DETERMINANTS OF BANK PROFITABILITY IN USA

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Abstract

Banking systems around the world have been affected by the financial and economic crisis that started in the USA in late 2007, which determined a significantly contraction of banks profitability as a result of difficult macroeconomic situation. The purpose of this thesis is to determine the factors that have a direct or indirect impact on the profitability of the banking system and to determine also the impact of the crisis on the financial performance of banks.

In this paper I will analyze the banks’ profitability during whole period (1970-2011) and the extent to which the crisis has affected the financial performance of banks between 2007-2011. If before the crisis, the banking system had an average economic return on assets of 0.88%, since 2007 the average ROA declined by roughly 45% to 0.49%. Also, if before the crisis ROE had an average value of 11.8%, in the period 2007-2011 average ROE declined by over 60% to 4.5%. The factors that have a negative impact on profitability (measured by ROA and ROE) were Cost_Income_Ratio, Loan_Loss_Provision_TL and Leverage.

Keywords: banking, profitability, financial crisis, impact on bank profitability, ROA, ROE
1. Introduction

Banking systems around the world have been affected by the financial and economic crisis that started in the USA in late 2007, which determined a significantly contraction of banks profitability as a result of difficult macroeconomic situation.

In the last two decades, but especially in the last five years, in the global banking industry occurred many changes, with significant impact on bank performance, both internal and external factors affecting the profitability of financial institutions.

2. Literature review

Jiang et al. (2003) analysed the profitability of banking industry in Hong Kong between 1990 and 2002, empirical results showing that both bank-specific as well as macroeconomic factors are important determinants in the profitability of banks. With regard to macroeconomic factors, real GDP growth, inflation and real interest rates have a positive impact. On the other hand, the size variable, represented by loans or deposits, has a negative relationship with profitability, suggesting that, on average, larger banks achieve a lower ROA than smaller ones. The conclusion of this study is that a profitable banking sector is better able to withstand negative shocks and contribute to the stability of the financial system.

The profitability of the European banking industry was studied by Goddard et al. (2004) during the 1990s. The empirical study was performed on six European banks - Denmark, France, Germany, Italy, Spain and the UK (665 banks) and revealed that the relationship between the capital–assets ratio and profitability (ROE) was positive.

Athanasoglou et al. (2005) investigated the profitability of Greek banks between 1985-2001 and found that credit risk and operational expenses have a negative impact on profitability, while labour productivity and inflation are positively correlated with financial performance.

Gul et al. (2011) examined the relationship between bank-specific (capital ratio, equity to total assets) and macroeconomic (GDP real growth, inflation and market capitalization) characteristics over bank profitability (ROA, ROE, net interest margin) by using data of top fifteen Pakistani commercial banks over the period 2005-2009. The conclusions were that between total loans, deposits, inflation, GDP on the one hand and ROA on the other hand is a positive relationship, while between market capitalization and ROA the correlation is negative.
**Dietrich și Wanzenried (2010)** studied the profitability of 453 commercial banks in Switzerland over the period 1999 - 2008. In order to take into account the impact of the recent financial crisis, they additionally consider the pre-crisis period and the crisis years 2007-2008 separately. The capital ratio, which is defined as equity over total assets, has a positive and significant effect on bank profitability as measured by ROAA, and this holds in all three time periods considered.

The coefficient of the cost-to-income ratio, a measure of efficiency, is negative and highly significant for the whole period as well as for the years before the crisis. The more efficient a bank is, the higher is its profitability.

The loan loss provisions relative to total loans ratio, which is a measure of credit quality, does not have a statistically significant effect on bank profitability before the crisis. The loan loss provisions, which have also significantly increased during the crisis, negatively affects ROA.

**Hoffmann (2011)** examine the determinants of the US banks profitability during the period 1995-2007. The empirical analysis combines bank specific and macroeconomic variables. The empirical findings document a negative relationship between the capital ratio and the profitability, which supports the notion that banks are operating over-cautiously and ignoring potentially profitable trading opportunities.

### 3. Profitability analysis in U.S. banking industry

U.S. banking system, one of the largest in the world, was strongly affected by the financial and economic crisis, and in this context many banks were forced to close or restructure their operations. Thus, if at the end of 2007 in the U.S. banking industry were active 7,267 banks, in September 2012 the number was 6,168, which means a decrease of 15%, according to information on the website of the Federal Deposit Insurance Corporation. Federal Deposit Insurance Corporation closed 465 failed banks from 2008 to 2012, a significant number considering the fact that in the previous five years of 2008 only ten banks failed.
Thesis purpose

The purpose of this thesis is to determine the factors that have a direct or indirect impact on the profitability of the banking system (being analyzed predominantly financial indicators specific to this economic sector, and macroeconomic variables) and to determine also the impact of the crisis on the financial performance of banks.

In this paper I will analyze the profitability in the whole period (1970-2011) and the extent to which the crisis has affected the financial performance of banks from 2007 to 2011.

The presented case study is structured as follows: the presentation of an econometric analysis that examines the impact of specific and macroeconomic determinants on bank profitability in the USA between 1970 - 2011. The profitability is measured using both ROA and ROE. I also run two regressions in which I studied the impact of the same factors on bank performance (measured by ROA and ROE) before the financial crisis, in order to determine, by comparison, how badly American banks felt the pressure of the crisis. The crisis impact could not be determined explicitly using the econometric analysis because the data set is very small (five annual data from 2007 to 2011) and econometric techniques do not allow this.

Hypothesis and determinants selection

Dependent variable

- ROA=Net profits / Total assets*100
- ROE= Net profits / Total equity *100

Independent variable

- Equity to total assets = Total equity / Total assets *100
- Cost income ratio = Total expenses / Total revenues *100
- Loan loss provision to total loans = Loan loss provision / Total loans *100
- Deposits growth = (Deposits - Deposits_{t-1}) / Deposits_{t-1}
- Interest income share = Total interest income / Total income*100
- Funding costs = Interest expenses / Total deposits*100
- Leverage = Total liabilities / Total equity *100
- GDP real growth = (GDPreal_t-GDPreal_{t-1}) / GDP real_{t-1}
- Inflation
Population growth = (Population_t - Population_{t-1}) / Population_{t-1}

Consumer confidence

Hypothesis

I considered the following assumptions concerning the U.S. banking industry:

➢ An inverse correlation between the financial performance of banks on the one hand and the equity over assets, cost income ratio, loan loss provisions to total loans and leverage on the other hand;

➢ A direct correlation between the financial performance of banks and the interest income share, real GDP growth and population growth.

4. Data and methodology

The dataset

This section describes the sources of the data and presents the regression model used for estimating the determinants of profitability in U.S. banks. The main source of the data is the Federal Deposit Insurance Corporation (FDIC) website. Informations on the real GDP growth rate were taken from The World Bank website.

Model description

I used a multiple linear regression model to study the impact of internal and external determinants on banks' financial performance. The equation has the following form.

\[ Y_t = b_0 + b_1 X_{1t} + \ldots + b_k X_{kt} + \varepsilon_t, \text{ where} \]

\[ t = 1, 2, \ldots, n \]

\[ Y_t \] – dependent variable

\[ X_j \] – independent variable, \( j = 1, 2, \ldots, k \)

\[ X_{jt} \] – observation \( t \) of the independent variable \( X_j \)

\[ b_0 \] – constant

\[ b_1, \ldots, b_k \] – regression coefficients

\[ \varepsilon_t \] – residual variable which incorporates the influence of the other factors not included in the model
The main factors influencing the financial performance which are analyzed in this paper are:

**Bank-specific independent variables**

- EQUITY_TA
- COST_INCOME_RATIO
- LOAN_LOSS_PROV_TL
- DEPOSIT_GROWTH
- INT_INCOME_SHARE
- FUNDING_COSTS
- LEVERAGE

**Macroeconomic independent variables**

- GDP_GROWTH
- INFLATION
- POP_GROWTH
- CONSUMER_CONF

5. **Empirical results**

Econometric analysis will be assuming direct/inverse correlation between financial performance of banks (ROA and ROE) and eleven internal and macroeconomic determinants (EQUITY_TA, COST_INCOME_RATIO, LOAN_LOSS_PROV_TL, DEPOSIT_GROWTH, INT_INCOME_SHARE, LEVERAGE, FUNDING_COSTS, GDP_GROWTH, INFLATION, POP_GROWTH, CONSUMER_CONF).

To have a more clear view on the crisis impact on bank profitability, I considered appropriate to make another analysis to include pre-crisis period (1970-2006) and the crisis years (2007-2011), beside the analysis performed form 1970 to 2011. The results show that until the crisis, U.S. banking system was characterised by an average ROA of 0.88%, but in the next five years the average return on assets decreased by 45%, to 0.49%. This has negatively affected economic return between 1970-2011, when the average ROA was 0.83%. Also, average return on equity was 11.8% until 2006 and then shrank by over 60% to 4.5% between 2007-2011.
Testing regression model for ROA

Econometric tests were performed using the Ewievs. Multiple regression presented above explains return on assets (ROA) in the U.S. banking sector. Four independent variable - Cost_Income_Ratio, Funding_Costs, Loan_Loss_Provisions and Leverage - had a significant influence over the profitability (ROA). The regression model is valid with Prob (F-statistic) = 0, less than 0.05.

The coefficient of determination R-squared, which indicates how much of the total variance of the dependent variable is due to the independent variables, is 40.9%.

\[ \text{DROA} = 0.001738 - 0.087941 \times \text{DCOST_INCOME_RATIO} + 0.057612 \times \text{DINT_INCOME_} \]
\[ \text{SHARE} - 0.196236 \times \text{LOAN_LOSS_PROV_TL} - 0.001180 \times \text{DLEVERAGE} \]

Independent variables such as DCost_Income_Ratio, Loan_Loss_Prov_TL and DLeverage had a negative impact on banks’ profitability during 1970-2011. The only determinant that had a positive influence on financial performance was DInterest_Income_Share (0.0576).

Results of the regression model for ROA and ROE

In this section I conducted a regression in which I tested the impact of independent variable Equity_TA, Cost_Income_Ratio, Loan_Loss_Pro_TL, Deposit_Growth, Int_Income_Share, Leverage, Funding_Costs, GDP_Growth, Inflation, Pop_Growth, Consumer_Conf on ROE between 1970-2011, and two regressions in which I studied the impact of the same factors on ROA and ROE in the pre-crisis period, namely 1970-2006.

For having a general overview on these four regressions, I centralized the results for both ROA and ROE. Conclusions of the comparative analysis performed on the two periods (1970-2011 and 1970-2006) are presented below.

The most important conclusion is that the best results were obtained for ROA, when the analysed period was that before the financial crisis. Thus, of the eleven internal and external determinants, six variables were statistically significant. Also, the R-squared was equal to 90.8%.
Table 1. Centralized results for ROA before the crisis and between 1970-2011

<table>
<thead>
<tr>
<th>Variable independente semnificative</th>
<th>Coefficient</th>
<th>Probabilitate</th>
<th>Variable independente semnificative</th>
<th>Coefficient</th>
<th>Probabilitate</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCost_Income_Ratio</td>
<td>-0.0879</td>
<td>**</td>
<td>DCost_Income_Ratio</td>
<td>-0.0449</td>
<td>***</td>
</tr>
<tr>
<td>DInt_Income_Share</td>
<td>0.0576</td>
<td>**</td>
<td>Deposit_Growth</td>
<td>0.0186</td>
<td>***</td>
</tr>
<tr>
<td>Loan_Loss_Prov_TL</td>
<td>-0.1942</td>
<td>***</td>
<td>DEquity_TA</td>
<td>-0.5911</td>
<td>***</td>
</tr>
<tr>
<td>DLeverage</td>
<td>-0.0011</td>
<td>**</td>
<td>DFunding_Costs</td>
<td>0.0446</td>
<td>**</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DLoan_Loss_Prov_TL</td>
<td>-0.3931</td>
<td>***</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>DLeverage</td>
<td>-0.0043</td>
<td>***</td>
</tr>
</tbody>
</table>

|                           | R-squared   | Prob(F-statistic) | Testul Durbin-Watson | Te|stul Breusch-Godfrey | Testul Jarque-Bera | Testul White | Testul Chow Forecast |
|---------------------------|-------------|-------------------|----------------------|----------------------|------------------|--------------|----------------------|
|                           | 40.90%      | 0.0006            | 1.43                 | p>5% (nu exista corelare seriala a erorilor pana la lagul k=2) | p<5% (erorile nu sunt distribuite normal) | p<10% (exist% homoscedasticitate a erorilor) | p<5% (variabilele sunt instabile) |
|                           |             |                   |                      |                       |                  |              |                      |
|                           | 90.80%      | 0                  | 2.15                 | p>5% (nu exista corelare seriala a erorilor pana la lagul k=2) | p<5% (erorile sunt distribuite normal) | p<10% (exist% homoscedasticitate a erorilor) | p<5% (variabilele sunt instabile) |

Probabilitatile aferente testului t pentru pragurile de semnificatie de 1%, 5%, 10% sunt reprezentate prin ***, **, respectiv *. Source: own calculation

In the pre-crisis period, Cost_Income_Ratio (total expenses over total revenues), Deposit_Growth (deposits growth rate), Equity_TA (share of equity to total assets), Funding_Costs (bank’s financing costs), Loan_Loss_Prov_TL (loan loss provisions over total loans) and Leverage had a significantly influence on banks’ performance. Equity over total assets had the most important impact on profitability. The coefficient of Equity_TA was -0.5911, which means that a one percent increase in the share of capital in total assets generated a decrease of 59% on the variation of ROA. Also, due to provisions, bank’s profitability significantly decreased (a one percent increase in the share of provision in total loans resulted in a contraction of the of financial performance ROA of 39%). Taking into account the influence of the crisis, R-squared value was 40.9%, compared to the pre-crisis period, when R-squared was 90.8%.

Below are the results of econometric tests performed on ROE, for both pre-crisis period (1970-2006) and the hole sample analysed (1970-2011).
Table 2. Centralized results for ROE before the crisis and between 1970-2011

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>Probabilitate</td>
</tr>
<tr>
<td>DCost_Income_Ratio</td>
<td>-1.0652</td>
<td>***</td>
</tr>
<tr>
<td>DLnt_Income_Share</td>
<td>0.5761</td>
<td>*</td>
</tr>
<tr>
<td>Loan_Loss_Prov_TL</td>
<td>-2.3422</td>
<td>***</td>
</tr>
<tr>
<td>R-squared</td>
<td>29.70%</td>
<td></td>
</tr>
<tr>
<td>Prob(F-statistic)</td>
<td>0.0041</td>
<td></td>
</tr>
<tr>
<td>Testul Durbin-Watson</td>
<td>2.16</td>
<td></td>
</tr>
<tr>
<td>Testul Breusch-Godfrey</td>
<td>p&gt;5% (nu exista corelatie seriala a erorilor pana la lagul k=2)</td>
<td>Testul Breusch-Godfrey</td>
</tr>
<tr>
<td>Testul Jarque-Bera</td>
<td>p&lt;5% (erorile nu sunt distribuite normal)</td>
<td>Testul Jarque-Bera</td>
</tr>
<tr>
<td>Testul White</td>
<td>p&gt;5% (nu exista homoscedasticitate a erorilor)</td>
<td>Testul White</td>
</tr>
<tr>
<td>Testul Chow Forecast</td>
<td>p&lt;5% (variabilele sunt instabile)</td>
<td>Testul Chow Forecast</td>
</tr>
</tbody>
</table>

Probabilitatile aferente testului t, pentru pragurile de semnificante de 1%, 5%, 10% sunt reprezintate prin ***, **, respectiv *.

Source: own calculation

Cost_Income_Ratio and Loan_Loss_Prov_TL had a statistically negative influence on profitability. Thus, the increase of bank’s provisions by one percentage point causes a decrease of 2.34 percentage point of ROE. Also, because of higher banking costs, a significant decline in profitability was noticed.

In both regression R-squared value is very low (29.7% during 1970-2011 and 27.27% from 1970 to 2006), this being determined by the small number of independent variables retained in the analysis.
Conclusions and proposals

In this paper I have analyzed how internal bank-specific factors and external, macroeconomic variables influenced the profitability of U.S. banks, particularly in the context of the financial crisis triggered in the late 2007 in the U.S. The analysis took into account an extended time horizon - 42 years. The study aimed to capture both the profitability of banks before the crisis and the impact of economic and financial uncertainties on bank performance (measured by ROA and ROE).

I conducted an econometric study (the considered period is between 1970-2011) to quantify the extent to which the crisis has affected banks' profits. Also, I performed separate regressions for the precrisis period, using the same independent variables, to have a general view on US bank’s profitability.

The results show that U.S. banks’ profitability has been affected significantly. Thus, if until the crisis, U.S. banking system was characterised by an average ROA of 0.88%, in the next five years the average return on assets decreased by 45%, to 0.49%. Also, average return on equity was 11.8% until 2006 and then shrank by over 60% to 4.5% between 2007-2011.

Equity over total assets had the most important impact on profitability. The coefficient of Equity_TA was -0.5911, which means that a one percent increase in the share of capital in total assets generated a decrease of 59% on the variation of ROA. Also, due to provisions, bank’s profitability significantly decreased (a one percent increase in the share of provision in total loans resulted in a contraction of the of financial performance ROA of 39%).

Cost_Income_Ratio and Loan_Loss_Prov_TL had a statistically negative influence on profitability.

The impact of the financial crisis on bank profitability couldn’t be studied explicitly in this paper because the data set is very limited (five annual data for the period 2007-2011). So, a recommendation for future research is to analyze explicitly the impact of this crisis on ROA and ROE in the US banking industry. Although this study included a qualitative variable - U.S. consumer confidence index, I consider that it is also interesting to quantify the impact of corporate governance on bank’s profitability or the extent in which brand value over market capitalization of banks generate added value for banks.
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**Online resources**

➢ site-ul Federal Deposit Insurance Corporation (FDIC) [http://www.fdic.gov/](http://www.fdic.gov/)

➢ site-ul agenţiei de evaluare financiară Moody’s [www.moodys.com](http://www.moodys.com)


➢ site-ul [www.usinflationcalculator.com](http://www.usinflationcalculator.com)


➢ site-ul [http://www.tradingeconomics.com/united-states/consumer-confidence](http://www.tradingeconomics.com/united-states/consumer-confidence)
