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**CRISES WARNING MODEL - STRESS TEST. ALBANIAN CASE**

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**Abstract**

*Risk is a permanent companion of any business, including also the banks, which have the objective of managing the money entrusted by the depositors. The effectiveness of this management requires safe and profitable transfer of money between the giver and recipient. Modern, reliable and well-managed banks are not only able to assess current threats, but are also familiar with the size of this risk. They are able to assess whether this risk is acceptable or if the accepted security level is exceeded. Stress test is an effective way to do research based on quantitative theoretical models in the management of banking risks. In fact, it is also a mandatory tool to be implemented in the banking system in the Capital Requirement Directive, also known as Basel II. Stress test is a model used also by Albania to assess the status of the banking system, through individual analysis of the banks and the banking system entirely.*

**Keywords:** stress test, risk evaluation, Albanian banking system.

**JEL Classification:** G01, G21, G32

**1-Preliminary considerations on stress test**

On its simplest form, stress test is a reevaluation of portfolio assets and/or the obligations through the use of a set of variables, which serve to show the sensitivity of the banks therefore, the immunity under the changing risk.

In this context, the notion of risk is understood as a threat and its presence have negative effects on the banking system, particularly on financial outcome, which directly impacts equity and therefore also the value earned by the owners. But regardless of whether the source of risk may be the environment (such as a crisis) or whether it comes because of wrong decisions by the owners, its negative effects should not move on to other depositors or creditors of the bank. This means that banks' equity should be sufficient to protect deposits and other liabilities in the event that we face a situation of inability to pay.

Stress test examines the stability of financial institutions and financial sector in general versus unpleasant events from two perspectives: micro, in which financial institutions are evaluated, and macroeconomic, evaluating the whole system against macroeconomic shocks.

Stress test is used by banks in order to manage risk<sup>1</sup>. Typical scenarios include fluctuations in the stock market, shock on interest rate and exchange rate and economic recession. In short, the objective of stress test is to determine the losses (hypothetically) which usually are associated with the banking sector.

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<sup>1</sup> An International Survey of Stress Tests: "Ingo Fender, Michael S. Gibson, and Patricia C Mosser". *Federal Reserve Bank of New York, Current issue in economics and finance*. November 2001, volume 7 number 10

Put in a way, *stress test* is a methodology that takes into account the sensitivity of macroprudential indicators to macroeconomic changes or shocks. The objective of stress test is the identification of risks in the most transparent way possible, by assessing possible losses of a portfolio in normal markets.

## 2- Stress test and its application in South Eastern Europe

Stress method is used in many countries after year 2000. The data shown on table 1 represent the starting year for the application stress test in some European countries.

**Table 1. Starting year for the application of stress test**

State	Year	State	Year
<b>Albania</b>	2004	<b>Kosovo</b>	2008
<b>Austria</b>	2003	<b>FYROM</b>	2003
<b>B&amp;H</b>	2005	<b>Montenegro</b>	2006
<b>Bulgaria</b>	2002	<b>Poland</b>	2006
<b>Croatia</b>	2004	<b>Rumania</b>	2003
<b>Czech Republic</b>	2002	<b>Serbia</b>	2007
<b>Hungaria</b>	2000	<b>Slovakia</b>	2005
<b>Greece</b>	2006	<b>Slovenia</b>	2005

*Source: World Bank "Macprudential Stress-Testing Practices of Central Banks in Central and South Eastern Europe", September 2010, pg 4.*

In the table we distinguish Bulgaria, which applies the stress test since 2002 (but only in 2010 made it public). Bad and restructured loans accounted for 4.6% of the Bulgarian banking system's portfolio at the end of June 2009, exacerbated by the slowdown in lending activity. But according to stress test the Bulgarian Central Bank, the banking system is stable and healthy.

Along with Bulgaria, the Czech Republic is noted, among the first which applied stress test in 2002 (preceded by Hungary in year 2000), for their respective banking systems. While some of the other countries of Eastern Europe have started the application later. Specifically, Croatia has applied this method in 2004, Bosnia & Herzegovina in 2004, Montenegro in 2006, Serbia in 2007 and Kosovo in 2008.

All these countries rely on macroeconomic analysis. In Austria, Bulgaria, Czech Republic, Macedonia, Montenegro and Poland banks operate with macroeconomic scenarios and seek to assess their impact on credit, market and liquidity risk indicators.

Frequency of stress testing varies in these countries. Tests can be on quarterly basis (Albania, Austria, Bulgaria, B & H, Czech Republic, Macedonia and Montenegro) twice a year (Croatia, Hungary, Kosovo, Romania and Slovakia), on annual basis (Poland and Slovenia)<sup>2</sup>.

<sup>2</sup> *World Bank "Macprudential Stress-Testing Practices of Central Banks in Central and South Eastern Europe", September 2010, pg 6-7.*

While Table 2 contains a summary of application of the stress test of the countries taken into consideration so far, with the main scenarios and possible outcomes.

**Table 2. Stress test application from different countries and possible results**

Central Bank	Risk factors	Outcome Indicators	Static/ Dynamic
<b>Bank of Albania</b>	Credit risk: aggregated data NPLs estimation Market risk: interest rate, exchange rate. Liquidity risk: withdrawal of deposits Contagion risk: not addressed	Credit and Market risk: CAR Liquidity risk	Static
<b>Austrian National Bank</b>	Credit risk: NPL and LLP ratios estimation Market risk: interest rate, equity price, exchange rate. Liquidity risk: decrease in liquid funds, deposits' drain. Contagion risk: bank failures	Credit and Market risk: system-wide credit loss distribution Liquidity risk: liquidity ratios. Contagion risk: total losses in the network model	Static
<b>Bulgarian National Bank</b>	Credit risk: information about PDs from a bottom-up stress test; attempt for estimations for corporate and household PDs. Market risk: interest rate. Liquidity risk: not addressed Contagion risk: not addressed	Credit and Market risk: :CAR	Static
<b>Central Bank of the Republic of Kosovo</b>	Credit risk: ad-hoc shock in NPL Market risk: interest rate, exchange rate. Liquidity risk: withdrawal of various types of deposits .	Credit and Market risk: CAR	Static
<b>National Bank of the Republic of Macedonia</b>	Credit risk: increase in classified risk Market risk: interest rate, exchange rate. Liquidity risk: withdrawal of deposits Contagion risk: not addressed	Credit and Market risk: CAR; assumptions for income.	Static
<b>Central Bank of Montenegro</b>	Credit risk: aggregated data NPLs estimation. Market risk: interest rate, exchange rate. Liquidity risk: withdrawal of various types of deposits . Contagion risk: not addressed	Credit an Market risk: CAR; assumptions for income .	Static

*Source: World Bank "Macprudential Stress-Testing Practices of Central Banks in Central and South Eastern Europe", September 2010, pg 4.*

Table 2 clearly gives the degree of differentiation of the tests in these countries. For some countries, for example, Austria, Czech Republic, Hungary, Bulgaria, Romania and Slovakia, the models used are the results of several years looking at building models, while for Croatia, Kosovo, Montenegro and Serbia, stress test models are yet in the initial stage.

Application of the stress test from Southeastern European countries and particularly in our region is a very important moment, but no less important is its improvement in the future. Thus, the Central Bank of Kosovo, Montenegro, Bosnia

& Herzegovina and Serbia, an important challenge is still going to be building a reliable database. While from the modeling point of view, the Central Bank of Hungary, Croatia and Czech Republic, plan to work more for a better assessment of income. It is worth mentioning here that the Albanian model is built on the Austrian experience and it is apparent the alignment with our model.

According to the Committee of European Banking Supervisors (CEBS), the stress test conducted in mid-2010, from 91 European banks to consider, 7 of them (5 Spanish and two German banks) could not pass "health test" assessment on the ability of banks to survive the future economic shocks.

According to analysts of UniCredit in Milano, investors should consider how the banks get the money they lend. Spanish banks receive more than half of their funding from customer deposits, which is a more stable source of money than the interbanking market.

If we move further into the banking system, namely France, we can affirm that it is true that stress test did not identify any French bank with problems. But, having said that, although French banks are seen as healthier, they are supported from other banks financing. In a few moments of financial crisis, interbank lending came to be almost stationary, thus creating problems to those who rely more than necessary in this type of financing.

Therefore, stress test is important even if we consider the domino effect in the interbanking market, often known as contagion risk. Since the banks are linked together in a complex way of the credit system, this domino effect plays an important role in the banking sector.

In such a system, the inability to pay a financial institution would cause problems in another institution and so the problem will spread throughout the system. In this regard, it is visible the probability that Greece's problems spread to other countries even closer to it, such as Spain and Portugal. Therefore, companies must be vigilant that may face the contagious risk. At the same time, it is stressed that a number of countries of Central and Eastern Europe are faced with similar situations as Greece and Spain, meaning low export competitiveness, rising unemployment and high debt to those who are credited as consumers. For these reasons, as well as other structural reasons, the risk of contagious effect among the countries which joined EU membership recently remains high.

### **3- Application of stress test in Albania**

Stress test, with its focus on the impact of macroeconomic shocks on the stability of the financial system in Albania, is focused in the banking sector.

These shocks have to do with higher interest rates, disruption of exchange rates, increasing inflation rate, lower rates of economic growth or adverse changes in the indicators of the payment balance<sup>3</sup>.

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<sup>3</sup> Asian crises (such as in Korea and Thailand) confirmed that macroeconomic shocks, the collapse of the gross domestic product, price and market conditions, the price of real estate, together with inadequate monetary policies led to pressures inflation and latter "contributed" to the crises of financial systems.

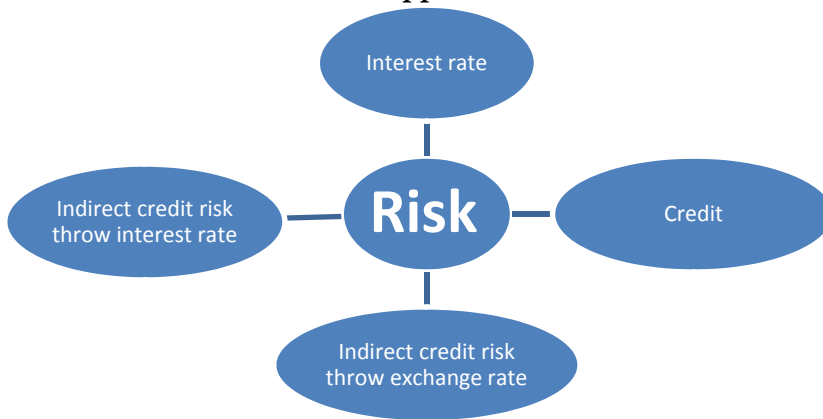
Basel II related to the stress test on:

- Focus on risk management;
- Market Risk Amendment, which requires the application of stress tests;
- Supervisors should consider how the bank evaluates “unexpected events” in the calculation of the size of capital (paragraph 750);
- Banks should assume shock event and test their internal model and their assessment procedures (paragraph 527);
- Risk of concentration (paragraph 775);

**3.1 Methodology of stress tests applied in Bank of Albania.**

The current model of stress test used in Albania includes 5 scenarios. Scheme 1 gives a summary these shocks as well as the tests built for each of them.

**Scheme 1. Stress test scenarios applied in Albania**



**Table 3. Stress test risks<sup>4</sup>**

<i>Risks</i>	<i>Test</i>
<i>Exchange rate risk.</i>	First test $S = FX_c^{NOP}$ Second test $S = FX_c^{ABS}$ $IRC_b^{FX_c^{NOP}} = \Delta^r FX_c \cdot NOP_{b,c}$
<i>Interest rate risk.</i>	$IRC_b^{\Delta^r} = \sum_{m=1}^M \frac{NP_b^m}{(1+r+\Delta^a r)^m} - \sum_{m=1}^M \frac{NP_b^m}{(1+r)^m}$
<i>Credit risk</i>	$\Delta NPLR_{it} = \alpha + \beta \Delta i_{it} + \gamma \Delta p_{it} + \delta \Delta GDP_{it} + \lambda$ $\Delta T \circ T_{it} + \epsilon_{it}$ $\Delta^r NPLR = C + B \cdot \Delta^r GDP$

<sup>4</sup> Michael Boss”office memorandum” Bank of Albania, February 24, 2004

<b>Indirect credit risk throw exchange rate</b>	$NPLR_c = \frac{NPL_c}{TL_c} ;$ $\Delta^r NPLR = \hat{\beta} \cdot \Delta^r I = -\hat{\beta} \frac{D}{I} \Delta^r FX$ $\Delta^r NPLR_b = B \cdot \Delta^r I = -B \frac{D}{I} \Delta^r FX$
<b>Indirect credit risk throw interest rate</b>	

*Source: Michael Boss"office memorandum" Bank of Albania, February 24, 2004*

The risks<sup>5</sup> mentioned above are the most evident for the Albanian banking system. Thus, the bulk of lending is realized in foreign currency, mainly in euros and in dollars, so a fluctuation in the exchange rate would cause serious problems in the bank's balance. Credit risk is of great importance, because there is a possibility that the borrower not to repay the lender for the loan taken. This risk is reflected NPLr, which is defined as the ratio of problematic loans / total loans. Further more, the level of lending has grown tremendously in recent years.

Another risk to the banking system is the interest rate. This risk relates to the impact of interest rate fluctuations in the costs of financing and investment.

Can this model predict crisis situations? Should we use a different model forecast or should re-evaluate the existing model?

The model mentioned is the current model that uses the Central Bank of Albania to test the endurance of the banking sector to adverse alleged developments of economic indicators and its needs for additional capital. The results of this analysis (stress test 2009)<sup>6</sup> generally represent a banking system protected from exchange rate risk and interest rate risk. Albanian banking sector is more sensitive to credit risk assuming a doubling of the value of loans. From the analysis results, that the banking sector can withstand a worsening of loans portfolio, which lies in a period of one year. However, for individual banks additional capital may be necessary depending on the situations presented.

Also, the Central Bank of Albania recognizes that this model relies on the hypothesis raised, whose assumptions are likely not to materialize into reality.

#### 4. Critical review on stress test

In the field of modern banking are being applied more and more sophisticated mathematical models as a result of huge growth of the complexity of financial operations. Although these models take into account the large number of variables present and are often based on the results of statistical analysis, economic reality is

<sup>5</sup> Bank of Albania: "Raporti i Stabilitetit Financiar 2009" pg 63.

<sup>6</sup> Bank of Albania: "Raporti i Stabilitetit Financiar për gjashtëmuorin e parë të 2010" pg 24.

unpredictable to the end and the forecast results are correct up to a certain degree of stability.

Besides, like other models, stress testing works based on simplification of real state on the market. Despite efforts to create stress scenarios and express them in quantitative terms, the complexity of real situation “motivates” us to make several assumptions and simplifications. In other words, these algorithms fail in extreme situations, it is therefore necessary to make a simple identification of key risks, the extent and the impact they have on the banking, linking them with the effects of capital requirements.

Hence, the value of stress test should not be exaggerated, especially during financial crises, because they can only roughly estimate the size of possible future losses based on variables that determine the negative developments as well as appreciate the extension of the period of financial collapse.

On the other hand, we stress that the process of testing can not be limited to the application of certain mathematical formulas. Stress test is a broader concept because it includes the selection and analysis of variables that determine the parameters of output.

So in conclusion we can say that passing the test should not immediately lead us to conclude that we have financial stability, since it is considered more systemic risk than individual risk or collective. Moreover, the test design is such that does not allow simultaneous variation of all risk factors, but presupposes the perception or consideration of only one set of risk factors. While the test failure is a signal of institutional weaknesses, passing it will not automatically mean that we have an overall financial condition healthy. For this reason, the stress test can not replace a systematic treatment of the risk, as discussed in the agenda of the G-20.

## **5-Conclusions**

The crisis of financial markets and especially banks, have imposed changes in the risk management. It has become necessary to develop or re-project existing models which offer us early warnings about the threat of bankruptcy as well as to determine the eventual impact of bank failure. One of the tools that tell us that resistance to the phenomenon of crisis is a stress test. Its intentions, at least in banking, are focused at assessing the level of economic resistance to the risk that exists.

The events that accompanied the recent global financial crisis, showed that in conditions of economic downturn bankers and managers take profit only for themselves, explaining success thanks to the skills to predict and excellent management of financial operations, not to mention the positive impact of favorable environmental conditions. In crisis situations, but the same owners and same boards of banks claim they are just as brilliant as before, but in adverse environmental conditions are exactly those conditions those bankers who are to blame for failures and bankruptcies. This way of reasoning gives bankers the “right” to receive help from outside, while holding in hand “weapons” - deposits of millions of customers

who have no equivalent right to cover the loss of their assets. And that, in the final analysis, serves as an effective instrument for blackmail and to receive, from all this, the capital subsidy from the state budget.

Although the Albanian banking system was affected little by the crisis compared with countries such as the Baltic countries or Iceland, a statement is applicable to the banking system in the global level, "privatization of profits and nationalization of banks' losses." Behavior of banks around the world is, in fact, as described by De Soto (2009), "banking is based on a partial backup in the form of deposits," which confirms the known conclusion of superiority that has safety on the businesses at risk.

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