dei Paschi di Siena, SpA	Italy	153.179	6.425	-40,30	10,40
Banco BPM, SpA	Italy	117.411	7.575	-28,60	16,17
Banco Popular Español, SA	Spain	147.686	10.835	-41,90	12,64
Banco de Sabadell, SA	Spain	212.508	13.033	7,90	13,80
Banco Santander, SA	Spain	1.339.125	90.938	12,0	14,68
Bank of Ireland Group, PLC	Ireland	123.129	9.401	11,10	16,40
Bank VTB, PAO	Russia	195.415	21.746	4,60	14,60
Barclays, PLC	UK	1.423.475	76.122	5,20	19,60
Banco Bilbao Vizcaya Argentaria, SA	Spain	731.856	47.364	13,50	15,10
BNP Paribas, SA	France	2.076.959	100.665	11,40	14,20
CaixaBank, SA	Spain	347.927	23.526	6,30	16,20
Commerzbank, AG	Germany	480.450	28.560	2,20	15,30
Crédit Agricole, SA	France	1.524.232	58.276	6,00	18,60
Danske Bank, A/S	Denmark	469.104	20.505	16,80	21,80
Deutsche Bank, AG	Germany	1.590.546	64.503	-1,20	16,60
Dexia, SA	Belgium	212.771	4.147	7,10	16,80
DNB ASA	Norway	292.200	22.734	11,80	19,50
Erste Group Bank, AG	Austria	208.227	12.460	16,60	18,20
HSBC Holdings, PLC	UK	2.259.087	166.827	3,90	20,10
ING Group, NV	Netherlands	845.081	49.793	12,10	19,68
Intesa Sanpaolo, SpA	Italy	725.100	48.911	6,70	17,00
KBC Group, NV	Belgium	275.200	17.357	18,60	20,00
Lloyds Banking Group, PLC	UK	959.593	56.763	8,90	18,40
Nationwide Building Society	UK	258.373	12.976	11,90	36,10
Nordea Bank, AB	Sweden	615.659	32.409	14,60	24,70
Royal Bank of Scotland, PLC	UK	937.138	57.038	-8,00	19,20
Sberbank of Russia, PAO	Russia	393.897	43.757	26,10	15,70
Skandinaviska Enskilda Banken, AB	Sweden	273.698	14.723	10,50	24,80
Société Générale	France	1.382.241	61.953	10,40	17,90
Standard Chartered, PLC	UK	615.133	45.978	0,80	21,30
Svenska Handelsbanken, AB	Sweden	274.422	14.243	15,60	31,40
Swedbank, AB	Sweden	224.983	13.526	18,80	31,80
UBS Group, AG	Switzerland	873.833	50.111	7,50	23,18
UniCredit, SpA	Italy	859.533	39.336	-25,20	11,66

Source: Reuters (2018).

TABLE A2. DESCRIPTION OF VARIABLES AND THE EXPECTED IMPACT OF THE INDEPENDENT VARIABLES

LABEL	DEFINITION OF THE VARIABLE	EXPECTED IMPACT
ROE	Profitability of the shareholders equity capital (in%)	Dependent variable
RWA/TA	Indicator of the risk of banking assets, i.e. the choice of banking management versus overall credit policy	+
FR	Indicator of banks' activities that does not include lending and other forms of core business (in %)	-
NII/OpINC	Indicator of the profitability of the selected business model of a particular banking company	-
DLA	Period of regulatory announcement	+
DLE	Period of regulatory enforcement	+
UNPLEU	Unemployment rate in the EU-28 (in %)	+/-
GDP	Gross domestic product in the EU-28 (in %)	+/-

Source: Author's calculation (2018).

TABLE A3. DESCRIPTIVE STATISTICS OF SAMPLE VARIABLES

VARIABLE	OBS.	MEAN	STD. DEV.	MIN	MAX
<i>BANKS BUSINESS INDICATORS</i>					
ROE	586	11.79	26.48	-413.90	76.90
RWA/TA	481	0.46	0.23	0.06	2.95
FR	583	31.84	28.07	-112.10	573.80
NII/OpINC	554	0.79	1.04	-0.33	13.01
<i>MACROECONOMIC ENVIRONMENT</i>					
UNPLEU	595	9.08	0.98	7.00	10.90
GDP	595	1.48	1.82	-4.40	3.90

Source: Author's calculation (2018).

TABLE A4. AVERAGE VALUE OF THE SAMPLE DEPENDENT VARIABLE AT THE LEVEL OF THE OBSERVED GROUPS OF BANKS TOTAL PORTFOLIO (%)

YEAR	2000	2001	2002	2003	2004	2005	2006	2007	2008
Avrg_ROE	27.91	21.74	18.08	18.94	22.35	24.78	25.63	21.13	3.40
Year	2009	2010	2011	2012	2013	2014	2015	2016	
Avrg_ROE	6.09	6.70	-1.74	-9.94	2.46	2.24	8.41	4.77	

Source: Author's calculation (2018).

TABLE A5. RESULTS OF THE TWO-WAY T-TEST OF DIFFERENCES IN ARITHMETIC MEANS OF THE OBSERVED SAMPLE VARIABLE FOR THE ANNOUNCEMENT PERIOD AND THE ENFORCEMENT OF REGULATORY MEASURES

VARIABLE		PERIOD	OBS.	MEAN	STD.DEV	P-VALUE
DLA	ROE	0	341	18.93812	13.4661	0.0000***
		1	245	1.843265	35.46951	
	RWA/TA	0	272	0.492143	0.1943344	0.0001***
		1	209	0.4092965	0.2533475	
	FR	0	340	32.90735	33.15854	0.2767
		1	243	30.34074	18.72135	
DLE	NII/OpINC	0	329	0.4955623	0.5294271	0.0000***
		1	225	1.2172	1.40456	
	ROE	0	446	14.08879	28.49445	0.0002***
		1	140	4.470714	16.77679	
	RWA/TA	0	358	0.4817545	0.2363993	0.0000***
		1	123	0.3816076	0.1700346	
	FR	0	443	31.43273	31.3516	0.5360
		1	140	33.11857	13.06444	
	NII/OpINC	0	424	0.6066509	0.751478	0.0000***
		1	130	1.382231	1.536885	

Source: Author's Calculation (2018).

Notes: \* - denotes significance at 10%; \*\* - denotes significance at 5%; \*\*\* - denotes significance at 1%.

TABLE A6. CORRELATION MATRIX: IMPACT ON RETURN ON EQUITY

	ROE	RWA/TA	FR	NII/OpINC
ROE	1			
RWA/TA	0.1375***	1		
FR	-0.2842***	-0.0203	1	
NII/OpINC	-0.1380***	-0.1044**	-0.0801*	1

Source: Author's Calculation (2018)

Notes: \* - denotes significance at 10%; \*\* - denotes significance at 5%; \*\*\* - denotes significance at 1%.

TABLE A7. CORRELATION MATRIX: MACROECONOMIC ENVIRONMENT AND DUMMY VARIABLES OF REGULATORY MEASURES

	DLA	DLE	UNPLEU	GDP
DLA	1			
DLE	0.6630***	1		
UNPLEU	-0.0652	-0.3623***	1	
GDP	-0.0643	0.0130	-0.7566***	1

Source: Author's Calculation (2018)

Notes: \* - denotes significance at 10%; \*\* - denotes significance at 5%; \*\*\* - denotes significance at 1%.

TABLE A8. THE RESULTS OF THE PANEL ANALYSIS IMPACT OF THE INCREASE OF REGULATORY CAPITAL REQUIREMENTS ON THE SELF-FINANCING CAPACITY OF A BANKING COMPANY

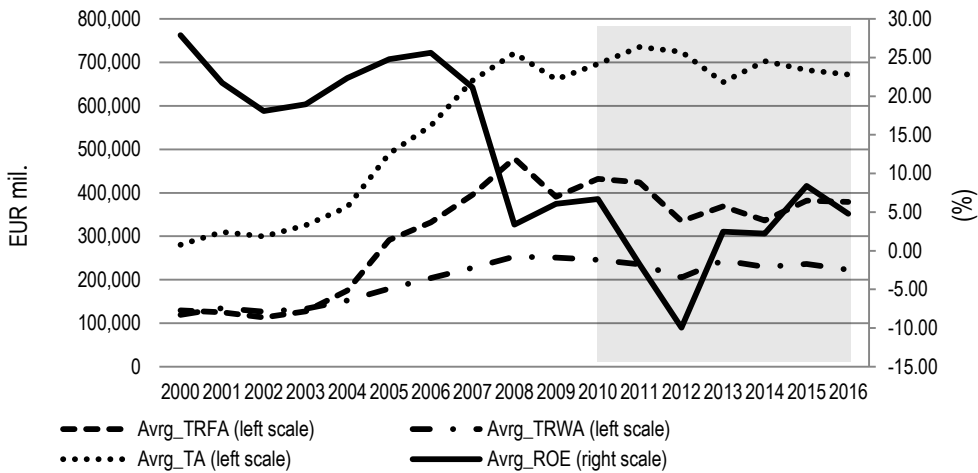
VARIABLE	MODEL1	MODEL2	MODEL3	MODEL4	MODEL5	MODEL6
BANKS BUSINESS INDICATORS						
$\Delta ROE_{i,t-1}$	-0.1006132** (0.1332071)	-0.0881978** (0.036907)	-0.1053612** (0.0431027)	-0.0965713*** (0.1327897)	-0.1006305** (0.0422968)	-0.0864697** (0.0358037)
$\Delta \text{LogRWA}/\text{TA}_{it}$	9.568538 (8.702656)	8.340065 (8.473471)	9.701708 (8.511357)	8.525928 (8.280155)	9.692966 (9.375714)	7.48361 (8.98983)
$\Delta FR_{it}$	-0.1509894*** (0.00864)	-0.1464224*** (0.0077968)	-0.1493534*** (0.0078707)	-0.1451036*** (0.0074385)	-0.1508783*** (0.0086131)	-0.1458233*** (0.0078902)
$\Delta \text{LogNII}/\text{OpINC}_{it}$	-26.5824** (13.67878)	-32.30685** (14.21961)	-27.62282** (13.51145)	-31.95187** (14.11826)	-26.58939** (13.4675)	-33.16788*** (13.54488)
ANNOUNCEMENT OF REGULATORY MEASURES						
$DLA_{it}$			3.848069*** (1.396508)	3.582382*** (1.464935)		
ENFORCEMENT OF REGULATORY MEASURES						
$DLE_{it}$					0.4658262 (3.553403)	2.734708 (3.748763)
MACROECONOMIC ENVIRONMENT						
$\Delta \text{UNPLEU}_{it}$		2.231946* (1.322749)		2.370103* (1.373416)		2.582309* (1.384796)
$GDP_{it}$	-0.0941236 (0.5349158)		-0.317147 (0.5655126)		-0.101583 (0.5382086)	
$\mu$	-0.5565433 (1.065986)	-0.6176661 (0.5381511)	-1.810668 (1.23676)	-2.062119** (1.031626)	-0.6582302 (1.51744)	-1.28551 (1.303383)
Number of observations	322	322	322	322	322	322
Number of groups	35	35	35	35	35	35
AR(1) test	0.0507	0.0487	0.0527	0.0524	0.0507	0.0471
AR(2) test	0.6406	0.6365	0.6123	0.5781	0.6373	0.6187

Source: Author's Calculation (2018).

Notes: \*- denotes significance at 10%; \*\*- denotes significance at 5%; \*\*\*- denotes significance at 1%.

Appendix B

FIGURE B1. THE DYNAMICS OF THE AVERAGE VALUE OF BANK ASSETS  
AND RETURN ON EQUITY OF BANKS



Sources: Reuters and authors' calculation.

Note: Avg\_TA - total average assets; Avg\_TRFA - total average risk-free assets; Avg\_TRWA - total average risk/ credit assets; Avg\_ROE - total average return on equity; DLA/DLE - time period of announcement / enforcement of regulatory requirements.