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**THE THIRD WAVE OF THE FINANCIAL CRISIS AND ITS RIPPLE
EFFECTS ON THE DETERIORATION RISK OF ROMANIAN
BANKING SECTOR'S PERFORMANCE**

***Abstract.** In the first two stages of the international financial turmoil, the Romanian banking system was not directly hit by its ripple effects. The aim of this paper is to gauge the potential impact of risks induced by the likely worsening of the domestic economic environment on the Romanian banking sector stability as a result of the third wave of the global financial crisis. The analysis is centered upon an econometric model which quantifies the rating downgrade probability in respect of credit institutions. The results derived from the model pinpoint that, in 2009, even though the majority of Romanian banking system's assets is associated with a small rating downgrade probability, the expected dynamics of the weight of nonperforming banking assets slipped into positive territory towards the end of the period under review. Estimations for end-2010 prepared under a multifactor hypothetic scenario of a hard landing of the Romanian economy in 2009 show that the credit institutions' performance might turn bad enough so that approximately 12 percent of banking system assets could be subject to rating downgrades.*

Keywords: global financial crisis, banking sector stability, early warning systems, rating downgrade probability, Basel II.

JEL classification: G21, G32, G33

INTRODUCTION

Successive securitization rounds, with impeccable ratings in those days, of housing loans packages ensured financing for an increasing number of highly risky mortgage loans, thereby fuelling the illusion of the growth trend that had started in the mid-80s to continue in the US. At the same time, the new securities arising from this financial innovation nurtured hopes of easy profits for the global investors in search of avenues to maximize excess liquidity, a feature of the world's financial market only several years ago.

Speaking either of ungrounded expectations on US housing market growth or inadequate assessment of the quality of securitized mortgage loans packages, the academic approach to the pathology of the ongoing financial crisis is the faulty processing of fundamental information about the value of some assets (Noyer 2008). The first wave of the financial crisis proved that assets valued at USD 1.5 trillion were worth less than USD 900 billion (Birchler 2008), as reputed financial institutions announced successive percentage decreases in their asset value. The relatively small size of the subprime market compared to global financial market depth, the high diversification of nonperforming securities holdings among investors and the reasonable affordability of recapitalization solutions until mid-2008 cushioned somewhat the effects of the first wave of the crisis on the quality of banking assets so that financial institutions could further carry out their day-to-day activity. However, investor sentiment gradually worsened and global financial market woes expanded.

An in-depth review of the crisis highlighted the propensity of the human factor to speculate market trends by making reference to professional ethics (Friedman 2008) as well as to the faded action taken by the authorities in identifying and preventing the build-up of vulnerabilities amid a poor understanding of securitization risks. The increase in investors' risk aversion, along with the pick-up in short selling of financial assets, entailed the second wave of the financial crisis. The response of capital market supervisors that moved to freeze short selling transactions involving the securities issued by financial institutions in distress did little to alleviate financial market participants' fears. The actions undertaken by panic-stricken investors also contaminated other debt instruments resulting from securitization operations (Caballero et al. 2008), with the turmoil engulfing more and more markets. Against this background, the losses incurred from the first wave of the crisis, which was equivalent to roughly four percent of the US financial market capitalization, evolved in tens of percentages loss for the global financial market capitalization. Markets' failure to provide a quick response to the challenges arising from the crisis multiplied the percent of impaired assets held by banks with substantial investments in financial securities, and the number of institutions on the brink of bankruptcy rose at a rapid pace. The state-of-affairs on financial markets worsened significantly and many banks

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were forced to retrench their lending activity considerably in order to stay afloat. The manner in which financial institutions played their part in the economy deteriorated swiftly and its impact on the economy's functioning became increasingly salient in developed countries.

The traditional nature of banking in emerging economies as it is the case of Romania, with a small share of investments in financial securities in total assets of credit institutions, allowed financial markets in these economies to perform surprisingly well during the first two stages of the global financial crisis (Trichet 2008). Over the past few years, trading portfolios in the Romanian banking system accounted for less than 3 percent of total investments. In addition, Romanian credit institutions did not hold in their portfolios 'toxic assets' arising from the securitization of subprime credit packages (Isarescu 2008), which caused the ripple effects of the first two stages of the global financial crisis to be confined to the additional interest costs occasioned by the costlier foreign resources amid the foreign creditors' broader perceptions according to which the risk of emerging market financing is increasing markedly.

Uncertainties were heightened once the recession that held advanced economies in its grip passed through to emerging markets during the third wave of the international financial crisis. The worsening of the global financial and macroeconomic climate put pressure on the local economy, and Romania is no exception. The deterioration of exporters' outlets, the reduction in the volume of foreign direct investment and the increase in revenues repatriated by such investors could squeeze financial resources that could be otherwise used for bank loan repayment. At the same time, foreign investor portfolio shifts or book squaring by the investors battered by the liquidity crunch led to a drop in economy-wide liquid funds and to stronger depreciation pressure on the domestic currency.

The measures taken by public authorities, e.g. in Austria and France, took some steam off the concerns on liquidity affordability at the level of local subsidiaries of parent undertakings. They were backed by the National Bank of Romania's decision to lower by 2 percentage points the reserve ratio on domestic currency-denominated liabilities. The coverage for guaranteed bank deposits was raised in line with European developments while the central bank intervened in the forex market to stem a speculative attack on the *leu*. On the other hand, as illustrated by the recent sovereign rating downgrades announced by Standard and Poor's and Fitch IBCA credit reference agencies, foreign market participants became increasingly wary of the Romanian banking system capability to withstand a hard landing of the economy, similar to the one that played havoc in Latvia and Hungary.

In this context, the aim of this paper is to gauge the potential impact of risks induced by the likely worsening of the domestic economic environment on the Romanian banking sector stability as a result of the third wave of the global financial crisis. The

operational aim is to outline the functional relationship between the macroeconomic picture and the performance of credit institutions in Romania by developing an early warning system for credit institutions whose financial standing is getting worse. This endeavor is based on the objective of devising an econometric model which quantifies the rating downgrade probability for credit institutions, estimated and tested consistent with the requirements of Basel II Accord.

The study contains four sections and it ends with conclusions and future analysis directions. The first section explores the methodology underlying the system for predicting CAMEL rating worsening events starting from the technical elements regarding the estimation of the statistical model which quantifies the rating downgrade probability. The second section deals with the scenario and data employed, and provides a detailed description of the micro-prudential information and the macroeconomic variables employed. The third section gives an overview of the key empirical issues on preparing and testing the statistical model quantifying the CAMEL rating downgrade probability. The fourth section examines the results of predictions for 2009 on the likely performance of credit institutions in Romania, as well as its sensitivity during 2010 to macroeconomic slippages that might occur this year.

I. Methodology underlying the system for predicting CAMEL rating worsening events

One of the major objectives of central banks is to prevent systemic risk by pursuing an efficient bank oversight, which is capable of helping achieve financial system stability. With this end in view, such entities developed procedures and instruments for the ongoing supervision and assessment of banks' financial position. In this vein, rating and early warning systems are noteworthy.

Supervisory authorities all over the world recognized the strengths of rating systems, a fact also proven by their extensive use in preventing systemic risk. By distinguishing between viable and unviable credit institutions, the bank rating allows improved allocation of the limited resources belonging to the supervisory authority in order to avoid isolate imbalances to pass through to the system as a whole.

Nonetheless, bank rating methodologies employed by the supervisory authorities consist mainly in expert systems using exclusively micro-prudential data and providing assessments only for the period under review, without any signals on future developments. Therefore, *ex-post* results should be supplemented by information from predicting instruments, which incorporates macroeconomic data as well. Such systems

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leave more room for maneuver to supervisors in taking the necessary measures, particularly prior to a recessionary episode.

Special attention is paid to the improvement of the quality of bank inspections by developing underlying systems that may assist supervisors in the early identification of potential unfavorable trends in a bank's activity, which might lead to serious problems in the future (Bichi et al 2003). Traditionally, these trends include issues such as adverse changes of some profitability variables, the significant deterioration of market share and the worsening of financial indicators as against their previous levels or compared to those set for the peer group. Recent studies have emphasized the sophisticated systems using econometric techniques for estimating the likelihood of bankruptcy or the rating downgrade probability. Based upon the information provided by such instruments, on-site inspections with specific targets are conducted, when necessary, or in case of general examinations, which are conducted on a regular basis, the priorities are ranked. Thus, early warning systems for the deteriorating performance of credit institutions allow a higher efficacy of bank inspections and a better management of the limited resources available to the prudential control authorities.

The role of the micro-prudential early warning system (EWS) is to provide *ex ante* signals on potential financial distress of credit institutions based on their financial statements and the current macroeconomic climate. EWS devices used by central banks or supervisory authorities combine qualitative and quantitative analysis in different proportions. Starting in the '90s, quantitative methods have increasingly gained ground to become the main methodological component of early warning systems. Among those, the most popular systems in the dedicated practice are aimed at estimating the likelihood of bankruptcy or the rating downgrade probability (Jagtiani et al 2003) by resorting to *logit/probit* regressions or duration models. The distinction between insolvency or rating downgrade events and those of solvency or stable/upgrade rating is often made on the basis of a single alarm threshold, the level of which is set so as to maximize model performance or lead to a desired value of the ratio of non-identified events and false alarms. Moreover, the recent requirements regarding the rating scale granularity set forth in the Basel II Accord (BCBS 2004) suggest that the use of only one alarm threshold is no longer state of the art in the field. The solution would be to put in place a rating scale large enough to encompass a variety of risk classes.

In principle, a mechanism able to predict a rating downgrade is based on a model which quantifies the deterioration risk probability relative to a credit institution's performance over a certain time horizon. The interest in using such an approach arises not only from its objective feature, but also from the possible automation of the assessment process. Another crucial issue is the rating scale, which ensures a good

segmentation of rating downgrade risk and, hence, a proper understanding of the signal conveyed by the statistical model (Moinescu 2007).

In order to develop such an instrument for early identification of the CAMEL bank rating downgrade events we have applied a *logit* approach which is able to predict the rating downgrade for a period of exactly one year in advance¹. The endogenous variable is binary and it discriminates between rating downgrade events and rating upgrade or maintaining events in a time horizon of one year. Conventionally, we assign zero value to the dependent variable when the rating is improved or remains stable and the value of one when the rating is downgraded over 12 months. The set of exogenous variables includes both micro-prudential information and macroeconomic elements. The selection of relevant variables has been made according to economic literature and the recommendations of staff involved in the supervisory activity of a series of indicators and criteria to fulfill. They were empirically tested and eventually only those variables having statistical significance were employed. The estimation methodology has the following model design:

$$DP_{i,t} = \frac{1}{1 + e^{-[\alpha + \sum \beta_i \times Micro_{i,t-1} + \sum \delta_j \times Macro_{j,t-1}]}}$$

From the supervision activity perspective, the estimated *logit* regression functional role is to provide the score (theoretical downgrade probability) based on which the banks are rated. The approach employed is that of traffic light approach, as the rating scale features four rating downgrade risk classes. The criteria for selecting the thresholds that delineate bank categories are based on Basel II requirements on the statistical performance of internal models for credit risk. The aim is to obtain a reasonable and time-consistent accuracy both of the credit institutions' rating procedure and the significant discrimination between rating downgrade probability and rating scale granularity.

II. Scenarios and data

As already mentioned above, the aim of this study is to assess the implications of a possible worsening of the domestic economic environment on the deterioration risk of the Romanian banking sector's performance. In this vein, two macroeconomic scenarios were used for 2009, namely a probable one that describes a soft landing and a severe one care that describes a potential hard landing (see Table 1).

¹ The possibility of developing a model to predict bank insolvency in Romania by using solely data on the local banking system is ruled out due to the small number of bank defaults and the heterogeneity of their causal factors.

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Table 1. Macroeconomic scenarios for 2009

Considered scenario	Unemployment rate	Interest rate on loans to non-government customers	Exchange rate (against the euro)	Gross wage, economy-wide
Soft landing	+1.50 pp	0.00 pp	+15 percent	+8 percent
Hard landing	+4.00 pp	-1.50 pp	+30 percent	-10 percent

Data for estimating the scoring function cover the period December 1999-June 2007 and those for testing cover the period July 2007 - December 2007. The forecast for 2009 is made based on 2008 figures whereas the estimates for 2010 rely on the two macroeconomic scenarios mentioned above by using the assumption that the individual risk profile remains unchanged.

The data sample used in order to develop the CAMEL rating downgrade prediction model is a panel of 31 credit institutions having Romanian legal personality. Mortgage banks and branches of foreign credit institutions were left out of this sample.

Box 1 – CAMEL Rating System

The uniform bank rating system CAMEL relies on the assessment of six components reflecting in a uniform and comprehensive manner the bank's performance, consistent with bank legislation and regulations in force. The specific components of the process for assessing the safety and soundness of credit institutions are capital adequacy (solvency rate, leverage ratio, the ratio of tier-one capital in total share capital), shareholders' quality, assets quality (the share of doubtful and past-due claims in total loan portfolio, the ratio of loans and related interest classified under "substandard", "doubtful" and "loss" and total loans and related interest classified, provisions coverage of loans classified under "substandard", "doubtful" and "loss"), management quality, profitability (return on assets, cost-income ratio, the ratio of net interest income and operational income) and liquidity (the loans/deposits ratio, liquid asset ratio). Each bank is assigned a rating from one to five for every indicator. The final step is to calculate a composite rating and a finale score representing the total scoring for the indicators defining the CAMEL elements.

The original set of candidate variables comprised around 20 elements, i.e. the prudential indicators covering the criteria traditionally employed in analyzing bank performance and the macroeconomic variables deemed relevant from the perspective of early warning of bank distress events (see Table 2). The main micro-prudential data categories used in the univariate analysis are (a) solvency indicators, (b) profitability indicators, (c) liquidity indicators, (d) asset quality indicators, (e) indicators on the credit institution's market share, and (f) the rating assigned by the supervisory authority. Along with these data, a set of basic macroeconomic variables was tested, covering the issues relating to (a) economic growth (using as a proxy the year-on-year change in the industrial production index), (b) unemployment rate, (c) whole-economy

gross average wage, (d) exchange rate, (e) inflation rate and (f) (domestic and external) interest rates.

Table 2 – List of main exogenous variables

Candidate variables	Expected sign	Empirical result
Micro-prudential data		
Leverage ratio	-	N
Solvency ratio	-	N
Share of doubtful and past-due claims in total assets	+	+
General risk ratio	+	+
Annual growth rate of loan portfolio	+	- / +
Share of credit to non-government in total assets	+	N
Cost efficiency indicator	+	+
Core business profitability ratio	-	-
Net profit ratio	-	-
Share of personnel costs in total expenditures	-	-
Loans/deposits ratio	+	N
Credit market share	-	-
Market share in terms of asset size	-	-
CAMEL rating	-	-
Macroeconomic indicators		
Industrial production (<i>percentage points change</i>)	-	- / +
Unemployment rate (<i>percentage points change</i>)	+	+
Gross wage, economy-wide (<i>percentage change</i>)	-	-
RON/EUR exchange rate (<i>percentage change</i>)	+	+
RON/USD exchange rate (<i>percentage change</i>)	+	- / +
Inflation rate	+	-
Average interest rate on credit to non-government	-	-
12-month EURIBOR (<i>percentage points change</i>)	+	- / +

A paramount criterion is the CAMEL rating at the time of making the prediction, as it summarizes the entire information contained in the constituent indicators. Assuming that in order to be able to maintain a good rating overall, a bank should strive to keep all its individual ratings (by component) at a high level², the lower (better) the current rating, the more likely the worsening, and the expected sign of the attached coefficient is “-”. This rationale is confirmed by the empirical result. Another significant variable is the market share, according to the loan portfolio value or the assets of every credit institution. It illustrates the reputation of a bank among its customers, as the entities

² Composite rating 1 or 2 can be assigned to banks only if all the components recorded ratings higher than 3, which means that for the rating to be maintained at level 1 or 2 sustained efforts are needed to preserve the ratings of all components.

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with a large share on the credit market register fewer rating downgrade events than those with a small share. Thus, a large share on the credit market, *ceteris paribus*, reduces the actual rating downgrade probability, and the sign of the attached coefficient for this variable will be “-”. At the same time, an increase in the share of non-performing loans to total assets generates a potential rating worsening. The larger the volume of doubtful and past-due loans in a bank’s portfolio, the higher the likelihood of doubtful losses becoming certain and, therefore, the credit institution’s financial performance deteriorating. In the same sense operates the general risk rate or the cost efficiency indicator. Profitability indicators have a negative bearing on the credit institutions’ rating downgrade probability, the low levels of both the net profit ratio and the core business profitability ratio being associated with CAMEL rating worsening events.

Among the macroeconomic variables, unemployment rate and exchange rate have an unfavorable bearing on the rating downgrade probability by the negative impact of a higher unemployment rate and a weaker currency on the performance of a credit institution. Furthermore, an increase in whole-economy average wages, along with a raise of the average interest rate on credit to non-government, gives a boost to institutions’ capability of generating income and hence entails a lower CAMEL rating downgrade probability.

Univariate statistical analyses reveal that both solvency indicators and liquidity indicators highlighted thus far a negligible amount of information for explaining the rating downgrade phenomenon. At the same time, the developments of industrial production, the USD/RON exchange rate and external interest rates had an inconsistent bearing. As surprising as it may be, inflation rate was found to have negative impact on the rating downgrade probability after using a one-year lag.

III. Empirical aspects on developing and testing the statistical model quantifying the CAMEL rating downgrade probability

After performing multivariate tests, **four micro-prudential variables and four macroeconomic variables** were retained for further analysis, as follows: (i) *the bank rating for the period in which the analysis is performed (B_RATING)*; (ii) *the market share of the loan portfolio (B_LOAN_SHARE)*; (iii) *the share of non-performing loans in total assets (B_NPL)*; (iv) *net profit ratio (B_NPR)*; (v) *annual change in percentage points of the unemployment rate (M_UNEMPLOYMENT)*; (vi) *annual change in percentage points of the interest rate on loans to non-government customers (M_IRC)*; (vii) *annual percentage change of the nominal exchange rate of the leu versus the euro (M_ER_EUR)*; (viii) *annual percentage change of the whole-economy gross average wage (M_GAW)*. Despite their good predictive power for CAMEL

rating downgrade events, micro-prudential indicators such as the market share in terms of asset size, core business profitability ratio and the cost efficiency indicator were removed from the final regression after applying the stepwise procedure. The first indicator is highly correlated with the variable describing the share on the credit market whereas the latter two are strongly linked to the net profit rate. Thus, most of the information provided by the excluded indicators is covered by the variables still included in the model, given that the predictive power of the multivariate regression is significantly higher.

Using the eight criteria to estimate the polynomial *logit* regression, the result obtained following the tests on the training sample resembles those obtained in other studies that modeled the credit institutions' performance (see Table 3).

Table 3. Rating downgrade model estimation results

Variables	Coefficient	Standard Error	z-Statistic	Probability
B_RATING	-2.665725	0.209579	-12.71943	0.0000
B_LOAN_SHARE	-42.48196	7.197608	-5.902233	0.0000
B_NPL	22.88246	6.929246	3.302301	0.0010
B_NPR	-2.010035	0.448984	-4.476853	0.0000
M_UNEMPLOYMENT	0.289042	0.050617	5.710323	0.0000
M_IRC	-0.038661	0.012017	-3.217285	0.0013
M_ER_EUR	1.132832	0.611718	1.851887	0.0640
M_GAW	-1.759181	0.762009	-2.308610	0.0210
C	5.225787	0.557513	9.373388	0.0000
McFadden R ²	0.26613	Non-downgrade observations		1,987
Akaike info criterion	0.62563	Downgrade observations		348
Schwarz criterion	0.64782	Total observations		2,335

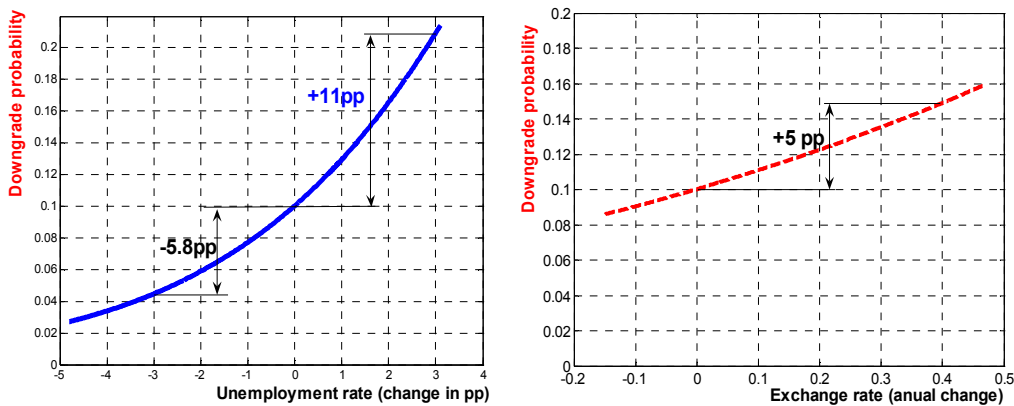
Statistical test values relative to the training sample are indicative of the fact that the obtained model is in line with the requirements of a good econometric performance. The coefficients are statistically significant and their signs are in accordance with economic theory. A special case relates to the interest rate on credit to non-government, its adjustment having a negative impact on the CAMEL rating in the following year. The result reflects the capability of most credit institutions to capitalize upon higher interest rates by applying to the net interest income an increase slightly greater than that of provision expenses as a result of poorer asset quality. Other variables having a negative impact on the rating downgrade probability are the current rating, the credit market share, profit ratio, the changes in both interest rate and whole-economy gross average wage, whereas the share of doubtful and past-due loans in total

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assets, and the movements in exchange rate and unemployment rate have a positive influence on such an event.

Sensitivity tests performed on the basis of the estimated model suggest that rating downgrade probability in relation to credit institutions in Romania reacts especially to the changes in every bank's risk profile. Macroeconomic developments produce a heterogeneous and considerably lower impact on the credit institutions' performance than individual factors amid relatively low financial intermediation. In this context, the macroeconomic indicators weighing heavily on the rating downgrade probability are unemployment rate and exchange rate changes (see Chart 1).

Chart 1 – Downgrade probability sensitivity to macroeconomic developments



Considering a credit institution whose individual features, according to model estimations, lead to a rating downgrade probability of 10 percent in a stable macroeconomic environment (zero change in macroeconomic factors), a potential 3 percentage point hike in unemployment rate could induce an 11 percentage point increase in the rating downgrade probability. Under the same original conditions, a massive depreciation by 40 percent in the exchange rate would increase the rating downgrade probability by 5 percentage points.

The reasonable accuracy of the predictions incorporated in the model assessing the rating downgrade probability is ensured by the scoring function performance, in terms of discriminatory power, stability and adequate calibration of its estimates. The discriminatory power has been tested both for observations included in the period for estimating the scoring function (December 1999 – June 2007) and those of the subsequent period (July 2007 – December 2007). In this vein, we have used ROC curve and the area under ROC (AUROC).

The results show high values of the AUROC indicator for the two periods under review, i.e. 84.1 percent for the estimation period and 82.6 percent for the subsequent period (out of time). This performance allows us to reach a level of 83.4 percent when the entire sample is put to test (see Chart 2), a value significantly higher than the 75 percent threshold which is considered the benchmark. In addition, the numerical results mentioned above are confirmed by the shape of the ROC curve. The concavity of the ROC curve highlights the fact that the selected variables have a discriminatory power large enough to ensure that the model in its entirety can provide a good ranking of banks, based on their rating downgrade probability. Thus, the model is successful in concentrating the majority of downgrading cases in the riskiest classes, while the curvature of the ROC test tends to near the unit square margins; in fact, the concavity of the ROC curve is equivalent to highly informational content scores, being a decreasing function.

The assessment of the stability of this performance has been done by estimating the confidence interval of the area under the ROC curve indicator (AUROC), running the bootstrap procedure with 200 iterations.

The results indicate that the model's ability to *ex-ante* discriminate between CAMEL downgrade and non-downgrade events remains strong for all the 200 random re-samplings, the quantiles of 97.5 percent and 2.5 percent being of 85.4 percent and 82.9 percent respectively (see Chart 3).

Chart 2 – ROC curve
(December 1999 – December 2007)

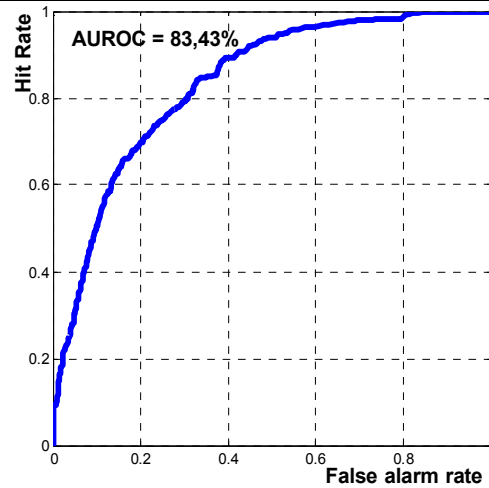
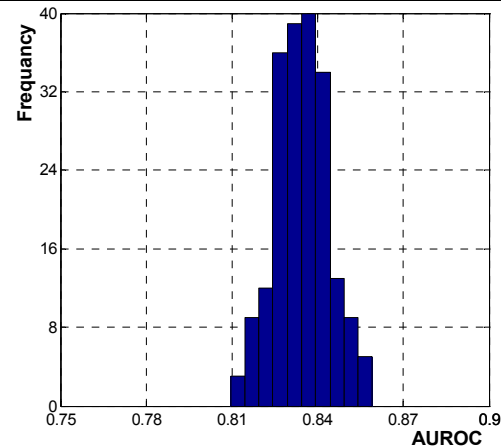


Chart 3 – AUROC histogram

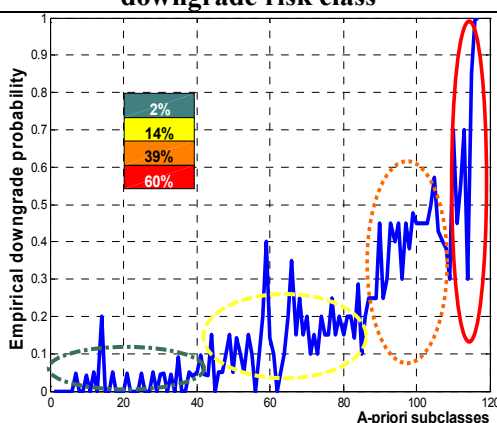


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Forecasting CAMEL rating downgrade events based on the estimated scoring function requires setting the value of the alarm threshold and calibrating the rating scale, namely the rating downgrade risk classes.

Having theoretical probabilities and the vector of rating downgrade events as a starting point, four rating downgrade risk classes have resulted. The criteria employed here were the homogeneity of events in the same category and the discrimination of empirical CAMEL rating downgrade probability between the different risk classes. The empirical values for the rating downgrade probability³ assigned to each risk class⁴ are set out in Chart 4.

Chart 4 – Segmentation by rating downgrade risk class



Thus, there is a chance in eight that a bank with a score ranging between 0.04 and 0.24 will be assigned a weaker rating over a time horizon of one year, bearing in mind that only 14 percent of banks classified under “yellow” code recorded a CAMEL rating downgrade. On the other hand, **“Yellow” code is a medium risk class**, taking into account that its empirical probability signals a level close to the unconditional downgrade probability⁵ seen in the whole data sample. At the same time, “green” code may be regarded as a low rating downgrade risk class while “orange” and “red” codes can be considered as implying an increased risk of a downgrade.

The four risk classes of the rating scale allow the analysis of risks associated with the Romanian banking system stability based on the breakdown of banking assets consistent with the downgrade probability forecast. The traffic light approach also favors an in-depth assessment of the credit institutions’ performance migration amid a potential worsening of the macroeconomic environment.

³ The empirical rating downgrade probability is the share of debtors in default in the total number of debtors of a risk class.

⁴ Pursuant to the requirements laid down in para. 446 of the Basel II Accord (BCBS 2004), namely the fact that a rating system should include a rating scale for debtors, in order to exclusively reflect the measurement of their probability of default.

⁵ Unconditional probability refers to the mean of the dependent variable for the whole sample. In our case, the dependent variable took the value 0 in 2,086 cases and 1 in 463 cases, i.e. a weight of 83.14 percent in the former case and 16.86 percent in the latter.

IV. Results of the CAMEL rating downgrade events forecasting system

Applying the above-described CAMEL rating downgrade events forecasting system to the data available for 2008, the breakdown of banking assets forecasted in terms of downgrade probabilities estimated for the period March – December 2009 is dominated by the concentration of credit institutions in the low rating downgrade risk category (see Table 4).

Table 4. Breakdown of banking assets by downgrade probability

Share in assets	March 2009	June 2009	September 2009	December 2009
“Green” code	94.88%	92.49%	91.75%	85.87%
“Yellow” code	3.41%	7.02%	7.77%	11.95%
“Orange” code	0.90%	0.00%	0.00%	1.69%
“Red” code	0.69%	0.37%	0.37%	0.37%
Expected downgrade	2.78%	2.70%	2.79%	3.94%

The share of assets classified under “Green” code declined in the run-up to year-end 2009, pointing to a moderate deterioration of bank performance, against the backdrop of weak macroeconomic developments in 2008 Q4. At the same time, estimations show a rise in the share of credit institutions with a medium risk of rating downgrade. Only four entities – three small-sized and a medium-sized one – have a high rating downgrade risk in 2009, but none of them reported a CAMEL rating lower than 3 in 2008.

These developments entailed an increase in the expected value of the share of impaired banking assets⁶ towards 4 percent at end-2009. The systemic nature of the migration to higher-risk areas is enhanced by the increase in median value of the set of estimated downgrade probabilities, given the reduction in their standard deviation (see Table 5).

Table 5. Statistics on rating downgrade probability

Rating downgrade probability	March 2009	June 2009	September 2009	December 2009
Median value	2.25%	2.71%	2.70%	3.40%
Standard deviation	22.89%	18.23%	17.73%	16.47%

⁶ The expected value of the share of impaired banking assets is calculated as a weighted average of the market share of each risk class by the empiric probability of estimated downgrade.

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The results of the analysis do not suggest any notable events relative to the Romanian banking sector stability throughout 2009, provided that banking fundamentals, those related to external financing in particular, remain unchanged. The forecast for end-2010 is fraught with heightened uncertainties. Even if the individual risk profile⁷ is left unchanged during 2009, the soft landing scenario for the Romanian economy in 2009 induces a substantial migration of credit institutions to higher-risk classes (see Table 6).

Table 6. Breakdown of banking assets at end-2010

Considered scenario	“Green” code	“Yellow” code	“Orange” code	“Red” code	Expected downgrade
Soft landing	64.07%	29.69%	5.75%	0.37%	7.66%
Hard landing	43.47%	47.89%	2.40%	6.12%	12.02%

Assessment of the rating downgrade probability amid a soft landing of the Romanian economy (scenario 1) underscores the moderate increase in the risk that credit institutions’ performance might get worse, with the share of assets classified under the riskier classes reaching as high as 6 percent. At the same time, about 30 percent of Romanian banking system assets could be in for a medium downgrade risk whereas 64 percent would remain in the low risk class. **These estimations induce the rise in the expected value of the share of impaired banking assets to as high as 8 percent at end-2010.**

The state of affairs becomes even more critical assuming that a hard landing of the Romanian economy occurred during 2009 (scenario 2). Against the background of such an extreme scenario, the risk attached to nine credit institutions could shift markedly to the higher-risk class, where the rating downgrade probabilities are upwards of 24 percent. At the same time, five of the low-risk banks might fall into the medium risk class. Thus, **expected value of the share of impaired banking assets expands to 12 percent, taking the banking sector in the waiting room to systemic instability.** The Romanian banking system’s ability to adequately play its role would be tremendously contained by the aggravation of liquidity indicators of credit institutions which will face a higher volume of overdue loans in terms of value, along with more foreign creditors seeking to avoid rollover of loans granted to local banks.

⁷ except the four credit institutions with a high downgrade risk for which the rating for end-2009 was lowered by one notch.

CONCLUSIONS

The global financial crisis enhances the risk of a worsening of Romanian banking sector's performance chiefly through its impact on the real economy. Worsening of the domestic economic environment against the backdrop of lower export volume, the poor performance of the construction sector and the build-up in arrears, coupled with the hike in interest rates and the depreciation of the domestic currency, have depressed the repayment capacity of both companies and individuals that were granted loans by banks. At the same time, resident creditors of the Romanian banking system could face a smaller number of saving opportunities, which could act as a deterrent on the outlook for the bank lending to keep expanding in Romania and make external financing tighter, which means both dearer and less available.

The novelty of this paper consists in the quantitative assessment of the impact that the worsening of the domestic macroeconomic landscape could have on the Romanian credit institutions' performance, on the basis of an econometric model which quantifies the rating downgrade probability in respect of credit institutions. Sensitivity tests performed on the basis of the estimated model suggest that rating downgrade probability for credit institutions in Romania reacts especially to the changes in every bank's risk profile. Macroeconomic developments have in the near run a heterogeneous and considerably lower impact on the credit institutions' performance than individual factors amid relatively low financial intermediation. The macroeconomic indicators weighing heavily on the rating downgrade probability are unemployment rate and exchange rate changes.

Following the running of the model, the results obtained for 2009 reveal that the **worsening of the macroeconomic climate will be reflected marginally by the credit institutions' performance throughout the year**, given the prioritization of both corporate and retail customers in repaying bank loans rather than discharging their debts owed to other creditors. Banks are more efficient in collecting their own claims than the state and companies, so that the contagion effects of a weaker macroeconomic environment would rather be reflected all through 2009 by budgetary receipts and inter-company arrears.

This is also borne out by the preventive steps taken by credit institutions in Romania which started adjusting their own activities in 2008 Q4 in terms of both financial intermediation operations and risk management. In regard to financial intermediation, special mention deserves the swift slowdown in the lending growth rate, alongside the increase in banks' interest margins so that such entities may cover the anticipated additional loss from asset quality through an increase in net interest income given the worsening of the macroeconomic climate. As for risk management, the key developments include tougher requirements in creating the customer base following

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the implementation of the new prudential regulations issued by the National Bank of Romania to contain exposures from household overly-high indebtedness. Also worth mentioning are the strengthening of outstanding debt collection departments (by changing the destination of part of the resources initially earmarked for loan sales sections) and attaching more attention to liquidity risk management, including by improving contingency plans in regard to treasury operations.

Such comments at systemic level do not rule out however the likelihood of insulated cases of liquidity straits which, provided that they are approached on a case-by-case basis, including by making recourse to the central bank's lender-of-last-resort function could avoid putting further pressure on an already hypersensitive interbank market. At the same time, target groups on eligible customers qualifying for being granted bank loans should shift their focus of attention towards small- and medium-sized enterprises which have the potential of attracting EU funds to develop activities in productive sectors relevant to narrowing the current account deficit. Sticking to bank strategies centered upon extending loans to individuals in particular would only fuel the ongoing spiral of macroeconomic imbalances, either the wide current account gap or the excessive budget deficit.

The forecast for end-2010 is fraught with heightened uncertainties. Even if the individual risk profile is left unchanged during 2009, the soft landing scenario for the Romanian economy in 2009 induces a substantial migration of credit institutions to higher-risk classes. In case the hard landing scenario for the Romanian economy materializes, impaired assets would account for as much as 12 percent of total banking assets, **which would take the banking sector in the waiting room to systemic instability in the absence of measures to mitigate liquidity risk**. A gradual cut in the minimum reserve ratio relating to domestic currency-denominated deposits combined with case-by-case solutions to ensure liquidity injections for cash-strapped banks or to secure government-backed interbank transactions could preclude the need of taking stern measures such as bank capitalization from public money or buying impaired assets through government spending in 2010.

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