Secondary capital adequacy management model with overview of Basel III – Case on the banking sector in the Republic of Macedonia

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ABSTRACT

Capital adequacy represents a challenge for stability of the financial sector, particularly in the periods of crisis and recession. Events in recent years and the collapse of a number of banking institutions caused a global change in the risks perception. Hence, banks become more risk averse in their credit activities. The financial institutions in the Republic of Macedonia are not exception of the ongoing trend of increased risk.

The challenges for banks in achieving Basel III standards in different countries could vary dramatically. Key reasons for differences could be the level of development of financial markets and institutions, the differences in the share of on-balance and off-balance sheet activities, product differentiation and a number of other variables. This paper argues finding the key variables affecting the capital adequacy of banks in the Republic of Macedonia. Identification and quantification of the adequate variables enables recognition of weak and strong sides of the banks in the country, and thus the key challenges in the following years.

The results of the econometric model indicated that the spread between interest rates on credits and deposits nominated in foreign currency (F.C), non-performing loans in the total (gross) amount of loans and the share of net-interest income in gross income, present the key independent variables, statistically important for the capital adequacy ratio of the banking sector in the Republic of Macedonia.

Nevertheless, other independent variables such as rate of staff costs (which are the basis of non-interest expenses)/non-interest expenses, the spread between interest rates on credits and deposits in domestic currency (MKD), the share of loans to companies and households in total loans, the rates of share of the equity securities in banks own assets, the share of the non-interest costs in gross income, as well as, the rates of highly liquid assets in the total amount of assets, demonstrated no significant impact on the dependent variable. The applied model is an alternative model and an extra tool in the capital adequacy management for the banks. It could be used combined with existing models for capital adequacy management of the banking sector in the country on the level on each individual bank.

Key words: capital adequacy, Basel standards, independent variables, statistical significance, Macedonian banks. JEL classification: G21

1. KEY LIMITS AND IMPLICATIONS OF THE BASEL III STANDARDS ACCOMPLISHMENT

Enlarged risks in the banking sector initiated higher regulatory requirements for capital adequacy rate. Prior to analysis of the current situation in the banking sector in the Republic of Macedonia, identifying the key differences between the new Basel III standards and previous capital

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The attitudes expressed in this research paper present the personal perception of the writers on the subject and in no case can be related to the official positions of the institutions where the authors work.
regulatory requirements is of essential meaning. The results of the comparison are specified in the Diagram 1.

Diagram 1 Basel II vs. Basel III Capital Ratios


Diagram 1, clarifies that the new standards cause a number of challenges in terms of capital adequacy requirements compared to the previous Basel II standards. Namely, despite the increase in the rate of core capital (Tier 1), it is necessary to mention:

1. **Capital Conservation Buffer** – This buffer is intended to support the banks during periods of stress. If the buffer falls below 2.5%, constraints on a bank's ability to distribute earnings will be progressively applied on a sliding scale.²

2. **Counter-cyclical Buffer** - A separate counter-cyclical buffer has also been introduced to ensure that the banking sector's capital requirements take account of the macro-economic environment. This buffer will range between 0 to 2.5% of a bank's risk-weighted assets and will be determined by the relevant regulator in each jurisdiction. The regulator will determine the level of the buffer according to its perception of the systemic risk that has built up in the banking system as a result of excess credit growth.³

New capital requirements would be implemented from the beginning of 2013 until 2019. The dynamics and required rates of separate types of capital are visible through Table 1.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Tier 1 Capital</td>
<td>2.0%</td>
<td>3.5%</td>
<td>4.0%</td>
<td>4.5%</td>
<td>4.5%</td>
<td>4.5%</td>
<td>4.5%</td>
<td>4.5%</td>
</tr>
<tr>
<td>Non-core Tier 1 Capital</td>
<td>2.0%</td>
<td>1.0%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.5%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Tier 2 Capital</td>
<td>4.0%</td>
<td>3.5%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Capital Conservation Buffer</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>0.6%</td>
<td>1.3%</td>
<td>1.9%</td>
<td>2.5%</td>
</tr>
<tr>
<td>Countercyclical Buffer</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>/</td>
<td>2.5%</td>
</tr>
</tbody>
</table>

The data presented in Table 1, indicate that the core capital adequacy ratio (Tier 1) would be increased from 4% to 6%, i.e. from January, 1st, 2013 4,5% (Core Tier 1 Capital + Non-core Tier 1 Capital), from January, 1st, 2014 the rate will be 5,5%, while 6 % as of January, 1st, 2015. The rate of Conservation Buffer is 2.5% whereas the Counter-cyclical Buffer varies from 0% to 2.5% (depending on the national financial system condition). Those facts definitely lead to further increase in the rate of capital adequacy need. Higher capitalization should lead to improved stability of the banking sector, yet, it could cause unnecessary costs and restrictions for healthy banking institutions especially if they run in markets where the banking sector is in crisis.

In this section we should mention the recent reactions of the banks in the USA, which initiated requests for relaxation of the new capital adequacy standards. These banks according to Basel III capital requirements should decrease extra CCA $800bn of its assets to meet the identified lack of 1.5tn at the end of 2010.\(^4\)

In addition to capital adequacy, Basel III determines new liquidity standards for banks. The liquidity coverage ratio is presented in Table 2.

| Table 2  The Basel III Liquidity Coverage Ratio |
|-----------------|-------|-------|-------|-------|-------|
| Minimum liquidity coverage ratio (LCR) requirement | 2015 | 2016 | 2017 | 2018 | 2019 |
| 60% | 70% | 80% | 90% | 100% |

Source: http://www.bis.org/publ/bcbs238.htm 27.02.2013.

Once the LCR has been fully implemented, its 100% threshold will be a minimum requirement in normal times. During a period of stress, banks should use their pool of liquid assets, thereby temporarily falling below the minimum requirement. The GHOS agreed that the LCR should be subject to phase-in arrangements which align with those that apply to the Basel III capital adequacy requirements.\(^5\)

Unlike U.S. banks, the banks in the Republic of Macedonia are in different situation regarding the subject of Basel III standards implementation. The analysis of the capital adequacy of the banks in the Republic of Macedonia and their liquidity ratios, are presented in the sequel of this paper.

1. CREDIT EXPOSURE AND CAPITAL ADEQUACY OF THE BANKS IN THE REPUBLIC OF MACEDONIA

In the last decade, most of the banks in the Republic of Macedonia become multimarket banks as affiliates of international banks from Turkey, Greece, Slovenia, France and other countries. Some research indicate that when multimarket banks enter a rural banking market, they skim off the least risky loans, leading to an increase in the riskiness of the single-market bank’s loan portfolios and hence a reduction in their profits (Timothy H. Hannan and Robin A. Prager, 2006). However, foreign capital initiated changes in the behaviour of the domestic Macedonian banks to stay competitive and profitable on similar level as foreign institutions that operate on the domestic market. Therefore, in the following part, we neglect the difference between banks regarding their ownership.

The ownership also remains irrelevant for the Macedonian banks concerning the nature of their core business activities. Macedonian banks could be classified in the group of traditional bank institutions. Namely, the traditional banking products are dominating the bank balance sheet whereas off-balance sheet activities have minor share especially among smaller banks. Therefore the key risks

\(^5\)http://www.bis.org/publ/bcbs238.htm 27.02.2013.
in their operations are largely determined by the lending activities to non-financial entities. Banks with their intermediation function contribute the economic growth especially with their expand credit activities to the private sector (Acha Ikechukwu A, 2011). This conclusion from the Nigerian market is also relevant and important for Macedonian real sector. Namely, higher credit activities could lead to higher risk weighted assets which are necessary to follow with improvement of the capital adequacy ratio management in the Republic of Macedonia. Regarding the research of Dr. K. Sriharsha Reddy (2012) about the relative performance of the commercial banks in India using CAMEL approach, it is found that the worst three performers during the study period are banks with low capital adequacy, low assets and earning quality as well as the poor quality of the management.

The credit exposure of the banking sector in the Republic of Macedonia had a steady upward trend in the past few years. The results of the analyses in this section are presented in Table 3.

**Table 3 Annual absolute and relative changes in the total credit exposure of the Macedonian banks**

<table>
<thead>
<tr>
<th>Period</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount</td>
<td>179,188</td>
<td>237,656</td>
<td>263,512</td>
<td>276,368</td>
<td>316,123</td>
<td>338,062</td>
</tr>
<tr>
<td>Growth (absolute change)</td>
<td>38,492</td>
<td>58,468</td>
<td>25,856</td>
<td>12,856</td>
<td>39,755</td>
<td>21,939</td>
</tr>
<tr>
<td>Growth (relative change)</td>
<td>27.40%</td>
<td>32.60%</td>
<td>11.40%</td>
<td>4.40%</td>
<td>14.40%</td>
<td>6.90%</td>
</tr>
</tbody>
</table>


Table 3 clearly shows that the banks in the Republic of Macedonia have been continuously increasing their lending activities in the past few years. Unlike banks in U.S. and EU, the Macedonian financial sector was much less affected by the latest financial crisis. As main reasons we could identify different credit policy and traditional conservative approach in lending activities, the structure of assets, differences in capital structure, as well as the different level of development of the Macedonian banking sector compared to U.S. and EU. However, some negative effects of the global economic trends should certainly affect the domestic economy. Therefore, in this part of the paper the indicators of the loan portfolio quality will be analyzed.

The increased credit exposure leads to an upward trend in the risk level of the banking system which requires adequate capital support. The trends of the risk rates in the past few years are presented in Graph 1.

**Graph 1 Indicators of the loan portfolio quality of the banking system in the Republic of Macedonia**

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6 According to the “Decision for the method of the capital adequacy management” banks in Republic of Macedonia in the core capital (Tier 1) does not include subordinated debt as well as other types of debt instruments. The core capital (Tier 1) of banks in the country consists of the nominal value of the ordinary and non-cumulative preferred shares (including shares premium), as well as reserves and retained earnings. More details could be obtained in the Official Gazette of the Republic of Macedonia n. 159/2007, 32/2008, 31/2009, 96/2009, 157/2009, 91/2011, 165/2011 and 74/2012 or on the internet site of the Central bank on the following link: http://www.nbrm.mk/ default.asp? ItemID = 1BD446E2E84799943B5C74268FADDF92. Therefore, according to the applicable regulations in the country, the tests of capital adequacy in the further presentation of this paper would be implemented on the core capital (Tier 1) of the banks in the Republic of Macedonia.
Data in Graph 1 indicate that the average risk level of the banks in the Republic of Macedonia had a slight tendency to increase in the last year. According to the other economic characteristics of the country, it could be concluded that there was certain adverse effects of the global financial crisis with some delay effect on domestic non-financial entities, especially on the export-oriented businesses.

Finally, considering the capital adequacy ratio via the data presented in Table 4, one can note that these indicators are the basis of regular stress tests conducted by the National Bank of the Republic of Macedonia. Latest results from individual test scenarios showed satisfactory resistance of the system. Details regarding these results could be obtained in the “Report for the banking system of the Republic of Macedonia for 2011”.

Table 4 Capital adequacy ratio of the banking sector in the Republic of Macedonia

<table>
<thead>
<tr>
<th>Capital adequacy</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital adequacy ratio/coefficient</td>
<td>16,2</td>
<td>16,4</td>
<td>16,1</td>
<td>16,8</td>
</tr>
<tr>
<td>Core capital (Tier 1)/risk – weighted assets</td>
<td>14,0</td>
<td>13,8</td>
<td>13,4</td>
<td>14,1</td>
</tr>
<tr>
<td>Capital and reserves / total assets</td>
<td>11,5</td>
<td>11,4</td>
<td>10,6</td>
<td>11,0</td>
</tr>
</tbody>
</table>

According to the data presented by Table 4, it could be concluded that the banking sector in Macedonia is well capitalized with a capital adequacy ratio of 16.8% at the end of the year 2011, of which the own funds (Tier 1) accounted for more than 14%. Such calculations specify that those banks will adapt to the new Basel III standards without major difficulties. However, this data varies for different groups of banks according to their size of assets. The data for each group of banks are given in Table 5.

Table 5 Capital adequacy ratio of the banking sector by groups of banks

<table>
<thead>
<tr>
<th>Period</th>
<th>Large banks</th>
<th>Medium-sized banks</th>
<th>Small banks</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>13,8%</td>
<td>18,5%</td>
<td>64,1%</td>
<td>16,4%</td>
</tr>
<tr>
<td>2010</td>
<td>14,1%</td>
<td>17,0%</td>
<td>54,7%</td>
<td>16,1%</td>
</tr>
<tr>
<td>2011</td>
<td>15,0%</td>
<td>17,2%</td>
<td>38,6%</td>
<td>16,8%</td>
</tr>
</tbody>
</table>


From the analysis of the data in Table 5, it could be seen that the group of large banks increase capital adequacy, while the group of medium and small-sized banks showed a declining trend. Downward trend is particularly characteristic for the group of small banks where from 64.1% in 2009, the share of capital has decreased to 38.6% in 2011. Per groups of banks, the group of large Macedonian banks shows the highest efficiency, while the group of medium-size and the group of small-size banks have unacceptably high value of the cost/income ratio which indicates a necessity of working improvements (Micajkova, 2011). Therefore, we believe that it is necessary to make a more detailed identification of the key variables that affect the capital adequacy ratio, particularly the core capital (Tier 1) to risk-weighted assets.

2. IDENTIFICATION OF THE KEY VARIABLES AFFECTING THE CAPITAL ADEQUACY RATIO OF MACEDONIAN BANKS

Capital adequacy ratio could be affected by many variables. Some authors identify that the capital ratio is significantly related to ROE, but not to ROA (Muhammad Bilal, Asif Saeed, Ammar Ali Gull and Toquer Akram, 2013). Other papers find a strong, statistically significant relationship between CAMELS ratings changes and the rates of growth in bank lending in general, and lending to small businesses in particular, even after controlling for commonly-used balance-sheet measures of bank financial condition (Elizabeth K. Kiser, Robin A. Prager and Jason R. Scott, 2012).

In order to analyze the capital ratios of Macedonian banks we create a model where rate of share of core capital (Tier 1) in total risk-weighted assets is dependent variable. We believe that an adequate assessment of the statistically significant variables will enable proactive management of this part of the business to meet the standards determined via Basel III, but in optimal environment. As independent variables influencing on the bank's capital adequacy we could identify the following:

a. Personnel costs/non-interest expenses – this variable presents the rate of share of employee costs in the total amount of non-interest expenses in the banking sector;

b. Spread between the interest rates on loans and deposits in foreign currency (F.C.) – this variable presents the difference between interest rates on loans and deposits in foreign currency;

c. Spread between the interest rates on loans and deposits in domestic currency (MKD) – this variable presents the difference between interest rates on loans and deposits in domestic currency;

d. Business loans/gross loans to non-financial entities – the participation rate of loans to companies in amount of gross loans placed in non-financial sector;

e. Loans to population/gross loans to non-financial entities – the participation rate of loans to households in the amount of gross loans placed in non-financial sector;

f. Non-performing loans/gross loans – the rate of share of non-performing loans in the amount of gross loans;

g. Investments in equity securities/own assets - the rate of share of the investments in equity securities of the banks in terms of their own funds;

h. Net interest income/gross income – participation rate of net interest income in the total amount of income of the banks. Net interest income represents interest income decreased for interest expenses. The gross revenues consist of: net interest income, fee and commission income (net) and all other regular income without extraordinary income;

i. Non-interest expenses/gross revenue – the participation rate of non-interest expenses to total amount of revenues;

ej. Highly liquid assets / total assets – Highly liquid assets include cash and balances with central banks, treasury bills and correspondent accounts with foreign banks. The total assets were decreased for the assets in domestic banks.

The individual impact of the identified variables will be determined through the application of regression analysis. Identified independent external and internal variables which are expected to affect capital adequacy are the following:

1. Personnel costs / non-interest expenses – it is uncertain how the trend of this variable would affect the capital adequacy ratio.
2. Spread between the interest rates on loans and deposits in foreign currency (F.C.) – it is expected that an increase in the spread between lending and deposit interest rates will lead to an increase in the capital adequacy ratio, due to increased profitability potential, while their reduction it’s expected to decrease the rate of adequacy of the dependent variable.

3. Spread between the interest rates on loans and deposits in domestic currency (MKD) – it is expected that an increase in the spread between lending and deposit interest rates will lead to an increase in the capital adequacy ratio, due to increased profitability potential, while their reduction is expected to decrease the rate of adequacy.

4. Business loans/gross loans to non-financial entities - it is uncertain how the trend of this variable would affect on capital adequacy.

5. Loans to population/ gross loans to non-financial entities - it is uncertain how the trend of this variable would affect on capital adequacy.

6. Non-performing loans/gross loans – it is expected that an increase in the share rate of non-performing loans in gross loans amount will lead to decrease of the capital adequacy ratio, while its reduction should lead to an increase in the ratio of the dependent variable.

7. Investments in equity securities/own assets - it is uncertain how the trend of this variable would effect on capital adequacy ratio.

8. Net-interest income/gross income – it is uncertain how the trend of this variable would effect on capital adequacy ratio.

9. Non-interest costs/gross income – it is uncertain how the trend of this variable would effect on capital adequacy ratio.

10. Highly liquid assets/total assets – it is expected that an increase in the participation rates of highly liquid assets in the total assets should lead to an increase in the rate of capital adequacy, while their decrease should lead to a decline of adequacy ratio of the dependent variable.

Above mentioned independent variables were considered to affect the capital adequacy of Macedonian banks. To recognize the influence of the individual factors is presented and tested an econometric model.

Subject of the observations were data for the banking sector in Republic of Macedonia for the period Q42001 – Q32012. We obtained the data for the analysis from the web site of the National bank of Republic of Macedonia (www nbrm.mk). For adequate hypothesis test performing, it is necessary to set up suitable econometric model. The model would be tested by applying the least square method and it could be presented via following formula:

\[ y = b_0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + b_7x_7 + b_8x_8 + b_9x_9 + b_{10}x_{10} + u \]

\[ b_0, b_{10} = \text{denote the coefficients of the variables used in the testing of regression model} \]

\[ x_1 = \text{PERSONNEL COSTS/NON-INTEREST COSTS} \]
\[ x_2 = \text{SPREAD BETWEEN THE INTEREST RATES ON LOANS AND DEPOSITS (F.C.)} \]
\[ x_3 = \text{SPREAD BETWEEN INTEREST RATES ON LOANS AND DEPOSITS (MKD)} \]
\[ x_4 = \text{BUSINESS LOANS/GROSS LOANS TO N.F.E.} \]
\[ x_5 = \text{POPULATION LOANS/GROSS LOANS TO N.F.E.} \]
\[ x_6 = \text{NON-PERFORMING LOANS/GROSS LOANS} \]
\[ x_7 = \text{EQUITY SECURITIES/OWN ASSETS} \]
\[ x_8 = \text{NET INTEREST INCOME/GROSS INCOME} \]

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\[ x_9 = \text{NON-INTEREST EXPENDITURE/GROSS INCOME} \] 
- participation rate of non-interest expenditure in the total income of the banks.

\[ x_{10} = \text{HIGHLY LIQUID ASSETS/TOTAL ASSETS} \] - the rate of share of highly liquid assets in the total assets of the banking sector.

\[ u = \text{STOCHASTIC ERROR} \] - random error.

The results obtained from the tests of the model are presented in the following section of this research paper.

### 3. RESULTS FROM THE TESTS OF THE MODEL

This section of the paper presents the results obtained through the tests of econometric model. The multiple regression result concerning the impact of independent variables on capital adequacy of the Macedonian banks is presented in Table 6.

#### Table 6

Results of regression analysis of the independent variables impact on capital adequacy (Tier 1) for the period Q42001 – Q32012

<table>
<thead>
<tr>
<th>Dependent Variable: CAPITAL ADEQUACY RATIO (TIER 1/RISK WEIGHTED ASSETS)</th>
<th>Method: Least Squares</th>
<th>Date: 02/27/13</th>
<th>Time: 23:38</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample: 2001Q4 2012Q3</td>
<td>Included observations: 31</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERSONNEL COSTS /NON-INTEREST EXPENCES</td>
<td>-0.046268</td>
<td>0.166248</td>
<td>-0.278307</td>
<td>0.7836</td>
</tr>
<tr>
<td>SPREAD BETWEEN INTEREST RATES (F.C.)</td>
<td>-0.794649</td>
<td>0.289197</td>
<td>-2.747776</td>
<td>0.0124</td>
</tr>
<tr>
<td>SPREAD BETWEEN INTEREST RATES (MKD)</td>
<td>0.334793</td>
<td>0.351335</td>
<td>0.952918</td>
<td>0.3520</td>
</tr>
<tr>
<td>BUSINESS LOANS/GROSS LOANS TO N.F.E.</td>
<td>0.251408</td>
<td>0.265248</td>
<td>0.947822</td>
<td>0.3545</td>
</tr>
<tr>
<td>POPULATION LOANS/GROSS LOANS TO N.F.E.</td>
<td>0.156618</td>
<td>0.200974</td>
<td>0.779297</td>
<td>0.4449</td>
</tr>
<tr>
<td>NON-PERFORMING LOANS/GROSS LOANS</td>
<td>0.495979</td>
<td>0.186245</td>
<td>2.663048</td>
<td>0.0149</td>
</tr>
<tr>
<td>EQUITY SECURITIES/OWN ASSETS</td>
<td>0.940593</td>
<td>0.613384</td>
<td>1.533449</td>
<td>0.1408</td>
</tr>
<tr>
<td>NET-INTEREST INCOME/GROSS INCOME</td>
<td>-0.165564</td>
<td>0.067365</td>
<td>-2.457698</td>
<td>0.0232</td>
</tr>
<tr>
<td>NON-INTEREST COSTS/GROSS INCOME</td>
<td>0.001575</td>
<td>0.054924</td>
<td>0.028670</td>
<td>0.9774</td>
</tr>
<tr>
<td>HIGHLY LIQUID ASSETS/TOTAL ASSETS</td>
<td>0.089961</td>
<td>0.066743</td>
<td>1.347879</td>
<td>0.1928</td>
</tr>
<tr>
<td>C</td>
<td>-0.204933</td>
<td>21.19186</td>
<td>-0.009670</td>
<td>0.9924</td>
</tr>
</tbody>
</table>

R-squared                   | 0.990595    | Mean dependent var | 16.69803   |
Adjusted R-squared          | 0.985892    | S.D. dependent var  | 4.771020   |
S.E. of regression          | 0.566683    | Akaike info criterion | 1.973390   |
Sum squared resid           | 6.422598    | Schwarz criterion   | 2.482224   |
Log likelihood              | -19.58755   | Hannan-Quinn criter. | 2.139257   |
F-statistic                 | 210.6488    | Durbin-Watson stat  | 1.820343   |
Prob(F-statistic)           | 0.000000    |                      |            |

Source: Own calculations obtained via E-Views 7 usage, based upon the time series data for the banking sector, published by National Bank of Macedonia.
Before the analysis of each data categories presented in Table 6, based on the calculations presented in the same table, following formula can be assembled:

\[ y = -0.204933x_1 - 0.046268x_2 - 0.794649x_3 + 0.334793x_4 + 0.251408x_5 + 0.156618x_6 + 0.495979x_7 + 0.940593x_8 - 0.165564x_9 + 0.001575x_{10} + 0.089961x_{10} + u \]

The coefficients \( b_1, b_2, b_6, b_7, b_8 \) and \( b_{10} \) represent the impact of independent variables on the dependent variable “CAPITAL ADEQUACY RATIO”. In the presented case, they have a positive impact and are right proportional with dependent variable \( y \), while the coefficients \( b_6, b_7 \) and \( b_8 \) have a negative impact and reverse proportionality to the dependent variable.

The coefficient of determination \( R^2 \) presents the percentage of conditionality of dependent variable (CAPITAL ADEQUACY RATIO) of the independent variables in the model. Via the value of R-Squared (0.990595) presented in Table 6, we could conclude that the dependent variable is more than 99% determined by the presented independent variables.

From the data presented in Table 6, we could verify that the value of F statistics (210.6488) is greater than the critical value of Prob - F statistics (0.000000). It could be concluded that the hypothesis for common statistically influence of dependent variables on dependent variable (i.e. CAPITAL ADEQUACY RATIO) is acceptable.

Regarding the values of t statistics presented in Table 6, which determines the separate significance of the independent variables on the dependent one, we could see that the values of coefficients \( t_{b2}, t_{b6} \) and \( t_{b9} \), are statistically significant for the dependent variable “CAPITAL ADEQUACY RATIO” Here we can mention that the variables related to coefficients \( t_{b6} \) and \( t_{b9} \), have a negative effect while the variable connected to the coefficient \( t_{b9} \) has a positive impact on the dependent variable.

According to the results from Breusch-Godfrey Serial Correlation LM Test (APPENDIX 1) and Breusch-Pagan-Godfrey Heteroskedasticity Test (APPENDIX 2), we accept the null hypothesis for no serial correlation existence in the model with value of 0.9162 (which is bigger than the critical value of 5%) and we accept the null hypothesis for no Heteroskedasticity presence with p-value of 0.5608 (which is bigger than the critical value of 5%) e.g. the variables in the model are homoskedastic. Via the results from the Jarque-Bera test (Probability 0.732544) we can confirm that the sample data have a normal distribution which is another characteristic of an adequate regression model.

The last step in our analysis is the value of Durbin-Watson statistics. The value of this measure is 1.820343, which means that there is not significant auto-correlation in the regression model. After this last check, we come to conclusion that the presented linear regression model is a relevant model sample from econometric point of view and could be used as a base for further statistical observations about the related topic.

CONCLUSION

Banking sector in the Republic of Macedonia has a high capital adequacy ratio. From the synthesized data for the banking sector, we could understand that Basel III standards would be met without major difficulties. However, there are significant differences between different groups of banks in the capital adequacy ratio.

In the capital structure of Macedonian banks, dominate the banks’ own funds (Tier 1), while the share of other types of capital has negligible participation. The share of Tier 1 is the most important aspect in the process of the implementation of the new Basel III standards, so the tests of the proposed model were conducted on this type of capital and its ratio as a dependent variable.

Recent years have seen a remarkable capital ratio decline in the small banks in Republic of Macedonia, indicating potential danger in the case of a continuing trend in the future. Some of the potential challenges in this domain could be identified through the proposed alternative model for

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8 The acceptable value of Durbin-Watson statistics is the range from 1.8 to 2.2.
measuring the statistical significance of the independent variables on the bank's own capital (Tier 1) ratio.

The results obtained through the tests showed a negative statistical significance of the spread between interest rates on credit and deposits in foreign currency (F.C.) on the capital adequacy ratio which was opposite than expected before. However, the same independent variable for loans and deposits in domestic currency (MKD) did not show statistical significance on the dependent variable during the period of observation which was also contrary to initial expectations.

The share of staff costs in total non-interest expenses showed no statistical significance, leading to the conclusion that the impact of this variable ranges in constant frame i.e., its shows no concessions that may influence the dependent variable. The share of highly liquid assets should lead to a reduction in risk-weighted assets that should lead to an increase of the rate of capital adequacy. However, this expectation wasn’t confirmed through the results of the model. The rate of share of non-interest income in total income showed no statistically significant effect on the dependent variable.

The rate of share of net interest income in gross income showed a negative statistical significance on the capital adequacy ratio. This output is probably a result of the riskier nature of the interest income compared to non-interest revenues. Higher share of interest revenues could lead to higher risk and credit defaults, whereas the provisions collection is much easier mostly at the time of banking transaction or services processing. However, the confirmation on this result could be a subject of future research. Of particular importance is the analysis of the rate of non-performing loans in gross loans which showed proportional statistical significance with the capital adequacy ratio. Some of the banks, to absorb the anticipated losses from non-performing loans increase the capital adequacy ratio. The group of large banks has been affected by an increase of capital adequacy. However, if the variable was being tested on the group of small or medium-sized banks, it is likely that we would have received different results.

Therefore, the presented econometric model is more omit to apply at the level of each bank. It could be a useful tool in the weaknesses recognition in the capital adequacy ratio management. However, this model could be used combined with existing models for the capital adequacy management and adjust according to the individual characteristics of each bank.

REFERENCES:

ONLINE REFERENCES:
5. www.bis.org.
6. www.pwc.com/lu.
11. www.mnd-bitola.mk

ANNEXURE:

APPENDIX 1

Segment of the results from Breusch-Godfrey Serial Correlation LM Test:

<table>
<thead>
<tr>
<th>F-statistic</th>
<th>Prob. F(2,18)</th>
<th>Prob. Chi-Square(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.051110</td>
<td></td>
<td>0.9503</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>0.175051</td>
<td>Prob. Chi-Square(2) 0.9162</td>
</tr>
</tbody>
</table>

APPENDIX 2

Segment of the results from Heteroskedasticity Test: Breusch-Pagan-Godfrey

<table>
<thead>
<tr>
<th>F-statistic</th>
<th>Prob. F(10,20)</th>
<th>Prob. Chi-Square(10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.780222</td>
<td></td>
<td>0.6470</td>
</tr>
<tr>
<td>Obs*R-squared</td>
<td>8.699626</td>
<td>Prob. Chi-Square(10) 0.5608</td>
</tr>
<tr>
<td>Scaled explained SS</td>
<td>2.710539</td>
<td>Prob. Chi-Square(10) 0.9874</td>
</tr>
</tbody>
</table>
APPENDIX 3

Results from Jarque – Bera test:

<table>
<thead>
<tr>
<th>Series: Residuals</th>
<th>Sample 2001Q4 2012Q3</th>
<th>Observations 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>-3.25e-15</td>
<td></td>
</tr>
<tr>
<td>Median</td>
<td>0.075031</td>
<td></td>
</tr>
<tr>
<td>Maximum</td>
<td>0.816762</td>
<td></td>
</tr>
<tr>
<td>Minimum</td>
<td>-1.084503</td>
<td></td>
</tr>
<tr>
<td>Std. Dev.</td>
<td>0.462695</td>
<td></td>
</tr>
<tr>
<td>Skewness</td>
<td>-0.239265</td>
<td></td>
</tr>
<tr>
<td>Kurtosis</td>
<td>2.497092</td>
<td></td>
</tr>
<tr>
<td>Jarque-Bera</td>
<td>0.622463</td>
<td></td>
</tr>
<tr>
<td>Probability</td>
<td>0.732544</td>
<td></td>
</tr>
</tbody>
</table>