

The Role of Stress-test Scenarios in Risk Management Activities and in the Avoidance of a New Crisis

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Abstract. *Stress-tests can increase the endurance of banks and financial system when faced with crises especially during economic growth periods, when they may accept higher risks more easily and with lower prices. Their importance was revealed by the crisis which has proven to be much more severe in terms of amplitude than the worst scenarios used by banks.*

The case study presented assessed the impact that the deterioration of the main macroeconomic indicators might have upon a bank's exposure to credit, FX, liquidity, interest, operational and market risks, upon its capital requirements, provisions and the balance sheet.

Keywords: stress-test; financial crisis; risk management; capital requirements; provisions.

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1. Introduction

Stress-test exercises represent assessments of a bank's financial status when faced with the occurrence of a/several severe (yet plausible) risk events which might affect its financial performance, capital volume and even existence (Bank of International Settlements, 2009).

We believe that the main role of crisis simulations (stress-tests) stems from the fact that they may increase the endurance of banks and of the financial system when faced with financial crises.

Therefore, we feel that the periodic application of stress-test scenarios should be an important risk management instrument warning against unexpected results afferent to the emergence of various types of risks and providing an assessment of the volume of capital necessary to cover the losses that occurred in this context. Consequently, stress test scenarios have the main functions: provide potential risk exposure assessments, beyond the limitations of ongoing models and historic data, and support the planning of capital and the defining of alternative liquidity plans.

We feel that the importance of stress test scenarios increases during stability/economic growth intervals, when, due to the lack of important risks, banks may not be aware of the major impact crisis intervals may have upon their financial stability and may accept higher risks exposures more easily and with lower prices.

Stress test activities must be an integral part of a bank's risk and management culture, while upper management must be actively involved in the drawing up of objectives and scenarios, as well as in the analysis of their results and in the undertaking of the necessary decisions so as to improve risk management activities, capital planning, liquidity, etc.

We feel that in order to provide a risk perspective complementary to other risk management instruments, such as Value at Risk (VaR) and the economic capital, stress-test exercises must provide an independent risk perspective.

Thus, stress test exercises are complementary to the bank's regular risk management models, based on complex, quantitative measures used for the analysis of historic data and for the forecasting of the bank's future evolution based on statistic methods. Furthermore, they can also be used for the validation of statistic models at high confidence levels, used for the computation of Value at Risk (VaR) for example. Stress-testing is also an important risk management instrument during economic expansion intervals, when financial innovations entail the implementation of new products for which no statistic data are available in order to assess the bank's risk exposure towards them, as is the case with other ongoing products.

What is very important in our opinion is the fact that the process of capital planning of a bank should include rigorous stress test scenarios (covering 1-3 years), based on the premise/hypothesis that market terms are changing or that special events have occurred. They must be used in the Internal Capital Adequacy Assessment Process for the identification of the bank's future needs and capital sources in unfavorable situations. This process must also consider the scenario when, because of the crisis, even healthy banks encounter major difficulties in attracting capital/funds at reasonable prices.

Furthermore, we feel that banks must also have other means of assessing in stress test conditions the effect that reputation risk may have upon other risk categories (credit risk, liquidity risk, market risk and other) the bank has exposed itself to, in order to maintain its level of confidence on the market.

Another important aspect revealed by the ongoing crisis is, in our opinion, the fact that banks must assess the risks associated with commitments regarding the securitization operations registered by various SPV-s or performed with various other entities, given the possibility that some of the respective assets might be taken over on-balance. Consequently, we believe that banks must include in their stress test exercises scenarios regarding the evolution of these SPV-s and their potential impact upon the banks' financial statuses, capital and liquidity.

In order to avoid the minimization of the implementation of the above-mentioned requirement by banks, the role of supervisory bodies in the analysis of the banks' stress test systems, methods and principles used and in the identification of weak points must be accentuated. Supervisory bodies must also check the maintenance of the validity/utility of these tests now and in the future.

2. The main deficiencies of stress-test systems as revealed by the crisis

The stress-test principles that have been used by banks so far have reflected several deficiencies in the context of the ongoing crisis, deficiencies which should be diminished/eliminated. Thus, the amplitude and duration of the ongoing financial crisis have made several banks and supervisory bodies wonder whether the stress-test systems used before the onset of the crisis were efficient and useful in the context of the swift changes that occurred at the level of financial markets.

We believe that the crisis has overall proven to be much more severe in terms of amplitude than the worst scenarios of many crisis simulation systems.

It is important to mention the fact that the 1st Pillar of the Basel II Agreement requests that banks using advanced methods (IRB and VaR) must have rigorous stress-test systems in order to assess whether or not their ongoing

capital reserves are sufficient. However, recent analyses have revealed that the stress test simulations used by banks did not result in major capital losses, nor did they include severe enough scenarios. Consequently, the Basel Committee, in collaboration with the banking industry, has undertaken the necessary measures for the re-assessment of the stress test systems used by banks and the elaboration of means for the solving of the deficiencies identified. Thus, the ongoing financial crisis has revealed several deficiencies of the stress-test systems used by banks in four areas:

- the utilization of crisis simulations and their integration in the operative management of risks;
- the stress-tests methodologies used;
- the scenarios used;
- the crisis simulations afferent to specific risks or to banking products.

The utilization of stress test scenarios and their integration in the operative management of risks

It is very important that the top management of a bank becomes involved in the drawing up of the objectives of risk simulations and scenarios, the analysis of their results and the undertaking of decisions regarding risk management activities and capital planning.

Thus, we feel that it is important to mention the fact that the top management of banks that have maintained their financial stability throughout the crisis have adhered (among other things) to the above-mentioned principle. Nevertheless, a major problem for many banks was the fact that the analysis of the results of stress test scenarios did not consider the actual possibilities, swiftness and the costs afferent to the additional capital increases necessary in this context.

A faulty aspect in the domain of stress test simulations performed by many banks prior to the onset of the crisis was that these simulations were isolated exercises performed by risk management specialists without involving other business lines. This is why subsequent analyses have revealed that they were based sometimes on completely unrealistic hypotheses.

Furthermore, many banks performed stress-test exercises only for some activities or risks, without aggregating the results at bank level. In this context, one must also consider the fact that, traditionally, banks perform stress-test exercises for market risk and interest risk only – credit risk was only recently included in the process, which led to an incomplete and incorrect assessment of the latter's effects. The situation is similar for all other risk types (liquidity, reputation risk).

Stress-test methodologies have various levels of complexity, the most advanced ones simulating the impact that severe changes in macroeconomic terms might have upon the bank's incomes and capital. They may consider

various risk types, such as credit risk, market risk, liquidity risk, operational risk, etc., analyzed individually or at aggregated level.

We feel it is very important mentioning that throughout the unfolding of the crisis these methodologies have proven to be faulty, affecting the utilization of stress-tests as management instruments. Their main deficiencies stem from the limitations of the informational infrastructure, which did not enable the swift identification and aggregation of consolidated exposures at the level of banks/ banking groups. Another problem is the fact that most risk management models, including stress-test simulations, use statistic data in order to assess future risk exposures and if said data are gathered during long intervals of economic stability, they become insufficient for the identification of a crisis.

Furthermore, the financial crisis has revealed the fact that the negative reaction of market participants to the initial issues/shocks has greatly amplified their effect, an aspect rarely considered in the regular stress-test models used by banks. Thus, for example, banks have underestimated the strong interdependence between the lack of liquidities on the market and the financing pressures of banks.

Generalizing this example, banks have disregarded or superficially approached the interactions between various risks, inconsistently integrating them at bank level or at financial group level.

Thus, for example, at the onset of the financial crisis, the shocks afferent to the accentuated increase in defaults played an important part in the fast deterioration of the prices afferent to the Collateralized Debt Obligations (CDO-s). At the same time, the respective issues revealed the deficiencies of the models used for the determining of the prices of these assets, as their complexity and lack of transparency have generated mistrust regarding their market value. This is why all market participants stopped purchasing them and the market's liquidity has basically become zero.

The blockage of the securitizations market has forced banks to store their assets which they intended to sell on the secondary market. Due to the lack of transparency of the financial issues banks encountered, the financing of their liquidity needs has become increasingly difficult, as banks with excess liquidities refused to invest in the system, which generated an overall liquidity crisis at global level.

As for the selection of scenarios, most stress test simulations used by banks did not include in their basic scenario the extreme market issues that occurred with the onset of the financial crisis, but rather low (average) shocks, with short-term effects, and did not consider correlations between various types of risks.

Thus, it is quite relevant to mention that before the onset of the crisis, severe stress-test simulations usually resulted in losses equivalent to the incomes gained during one quarter of activity, while the real crisis has proved

that the actual losses would have obliged many banks to declare bankruptcy without financial aid from the states.

Another deficiency of these stress-test models stems from the residual risk of the contractual obligations afferent to the financial lines provided to participants to the securitization market or from the necessity of covering the reputation risks afferent to off-balance SPV-s.

We should also mention that the stress-test scenarios used do not properly reflect the systemic-risk nature of the liquidity crisis, its magnitude or its duration.

3. Case study on the stress test scenarios of a commercial bank

The purpose of the following stress-test simulation is to assess the impact that the deterioration of the main macroeconomic indicators might have upon a bank's exposure to credit, FX, liquidity, interest, operational and market risk, as well as upon its capital requirements, credit risk provisions, the profit and loss account and the structure of the balance sheet of that bank.

The following table displays the evolution of the main macroeconomic indicators in the analyzed crisis scenario: the GDP decreases with 10.2%, industrial production with 22.3%, exports with 27.3%, while the national currency depreciates with 20%, etc.:

Table 1

The evolution of the main macroeconomic indicators

	2007	2008	Stress-test
Real GDP %	6.3	6.8	-10.2
Private consumption%	4.5	5.4	-1.9
Public consumption %	2.9	3.0	5.7
Gross fixed capital %	6.5	5.8	-4.1
Industrial production %	5.4	7.1	-22.3
Imports (nominal) %	28.2	29.1	-38.6
Exports (nominal) %	23.1	21.6	-27.3
Trade deficit in GDP %	-10.8	-12.5	-8.6
Current account deficit in GDP %	-5.1	-7.9	-11.0
Direct foreign investments (flows) in GDP %	7.5	9.1	3.7
Inflation rate	4.4	5.3	3.9
Unemployment rate %	5.8	4.4	7.9
Consolidated budget deficit in GDP %	-1.9	-2.3	-5.6
Public debt in GDP %	18.7	20.6	27.9
Currency policy interest	9.5	9.0	6.0
EUR/RON exchange rate	3.6	4.0	4.8

Note: The data above is based on a work scenario.

3.1. Stress test covering credit risk

Estimations of the impact of the deterioration of macroeconomic indicators due to credit risk are performed from two points of view:

- capital requirements (unexpected losses) computed in compliance with the IRB advanced approach; this approach is based on the re-computation of the Probability of Default (PD), Loss Given Default (LGD) and Risk Weighed Assets (RWA) indicators, as well as of the remaining risk parameters in the context of the crisis scenario;
- provision expenses (expected losses), which leads to the diminishment of the financial results of the analyzed bank.

The main principles used to assess the impact of the deterioration of macroeconomic indicators upon capital requirements in compliance with the IRB advanced approach are the following:

- For Corporate customers, the probability of default was drawn up based on the sensitivity of the economic sectors to the effects of the ongoing crisis:
 - Sectors with high sensitivity: real-estate, constructions, textile-leather, construction materials, furniture production, the chemical and petrochemical industry, car industry, leasing, transports and other.

The average probability of default for these sectors - PD = 20%, ranging from one individual sector to another between 15-25%.

- Sectors with average sensitivity: retail sale, hotels and restaurants, papers and paper products, other.

The average probability of default for these sectors is PD = 9%, ranging from one individual sector to another between 5-15%.

- Sectors with low sensitivity: the food and tobacco industry, public administration, electric power processing and distribution, telecommunications, health, etc.

The average probability of default for these sectors is PD = 3%, ranging from one individual sector to another between 0.5-5%.

- The probability of default for loans granted to private individual clients was determined based on the existence of collaterals:
 - Mortgage or consumer loans secured with real estate assets - average probability of default – PD = 17%,
 - Unsecured consumer loans - average probability of default – PD = 28%.
- Microenterprises (with turnovers of maximum 1 million EUR in equivalent per year) - average probability of default – PD = 22%.

Consequently, the portfolio of loans granted to corporate clients has the following structure conditional upon its sensitivity to the effects of the crisis:

Table 2

The structure of the Corporate loan portfolio

million EUR	2008	Weight (%)	Stress-test 2009	Weight (%)
Total	11.396	100.00	11.780	100.00
Economic sectors with high sensitivity	3.591	31.51	3.150	26.74
Economic sectors with average sensitivity	2.916	25.59	2.980	25.30
Economic sectors with low sensitivity	4.889	42.90	5.650	47.96

Note: The data above is based on a work scenario.

The Retail portfolio (including loans granted to microenterprises) considered in the analyzed stress-test simulation looks as follows:

Table 3

The structure of the Retail loan portfolio

million EUR	2008	Weight (%)	Stress-test 2009	Weight (%)
Total	12.714	100.00	10.425	100.00
Mortgage and consumer loans secured with real estate assets	6.542	51.46	5.954	57.11
Consumer loans	4.321	33.98	2.520	24.17
Loans granted to microenterprises	1.851	14.56	1.951	18.72

Note: The data above is based on a work scenario.

The impact of the stress test scenario on the probability of default - PD indicator for Retail and Corporate clients can be displayed as follows:

- for Retail clients, the average stress factor (multiplier of PD) is 4.8, as compared to the end of 2008;
- for Corporate clients, the average stress factor (multiplier) PD is 6.5 as compared to 2008, as attested by the table below:

Table 4

The impact of the crisis on the Probability of default

million EUR	PD 2008 (%)	Stress factor (multiplier)	PD stress test 2009 (%)	Budget 2009 (%)
Retail, of which:	4.4	4.8	21	9.8
Mortgage and consumer loans secured with residential mortgages	1.5	11.3	17	5.5
Unsecured consumer loans	5.3	5.3	28	13.3
Loans granted to microenterprises	4.8	4.6	22	10.5
Corporate, of which:	2.3	6.5	15	5.4
Loans granted to SME clients	3.8	4.7	18	8.2
Loans granted to Large Corporate clients	1.8	6.1	11	3.9
Loans granted to Real Estate clients	0.5	40.0	20	6.1
Loans granted to Municipalities	0.0	-	2	0.0

Note: The data above is based on a work scenario.

The impact of the stress test scenario upon the Loss given default - LGD is based on the following principles:

- for mortgage and consumer loans secured with residential mortgages from the Retail sector, the LGD stress factor (multiplier) is of 2.1, as compared to the end of 2008. This stems from the diminishment in the value of residential properties, which will entail a decrease in recoveries from 87% to 54%.
- For Corporate agents, the LGD stress factor (multiplier) is of 2.3, as compared to 2008, as attested by the table below.

Table 5

The impact of the crisis on the Loss given default

	LGD 2008 (%)	Stress factor (multiplier)	LGD stress test 2009 (%)	LGD budget 2009 (%)
Retail, of which:	44	2.1	92	61
Mortgage and consumer loans secured with residential mortgages	13	3.5	46	21
Unsecured consumer loans	52	1.8	93	62
Loans granted to microenterprises	36	2.3	82	58
Corporate, of which:	26	2.3	59	44.0
Loans granted to SME clients	31	2.2	68	55.0
Loans granted to large corporate clients	22	2.1	47	40.0
Loans granted to real estate clients	9	4.0	36	21.0
Loans granted to municipalities	0	-	0	0.0

Note: The data above is based on a work scenario.

In order to assess the impact that the new risk parameters will have on the bank's capital requirements, one must compute the risk-weighted exposure towards each client segment, in compliance with the formula (NBR, 2009):

Risk-weighted asset= RW (risk weight %) x Exposure value, where:

RW computation for corporate clients is performed in compliance with the following formulas:

$$\text{Risk weight (RW)} = (\text{LGD} \times N[(1-R)^{-0.5} \times G(\text{PD}) + (R/(1-R))^{0.5} \times G(0.999)] - \text{PD} \times \text{LGD}) \times (1-1.5 \times b)^{-1} \times (1+(M-2.5) \times b) \times 12.5 \times 1.06$$

$$\text{Correlation (R)} = 0.12 \times (1-\text{EXP}(-50 \times \text{PD})) / (1-\text{EXP}(-50)) + 0.24 \times [1 - (1-\text{EXP}(-50 \times \text{PD})) / (1-\text{EXP}(-50))]$$

$$\text{Adjustment conditional upon the maturity date (b)} = [0,11852 - 0,05478 \times \ln(\text{PD})]^2,$$

where $N(x)$ is the cumulative distribution function of a regular standard random variable (which expresses the probability that a regularly distributed random variable with average zero and variance 1 is smaller than or equal to x).

$G(z)$ represents the opposite of the cumulative distribution function for a regular standard random variable [which expresses value x so that $N(x) = z$].

RW computation for retail clients is performed in compliance with the following formulas:

$$\text{Risk weight (RW)} = (\text{LGD} \times N[(1-R)^{-0.5} \times G(\text{PD}) + (R/(1-R))^{0.5} \times G(0.999)] - \text{PD} \times \text{LGD}) \times 12.5 \times 1.06$$

$$\text{Correlation (R)} = 0.03 \times (1 - \text{EXP}(-35 \times \text{PD})) / (1 - \text{EXP}(-35)) + 0.16 \times [1 - (1 - \text{EXP}(-35 \times \text{PD})) / (1 - \text{EXP}(-35))]$$

$N(x)$ is the cumulative distribution function of a regular standard random variable (which expresses the probability that a regularly distributed random variable with average zero and variance 1 is smaller than or equal to x).

$G(z)$ represents the opposite of the cumulative distribution function for a regular standard random variable [which expresses value x so that $N(x) = z$].

Consequently, the risk-weighted assets at the level of the portfolio of exposures on credit-type products divided on retail and corporate segments can be displayed as follows:

Table 6

The risk-weighted assets for the loan portfolio

million EUR	2008	Weight (%)	Stress test 2009	Weight (%)	Increase (%)
Total bank, of which:	14.812	100.0	20.972	100.0	+41.5
Retail	5.630	38.0	9.005	42.9	+59.9
Corporate	9.182	62.0	11.967	57.1	+30.3

Note: The data above is based on a work scenario.

The above-mentioned data reveals a 41.5% increase in the risk-weighted value of assets in the context of the crisis scenario described above, mainly due to the accentuated increase in the risk-weighted value of the exposure afferent to the Retail segment (+60% as compared to 2008).

Aside from the additional capital requirement in the context of the crisis scenario described above, the bank must also consider the impact that the provision expenses afferent to the increase in the volume of non-performing loans has upon the profit and loss account.

Considering:

- The increase in the weight of non-performing loans in the total portfolio, from 3.0% in 2008 to 10.9% in the analyzed crisis scenario;
- The fact that most segments are affected by the increase in the volume of non-performing loans, such as unsecured consumer loans – increasing from 6.3% in 2008 to 18.0% in the analyzed crisis scenario – and loans granted to microenterprises – increasing from 5.2% to 14.3%, loans granted to SME-s, increasing from 3.1% to 11.3%;
- That one of the internal targets of the Bank is to cover 40% of its non-performing loans with provisions – this is the result of the specific targets drawn up for each client segment (computed conditional upon the collateralization degree, the loss given default - LGD etc.),
- this means that the necessary additional provisions that the Bank must draw up amount to 678 million EUR, as displayed in the table below:

Table 7

The impact of the crisis on the credit risk provisions

million EUR	December 2007		December 2008		Stress test		Non-performing loans coverage target (%)	Additional provisions necessary to reach this target
	Sum	Weight of non-perf. loans (%)	Sum	Weight of non-perf. loans (%)	Sum	Weight of non-perf. loans (%)		
Total bank	614	2.6	733	3.0	2.429	10.9	40	678
Total Corporate clients of which:	190	1.5	221	1.9	987	8.4	34	260
SME-s	150	2.5	170	3.1	665	11.3	40	197
Large Corporate clients	39	1.1	44	1.5	116	4.0	20	14
Real Estate	0	0.0	6	0.3	200	10.5	25	48
Municipalities	1	0.1	1	0.1	6	0.5	10	1
Total Retail clients of which:	424	2.5	512	4.0	1.442	13.8	45	418
Mortgage and consumer loans secured with residential mortgages	122	1.7	144	2.2	709	11.9	30	171
Unsecured consumer loans	250	5.1	272	6.3	454	18.0	90	164
Loans granted to microenterprises	52	3.3	96	5.2	279	14.3	45	83

Note: The data above is based on a work scenario.

3.2. Stress test covering FX risk

In order to assess the impact of the crisis simulation upon the profit and loss account of the bank, one must start from the structure of the bank's assets and liabilities for December 31st 2008, which can be displayed as follows:

Table 8

The net FX positions as of 31.12.2008

RON equiv.	Assets			Liabilities			Net position			Total net FX position
	Individuals	Other counterparties	Other positions	Individuals	Other counterparties	Other positions	Individuals	Other counterparties	Other positions	
EUR	30,581	34,735	35,844	47,317	29,429	25,430	-16,736	5,306	10,414	-1,016
CHF	17	0	73	43	30	0	-25	-30	73	18
USD	838	172	73	941	111	215	-103	60	-142	-185
Other	438	0	176	0	387	146	438	-387	30	81
Total	31,875	34,907	36,167	48,301	29,958	25,791	-16,426	4,949	10,375	-1,102

Note: The data above is based on a work scenario.

The table above reveals that the analyzed bank has drawn resources worth 104,050 million RON (the equivalent of approximative 24,2 billion EUR), which have increased with 1,102 million RON (approximative 256 million EUR) as compared to its assets in foreign currencies, namely 102,949 million RON (the equivalent of approximative 23,942 million EUR). In these terms, the respective bank is exposed to FX risk if the national currency depreciates as compared to the main currencies, as it will have to reimburse larger sums in RON equivalent afferent to the GAP between its assets and liabilities in foreign currencies.

In addition to the above-mentioned information, by applying the following stress test scenarios regarding the depreciation of the national currency as compared to foreign currencies (-5%, -10%, -20% and -35%), one can identify new net FX positions, as attested in the following table:

Table 9

The net FX positions for the stress-test

Stress-test - net result (mil. lei)											
	Depreciation of the national currency as compared to FX (%)	Assets			Liabilities			Net position			Total net FX position after the stress-test
		Individuals	Other counterparties	Other posit.	Individuals	Other counterparties	Other posit.	Individuals	Other counterparties	Other posit.	
Scenario 1	-5	33,469	36,652	37,975	50,717	31,456	27,081	-17,247	5,196	10,894	-1,155
Scenario 2	-10	35,063	38,398	39,783	53,132	32,953	28,370	-18,068	5,444	11,413	-1,211
Scenario 3	-20	38,251	41,888	43,400	57,962	35,949	30,949	-19,711	5,939	12,451	-1,321
Scenario 4	-35	43,032	47,125	48,825	65,207	40,443	34,818	-22,175	6,681	14,007	-1,486

Note: The data above is based on a work scenario.

By comparing the new FX positions derived from the stress-test scenarios and the FX position for December 31st 2008, one can determine the bank's potential loss resulted from the depreciation of the national currency as compared to foreign currencies, as attested in the table below:

Table 10

Stress-test – impact upon the P&L account			
	Depreciation of the national currency as compared to foreign currencies (%)	Impact upon P&L account (mil. lei)	Impact upon P&L account (mil. EUR)
Scenario 1	-5	-485	-113
Scenario 2	-10	-540	-125
Scenario 3	-20	-650	-151
Scenario 4	-35	-815	-189

Note: The data above is based on a work scenario.

3.3 Stress test covering liquidity risk

The stress-test regarding the impact that liquidity risk has upon the bank's profit and loss account is based on the following premises:

- The sudden drawing of 20% from the deposits of individuals, 10% from the deposits of corporate clients and 30% from interbank deposits;
- A lack of liquidities on the interbank market and the banks' aversion to risks; the only financing possibilities available on the market have an additional cost of 7 p.p. for RON and 4 p.p. for EUR;
- The trading portfolio (shares) register value decreases of 35% per average; consequently, they are not traded for liquidities so that they may redress their value – their selling is unprofitable as compared to the option of drawing resources from the interbank market;
- The t-bills from the bank's portfolio have a very low volume and are not a solution when it comes to obtaining liquidities after refinancing operations performed with the Central Bank;
- The minimum limit of the liquidity indicator (liquid assets/total deposits of individual and corporate entities, as well as interbank deposits) accepted by the Central Bank is 20%; the Central Bank allows the utilization of a part of the minimum obligatory reserves to cover cash drawings for the short-term only, provided that their level is quickly restored afterwards.

In addition to the information above, the evolution of the bank's liquid assets and liabilities and the impact of the stress test upon its P&L indicator can be displayed as follows:

Table 11

The impact of the crisis for the liquidity risk

(million EUR)

Liquid assets before the application of the stress-test scenario	6.250	Liquid assets after the application of the stress-test scenario	2.450
Individual deposits before the application of the stress-test scenario	11.252	Individual deposits after the application of the stress-test scenario	9.002
Corporate deposits before the application of the stress-test scenario	11.825	Corporate deposits after the application of the stress-test scenario	10.643
Interbank deposits before the application of the stress-test scenario	2.572	Interbank deposits after the application of the stress-test scenario	1.800
Total deposits before the application of the stress-test scenario (individual, corporate, interbank)	25.649	Total deposits after the application of the stress-test scenario (individual, corporate, interbank)	21.445
The diminishment of deposits following the application of the crisis scenario	4.204		
The diminishment of liquid assets following the application of the crisis scenario	3.800		
Liquidity indicator before the application of stress-tests*	24.4%		
Liquidity indicator after the application of stress-tests	11.4%		
Additional liquidities necessary for a liquidity indicator of 20% and the observance of minimum obligatory reserves requirements	1.840**		
Losses ensuring additional liquidities	107		

*liquid assets/ total individual, corporate and interbank deposits

** of which 1.100 in RON equiv. and 740 in EUR

Note: The data above is based on a work scenario.

3.4. Stress test covering banking book and trading book interest rate risk

The methodology used is the following:

- all interest rate-sensitive assets and liabilities (both on-balance and off-balance) were distributed on intervals, based on the date for the restoring of the interest rate level, as stipulated in contracts;

- the differences between assets and liabilities were computed for each interval (GAP-s);
- for each scenario, GAP-s were multiplied with the shocks and the results were aggregated.

6 stress test scenarios regarding interests in RON and 4 regarding interests in EUR were used in this respect, as attested by the table below:

Table 12

The scenarios regarding the potential changes of the RON and EUR interest rates

Interest rate change in RON		Interest rate change in EUR	
Scenario	Change	Scenario	Change
Scenario 1:		Scenario 7, on time bands:	
For all maturity dates	+ 250 bp	Under one month	+30 bp
Scenario 2:		1-3 months	+50 bp
For all maturity dates	- 200 bp	3-6 months	+75 bp
Scenario 3, on time bands:		6-12 months	+100 bp
Under one month	+75 bp	1-5 years	+150 bp
1-3 months	+125 bp	over 5 years	+250 bp
3-6 months	+150 bp	Scenario 8, on time bands:	
6-12 months	+200 bp	Under one month	-25 bp
1-5 years	+250 bp	1-3 months	-50 bp
over 5 years	+350 bp	3-6 months	-75 bp
Scenario 4, on time bands:		6-12 months	-125 bp
Under one month	-50 bp	1-5 years	-150 bp
1-3 months	-100 bp	over 5 years	-200 bp
3-6 months	-125 bp	Scenario 9, on time bands:	
6-12 months	-200 bp	Under one month	+250 bp
1-5 years	-250 bp	1-3 months	+200 bp
over 5 years	-300 bp	3-6 months	+175 bp
Scenario 5, on time bands:		6-12 months	+100 bp
Under one month	+250 bp	1-5 years	+50 bp
1-3 months	+200 bp	over 5 years	+25 bp
3-6 months	+150 bp	Scenario 10, on time bands:	
6-12 months	+100 bp	Under one month	-300 bp
1-5 years	+75 bp	1-3 months	-250 bp
over 5 years	+50 bp	3-6 months	-175 bp
Scenario 6, on time bands:		6-12 months	-125 bp
Under one month	-200 bp	1-5 years	-75 bp
1-3 months	-175 bp	over 5 years	-50 bp
3-6 months	-150 bp		
6-12 months	-75 bp		
1-5 years	-50 bp		
over 5 years	-25 bp		

Note: The data above is based on a work scenario.

After the application of the 10 stress-test scenarios, the (positive or negative) impact upon the bank's financial results and capital can be displayed as follows:

Table 13

The impact of the crisis for the interest rate risk
Stress-test scenarios for interest rate risk

		Net result (mil. EUR)
Interest rate for RON		
Scenario 1		61.26
Scenario 2		-42.15
Scenario 3		117.02
Scenario 4		-105.04
Scenario 5		-37.41
Scenario 6		35.38
Interest rate for EUR		
Scenario 7		43.69
Scenario 8		-47.23
Scenario 9		-69.76
Scenario 10		73.89

Note: The data above is based on a work scenario.

In addition to the above-mentioned information, due to the maintenance of a conservative approach, the management of the respective bank has decided that the scenario used in order to assess the impact of the stress test upon its P&L account and its capital requirements should be scenario 4 for RON and scenario 9 for EUR, resulting in potential losses of approximative 175 million EUR due to the BB interest rate risk.

3.5. The impact of stress test scenarios upon the bank's financial results, balance sheet structure and capital requirements

The impact of stress-test scenarios upon the bank's balance sheet structure is as follows:

Table 14

The impact of the crisis on the balance sheet (IFRS)		
thousand EUR	31.12.2008	Stress test
ASSETS		
Cash and investments at Central Banks	3,627,318	3,523,328
Debts upon credit institutions	117,984	57,956
Repurchase agreements with specific delivery	13,650	13,640
Financial assets held for trading	2,223,022	2,013,051
Fair value financial assets via the P&L account	191,595	281,544
Loans and money in advance granted to the clientele	24,110,000	22,205,000
Financial assets – available for sale	106,077	96,057
Financial assets – held to maturity	98,851	78,565
Insurance companies investments	0	0
Tangible assets	720,531	563,215
Trade fund and other intangible assets	73,726	73,726
Debts from postponed taxes	2,344	2,300
Other assets	423,215	28,508
Assets held for sale	53,218	64,215
TOTAL ASSETS	31,761,531	28,998,105
DEBTS AND OWN CAPITALS		
Sums owed to credit institutions	2,572,339	2,391,524
Repurchase agreements with specific delivery	114,233	113,235
Derivative financial instruments	399,977	402,975
Sums owed to clients	23,077,297	20,831,681
Bonds issued and other borrowed funds	985,825	881,829
Current debts from taxes	165,051	165,051
Debts from postponed taxes	141,593	114,592
Other debts	1,143,422	1,983,420
Subordinated debts	330,000	330,000
Debts afferent to assets held for sale	379,135	259,135
TOTAL DEBTS	29,308,872	27,473,442
Equity	1,082,507	1,082,507
Current result	766,000	-122,000
Other reserves	604,152	564,156
TOTAL OWN CAPITALS	2,452,659	1,524,663*
TOTAL DEBTS AND OWN CAPITALS	31,761,531	28,998,105

* own capitals derived from the stress test, prior to the increase afferent to the maintenance of an appropriate solvency indicator

Note: The data above is based on a work scenario.

If the stress-tests scenarios described should come true, the aggregated losses would amount to 1,111 million EUR, namely:

- 678 million EUR due to the increase in provision expenses;
- 151 million EUR due to FX risk;
- 107 million EUR due to liquidity risk;
- 175 million EUR due to interest rate risk.

By correlating the impact of the losses stemming from the occurrence of banking risks in crisis situations with a gross profit of 989 million EUR, the resulted loss amounts to 122 million EUR.

After the recalculation of risk-weighted assets (credit, market and operational risk) and of the solvency indicator registered by the respective bank if the stress tests scenario comes true, the bank's status could be displayed as follows:

Table 15

The aggregated impact of the crisis on the capital requirements

million EUR	2008	Budget for 2009	Stress test	Difference as compared to 2008 (%)
Total RWA, of which:*	19,515	19,542	25.842	32.42
-for credit risk**	15,812	15,592	21.672	37.06
-for operational risk	2,780	2,900	2.920	5.03
-for market risk	923	1,050	1.250	35.40
Total capital	2,390	2,150	1.854	-22.43
Solvency indicator	12.2	11.0	7.2	-40.98
Additional capital for a solvency indicator of 10% minimum	-	-	730.2	

* the respective bank uses the most advanced methods regulated by the Basel II Agreement, namely: Advanced IRB for credit risk, AMA for operational risk and VaR for market risk

** aside from the capital requirements for the Retail and Corporate segments, the bank also computes the RWA for its other assets as well (assets, investments at other banks, etc.)

Note: The data above is based on a work scenario.

In addition to the information above, the solvency indicator of the analyzed bank decreases to 7.2% in the context of the stress-test scenario described, being below the minimum 8% limit stipulated in the Basel II Agreement and below the 10% limit which is considered a proper level in the context of the ongoing crisis. The diminishment of the solvency indicator is due both to the increasing of risk-weighted assets with 6,327 million EUR (+32.4%), mainly determined by credit risk (+5,860 million EUR, +37.1%) and market risk (+327 million EUR, +35.4%), and to the diminishment of own capitals with 536 million EUR (-22.4%).

This diminishment is due to the impact of the increase of credit risk provisions, losses derived from the depreciation of the national currency as compared to foreign currencies, the unfavorable evolution of interest rates and the manifestation of the other risk categories considered.

In addition to the above-mentioned information, if the stress-test scenario comes true, the respective bank should increase its capital with minimum 213 million EUR (+8.9%), so as to have a solvency indicator of minimum 8%, and with 730 million EUR (+30.5%), so as to have its solvency level at a proper level (10%).

4. Conclusions

We believe that the periodic application of stress-test scenarios must be an integral part of a bank's risk and management culture because they can provide potential risk exposure assessments and support the capital planning and the defining of alternative liquidity plans.

They can increase the endurance of banks and of the financial system when faced with financial crises especially during stability/economic growth periods, when, due to the lack of important risks, banks may not be aware of the major impact crisis may have upon their financial stability and may accept higher risks exposures more easily and with lower prices.

The importance of the stress-test was revealed by the amplitude and duration of the ongoing financial crisis; in the same time, the need of improving their effectiveness is driven by the fact that the crisis has overall proven to be much more severe in terms of amplitude than the worst scenarios of many crisis simulation systems.

We also presented a stress-test simulation for a commercial bank, by assessing the impact that the deterioration of the main macroeconomic indicators might have upon a bank's exposure to credit, FX, liquidity, interest, operational and market risks, as well as upon its capital requirements, credit risk provisions, the profit and loss account and the structure of the balance sheet of that bank.

In conclusion, if the stress-test scenario comes true, the analyzed bank will register losses due to the manifestation of banking risks worth 1,111 million EUR (significantly affecting the bank, as it represents its profit for approximative two years prior to the onset of the crisis) and will have to increase its own capitals with 730 million EUR (which represent approximative 67% from the volume of the bank's existing equity).

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