

LIMITS AND VULNERABILITIES OF BANKING PROFITABILITY INDICATORS DURING THE FINANCIAL CRISIS

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Abstract

Bank performance measurement, as an expression of banks' ability to generate sustainable profits, is a topic of major interest, located in the core of all categories of participants involved in the banking business: banking supervisory authorities, rating agencies, shareholders, investors and analysts of banking activity.

Recent developments in bank profitability during the global financial crisis have highlighted a number of limitations of traditional banking performance measurement indicators, in respect of their capacity to provide relevant, credible and genuine information related to credit institutions' activity. In this article we intend to argue, by investigations at conceptual and quantitative level, the extent to which traditional indicators of bank profitability provide a comprehensive and real insight into the credit institutions' financial performance.

The empirical study applies the stress test methodology, through which is assessed the extent to which Romanian banking system's performance, represented by ROE, changes in the context of defining adverse, but plausible scenarios. Hence, it had been simulated ROE's degree of response for three types of scenarios. We have applied both univariate stress tests (sensitivity analysis) in order to isolate the potential impact of each risk factor on bank profitability, and multivariate stress tests, which allow the simultaneous application of multiple shocks on risk factors. The results show the most important risk factors that adversely affect banking system's profitability and the concrete value by which profitability is expected to decrease for each scenario analyzed.

Keywords: *profitability indicators, banking systems, financial instability, regulation, stress test scenario.*

Introduction

Financial markets' current concern is to strengthen financial activity's regulation, a special emphasis being placed on refining the capital adequacy requirements. Indirectly, on medium and long term, banking profitability acquires a key role in the capital formation, because maintaining it on an upward trend will enable banks to generate internal capital, thus reducing their dependence on foreign or interbank loans.

Profitability ratios are used to measure how well a business performs in terms of profit, by offering different scales for assessing an entity's ability to achieve positive financial results. The analysis of a bank's ability to be profitable has been the subject of numerous studies, which revealed the presence of correlation between bank performance and macroeconomic variables.

Bolt, de Haan, Hoerberichts van Oordt and Swank (2011) examined the relationship between banking profitability and business cycles, by developing a model which takes into account the history of bank loans, amortization and provisions. Their analysis focused on bank profit components: net interest income, other income, net provisions and other costs. The results confirmed the cyclicity of bank profits and their strong decline during crises. The authors found that for each percent of GDP contraction, during a severe recession, it is registered a decline of 0.24% of the level of profitability based on assets (ROA).

Another study (Apergis, 2009) also put in evidence the correlation between bank profitability and business cycles. The relationship is positive and robust in every phase of the economic cycle, but

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in the expansion phase the correlation is even more intense and is conclusive both in the case of the emerging and developed countries.

McKinsey global consulting company (Visalli, Roxburgh, Daruvala, Dietz, Lund, Marrs 2011) has analyzed banks' performance in 2010, compared with the average value recorded in the period before the financial crisis (2001-2007). This revealed that banks in emerging markets have managed to recover the performance and confidence indicators in the banking system faster than in developed countries (see the picture below).

Overview of banking "performance" and "confidence" indicators

2010

	Developed markets	Emerging markets	
Performance	1 Financial depth ¹ (% GDP)	427	197
	2 Banking revenue pool growth after provisions (%)	23	21
	3 Net interest and fee margins (%)	2.7	5.9
	4 Annual provisions for loan losses (% revenues)	23	16
	5 Nonperforming loans (%)	4.0	3.8
	6 Cost-to-income ratio (%)	54.0	45.7
	7 Banking profit pool growth (%)	141	28
	8 Bank ROEs (%)	7.9	19.6
	9 Bank capital ratios (TCE/RWA ² , %)	10	14.1
	10 Loan-to-deposit ratio (%)	92.2	82.3
Confidence	11 Cross-border capital flows (% GDP)	9.2	5.6
	12 Short-term cross-border loans ³ (% foreign liab.)	12.3	11.9
	13 LIBOR-OIS spreads (bps)	21.6	-
	14 Bank CDS spreads (bps)	136	213.7
	15 Bank market caps (% total market cap.)	10.8	17.3
	16 Bank P/B multiples	1.0	1.9

● Better than 2001–07 avg.
 ● Near 2001–07 avg.
 ● Worse than 2001–07 avg.

NOTE: "Better/worse than 2001–07 average" indicates deviation >10%

1 Stock market capitalization, public debt securities, financial and nonfinancial corporate bonds, and securitized and nonsecuritized loans

2 Tangible common equity/risk-weighted assets

3 Stock of cross-border loans with a maturity of less than 1 year

SOURCE: McKinsey Global Banking Practice; McKinsey Global Institute

Also, the authors have made a forecast relative to the potential level of ROE in 2015. For U.S. banks, it is expected to vary between 6.2 and 8.3%, while for the European Union banks it will range between 7.4 and 8.6%, well below the levels recorded in the year prior to crisis (11.4% in the U.S. and 16.7 % in the EU in 2007).

Aebi, Sabato, Schmid (2011) examined the extent to which corporate governance, subordinated to risk management procedures, exerts any influence on bank performance during crises, especially in 2007-2008. The results indicate that banks are determined to maximize shareholder wealth before the crisis and to take on risks in order to generate significant revenue later. Banks that are well prepared to cope with financial crises present an important and significant improvement in the quality of risk management function, but, at the same time, a lower performance than previous periods. An important point is that related to the mix of factors that impact banks' performance during crises. The results show that liquidity and credit quality are the variables that contribute positively to banking performance recording.

Another study that answered the question why some banks perform during crises is Beltratti and Stulz (2009), which made a comparative study on the impact of governance and banking regulation. Using conventional indicators to express corporate governance, the authors show that

banks with a friendly relationship between its board and shareholders registered poor performance during crises; in turn, countries where regulations are strict in terms of capital and supervisory authority is independent, banks registered better performance.

According to Coffinet and Lin (2010), from the standpoint of supervisory authority, the identification of vulnerabilities that may have negative impact on bank profitability is subordinated to maintaining banking system's solvency.

Bank profitability sensitivity to adverse, but plausible changes in the macroeconomic, financial and bank-specific indicators is a concern that catches more and more shape, being subject to stress tests carried out under the aegis of central banks.

In this respect, Coffinet and Lin (2010) conducted a study on the French banking system, for the period 1993-2009, the empirical results indicating that although the profitability of individual credit institutions is largely influenced by GDP growth; interest rate spread; volatility of capital markets; the share of financial income, other than interest, in the total asset; banks' size and capital ratio, all the simulated shocks do not severely erode the profitability level.

Stress tests conducted at the Bank of Norway (Andersen, Berge 2008), based on a sample of five major credit institutions, have reported that under a scenario of severe housing prices decrease, rising interest rates and boost of banks' risk aversion, their profits will face a downward trend.

Rouabah (2006) performed univariate stress tests on banks profitability in Luxembourg, based on historical data series for the time interval 1994-2005. Results indicated that the monetary shocks have a marginal effect on the level of profitability, but the GDP and stock index Stoxx DJE variation have a high impact on the revenue of Luxembourg banks.

Stress exercises conducted by Lehmann and Manz (2006) for the Swiss banking system revealed significant influence of GDP growth rate and interest rates on bank profitability. The stress scenario that captures the simultaneous manifestation of the recession, lower stock prices and increasing interest rates has generated substantial loss of profitability for Swiss banks.

On the other hand, a strong point of view, supported by the European Central Bank (2010), is on the ROE indicator limits during the current period of financial instability. The ECB has made a number of critics on the ability of this indicator to provide relevant information about bank performance, after the onset of financial crisis. Thus, ROE as a measure of performance has some limitations, namely:

- *it is not risk-sensitive;*
- *it hasn't a long term predictive ability.* A number of banks that, during the financial crisis, recorded significant losses had, with 3-4 years before its onset a good level of ROE. Therefore, ROE is a short-term indicator and has many weaknesses in times of financial uncertainty;
- *provides contradictory information:* for example, while banks have had to restructure their capital by issuing new titles, this strategy for improving capital and income has generated a decline in ROE;
- ROE is the *best known indicator of bank performance*, being under the attention of all market investors. Targeting this performance indicator exposes the bank to a strategy based on short-term balance sheet management;
- *lack of transparency and inconsistency* of this indicator made it difficult and irrelevant to be used for comparisons across different banks. Non-recognition of losses and the use of different accounting standards show that this indicator cannot be used for comparative measurement of bank performance.

In the present study we aimed, in the first instance, to investigate to what extent the traditional indicators of bank profitability provide a comprehensive picture of the actual financial performance of banks. The second part of the study evaluates, by applying the stress test methodology, the way Romanian banking system's financial performance will change, as a result of simulating adverse, but plausible scenarios that may materialize in the loan portfolio or macroeconomic environment.

The stress test methodology and simulation results

In the following, we intend to evaluate the impact of macroeconomic and bank-specific risk factors on the traditional indicator ROE, which provides a quantitative measure of the global performance, recorded by all the business lines of a credit institution and synthesizes shareholders' investment profitability.

The empirical study involves two steps: a) defining and processing the set of explanatory variables, by applying stationarity tests, multicollinearity tests, deseasonalisation and estimating the functional form of the equation; b) performing stress test analyses, through which it had been measured the degree in which Romanian banking system performance changed in the context of the definition of adverse, but plausible scenarios.

In essence, stress exercises are designed to identify potential sources of vulnerability (risk factors) for a financial institution and to simulate the impact of extreme events on its activity. These complete the risk management tools available to financial institutions and central banks.

A report published by the BIS (2005) made a synthesis of major financial institutions' stress test practices, revealing that 47.5% of them consist of sensitivity analyses, 30.43% are hypothetical scenarios and 22.01% are scenarios based on historical data analysis. Most stress exercises were designed to simulate changes in interest rates or credit.

In this study we have simulated the response of ROE indicator for three types of scenarios: one reflecting increases in idiosyncratic risk factors (bank-specific risks: credit risk, liquidity risk, interest rate risk), other that captures the impact of exogenous factors, having a macroeconomic nature (unemployment rate, inflation, average salary on economy, EUR/RON exchange rate) and a third one that combines idiosyncratic risk factors with macroeconomic ones.

It had been performed both univariate stress tests (sensitivity analysis) in order to isolate the potential impact of each risk factor on bank profitability, and multivariate tests, which allow the simultaneous application of multiple shocks on several risk factors.

The analysis was developed based on data aggregated for the entire Romanian banking system, available for the period January 2001 - October 2011, the time series considered having a monthly frequency. The methodology used is the classical linear regression model, the coefficient values being determined with OLS estimation method. In Table 1 we summarized the variables used.

Table 1. Description of variables

Dependent variable	Return on equity (ROE)
Explanatory variables	Macroeconomic factors: - unemployment rate - inflation rate - net average salary on economy - EUR/RON exchange rate
	Bank-specific variables: credit growth loan loss provisions due and doubtful loans/total loans liquidity indicator lending/deposit interest rate ratio

Preliminary analysis of the statistical characteristics for the variables considered revealed the presence of a positive asymmetry (skewness) for *inflation rate*, *liquidity indicator*, *lending / deposit ratio*, *loan loss provisions*, *due and doubtful credits in total credit*, *average net salary* and *the*

unemployment rate, suggesting that, during the period considered, these variables have followed an upward trend, while *ROE*, *the EUR/RON exchange rate* and *the credit growth* showed a negative asymmetry. Also, we noticed a trend towards platikurtosis for *the exchange rate*, *liquidity indicator*, *the average net salary* and *ROE*, the remaining variables indicating a tendency for leptokurtosis, which means that the likelihood for an extreme event to occur is higher. It hasn't been detected the presence of multicollinearity between variables; the time series for unemployment rate, net average wage, loan loss provisions and credit growth rate were deseasonalized. Time series' unit root was tested using the Augmented Dickey-Fuller test. *Inflation rate* and *credit growth* were found to be stationary in level, *the average net wage* is stationary in the second difference while the other variables are stationary in first difference, the null hypothesis of having a unit root being rejected at a critical level of 5%. In addition, the variables were considered in their logarithm, to facilitate the interpretation of the estimated coefficients in the form of elasticities.

In the following, we have estimated the parameters of simple and multiple linear regression equations, which will constitute the basis for performing univariate and multivariate stress test exercises. In the case of simple linear regressions, the only variables that statistically prove to have explanatory power on the level of ROE are: *the liquidity indicator*, *loan loss provisions* and *due and doubtful loans in total loans*. The estimated equations are presented as follows:

$$\ln ROE = 0.6107 \times \ln \text{liquidity indicator}(-8) - 0.0265$$

$$\ln ROE = -1.3516 \times \ln \text{due and doubtful loans in total loans} - 0.01$$

$$\ln ROE = -0.1764 \times \ln \text{loan loss provisions}(-1) - 0.0254$$

Thus, a 1% increase in expenses with loan loss provisions will be followed one month later by a decrease of ROE with 0.1764%; a 1% increase of the liquidity indicator, with a lag of 8 months, will generate in the current period a reduction of 0.6107% in ROE level and the increase of the share of due and doubtful loans in total credit by 1% will be followed by a reduction of ROE of 1.3516%.

In the case of multivariate regressions, in order to facilitate the subsequent stress exercises, we tested three specifications:

a regression model that includes only bank-specific variables, reflecting banking activity idiosyncratic risk (credit risk, liquidity risk, interest rate risk). Regression's functional form is:

$$\ln ROE = 0.0489 \times \ln \text{credit growth}(-6) - 1.6943 \times \ln \text{due and doubtful loans in total loans}(-3) - 0.1829 \times \ln \text{loan loss provisions}(-1) + 0.6413 \times \ln \text{liquidity indicator}(-8) + 0.126418$$

a regression model composed only by macroeconomic variables (inflation rate, unemployment rate, exchange rate, net average salary on economy). The results revealed that ROE level can be explained only by the variation registered by unemployment rate and inflation rate.

$$\ln ROE = -2.0293 \ln \text{unemployment rate}(-3) + 23.7235 \ln \text{net average salary}(-3) + 0.018182$$

Thus, increasing the unemployment rate by 1% will take effect on the level of ROE with a delay of three months, leading to a reduction of 2.0293%. On the other hand, the increase of net average wage in the economy by 1% will be reflected in the growth with 23.7235% of the ROE level, with a lag of one quarter.

a regression model that gathers both bank-specific variables and macroeconomic ones. The estimated coefficients are:

$$\ln ROE = 0.4462 \times \ln \text{inflation rate}(-3) - 3.7807 \times \ln \text{exchange rate}(-16) - 3.0399 \times \ln \text{unemployment rate}(-3) + 29.2260 \times \ln \text{net average wage}(-3) + 0.0429 \times \ln \text{credit growth}(-6) - 1.1174 \times \ln \text{lending/deposit ratio}(-13) + 0.6379 \times \ln \text{liquidity indicator}(-8) - 0.1637 \times \ln \text{loan loss provisions}(-1) - 2.0286$$

It can be noted that, although the sign of estimated coefficients is in line with economic theory, for the inflation rate the coefficient is positive, meaning that an increase in the inflation rate

improves bank profitability. Coffinet and Lin (2010) reported that the effect induced by inflation on profitability is ambiguous, although most recent studies indicate a significant positive effect. The explanation lies in the ability of banks to accurately forecast the inflation rate and to adjust the interest rates charged on loans and deposits, so as that revenues grow faster than expenses.

The second stage of the analysis consisted in defining several adverse scenarios and simulating the ROE's response, as a reaction to the volatility recorded by explanatory variables. The severity of shocks applied to each risk factor has been calibrated based on the most significant changes in the historical series of observations. In other words, we have considered the first two most significant changes in the level of each explanatory variable, recorded during January 2001- October 2011.

Table 2. Sensitivity analysis

<i>The scenario defined</i>	<i>The change induced in the level of ROE</i>
Decrease of the liquidity indicator (8 months lag) with 14.5%	Decreases with 2.78%
Decrease of the liquidity indicator (8 months lag) with 30%	Decreases with 5.76%
Increase of the share of due and doubtful loans in total loan with 30%	Decreases with 38.43%
Increase of the share of due and doubtful loans in total loan with 54%	Decreases with 69.17%
Increase of loan loss provisions (one month lag) with 34%	Decreases with 61.82%
Increase of loan loss provisions (one month lag) with 27%	Decreases with 49.10%

As seen in the simulations presented in Table 2, the change of the liquidity ratio has a relatively low impact on profitability; in turn, the impairment of credit risk proxy variables (the share of overdue and doubtful loans to total loans, loan loss provisions expenses) significantly erodes banks' profitability. In Table 3 we summarized the combined influence of explanatory variables on ROE, assuming three stress scenarios.

Table 3. Multivariate stress tests

<i>The scenario defined</i>	<i>The change induced in the level of ROE</i>
Microeconomic scenarios	
Credit growth contraction (6 months lag) with 33.72% Increase of the share of due and doubtful loans in total loan (3 months lag) with 54% Increase of loan loss provisions (one month lag) with 34% Decrease of the liquidity indicator (8 months lag) with 30%	Decreases with 149.22%
Credit growth contraction (6 months lag) with 2.1% Increase of the share of due and doubtful loans in total loan (3 months lag) with 30%	Decreases with 101.02%

Increase of loan loss provisions (one month lag) with 27% Decrease of the liquidity indicator (8 months lag) with 14.5%	
Credit growth contraction (6 months lag) with 2.1% Increase of the share of due and doubtful loans in total loan (3 months lag) with 30% Increase of loan loss provisions (one month lag) with 27% Decrease of the liquidity indicator (8 months lag) with 10%	Decreases with 100.1%
Macroeconomic scenarios	
Increase of unemployment rate (3 months lag) with 44% Decrease of average wage (3 months lag) with 9%	Decreases with 15.5%
Increase of unemployment rate (3 months lag) with 11% Decrease of average wage (3 months lag) with 9%	Decreases with 14.89%
Increase of unemployment rate (3 months lag) with 11% Decrease of average wage (3 months lag) with 2%	Decreases with 2.78%
Mixed scenarios	
Increase of inflation rate (3 months lag) with 2% Exchange rate depreciation (16 months lag) with 6% Increase of unemployment rate (3 months lag) with 44% Decrease of average wage (3 months lag) with 9% Credit growth contraction (6 months lag) with 33.72% Increase of lending/deposit ratio (13 months lag) with 21% Decrease of the liquidity indicator (8 months lag) with 30% Increase of loan loss provisions (one month lag) with 34%	Decreases with 244.95%
Increase of inflation rate (3 months lag) with 2% Exchange rate depreciation (16 months lag) with 6% Increase of unemployment rate (3 months lag) with 11% Decrease of average wage (3 months lag) with	Decreases with 216.4%

<p>9% Credit growth contraction (6 months lag) with 2.1% Increase of lending/deposit ratio (13 months lag) with 12% Decrease of the liquidity indicator (8 months lag) with 10% Increase of loan loss provisions (one month lag) with 34%</p>	
<p>Increase of inflation rate (3 months lag) with 2% Exchange rate depreciation (16 months lag) with 6% Increase of unemployment rate (3 months lag) with 11% Decrease of average wage (3 months lag) with 2% Credit growth contraction (6 months lag) with 2.1% Increase of lending/deposit ratio (13 months lag) with 9% Decrease of the liquidity indicator (8 months lag) with 10% Increase of loan loss provisions (one month lag) with 27%</p>	<p>Decreases with 65.81%</p>

The combination of banking system's specific variables generates a significant loss of profitability in our simulation, of over 100%. Of these, the deterioration of loan portfolio quality, reflected by the increase of overdue and doubtful loans to total credit and the increase of provisioning costs have the greatest impact on the level of ROE.

In terms of the macroeconomic scenarios simulated, we noticed a more pronounced decrease in the level of ROE, mainly due to contraction of net average wage and, in a smaller proportion, to increases in unemployment rate. The explanation lies in the fact that not all borrowers can be affected by the entry in unemployment, but a generalized decrease in the level of wages in the economy will be passed on to each debtor.

The third scenario offers an overview of the evolution of profitability level, because it connects both the specific characteristics of banking activity and macroeconomic factors. Thus, developments on the labor market directly affect the profitability both directly, as increases of unemployment and / or decreases of disposable income are translated into the contraction of the demand for new credit, and indirectly by the fact that repayment difficulties faced by borrowers will damage the quality of loan portfolio, will increase the provisions costs, thus eroding the profitability of credit institutions. The results indicate that ROE is very sensitive to reductions of net average wage in the economy and increases in loan loss provisions expenses.

Conclusions

ROE is an indicator that characterizes the overall performance of the activity of credit institutions, without revealing how much of this performance is due to certain lines of business: retail, corporate, investment banking, private banking. In our opinion, it is necessary to design new profitability indicators that provide a more faithful picture to banks' sources of profit (non-bank customer lending operations, loans and placements with other financial institutions, securities

transactions, and asset management). The empirical results obtained indicate that the main macroeconomic indicators and the specific banking system ones don't explain, overwhelmingly, the changes recorded by ROE. Analysis must be completed with variables that reflect, with a greater degree of accuracy and detail, financial situation and vulnerabilities related to retail and corporate sector, and individual characteristics of banks: sources of revenue, operating expenses, the market share held (banks with a higher market share and diversified products can benefit from greater stability of revenues).

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