Are Croatian Banks Ready for Pass on AIRB Approach?

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Abstract—**This paper presents banks' fulfillment of preconditions for application on advanced internal rating based approach (AIRB). We investigated the level of qualitative and quantitative preconditions matched by Croatian banks in order to reveal readiness of Croatian banks for AIRB application. Results of the test on assumed value of proportion show that the majority of Croatian banks don't fulfill qualitative and quantitative preconditions for AIRB. Furthermore, according to the document of Public disclosures on solvency requirements that banks are obliged to disclose on their web sites, all Croatian banks are applying standardized approach for credit risk estimation. The main goal of credit risk management is to maximize a bank's risk-adjusted rate of return by maintaining credit risk exposure within acceptable parameters. That is why banks need to manage the credit risk inherent in the entire portfolio as well as the risk in individual credits. Since exposure to credit risk continues to be the leading source of problems in all banks, the effective credit risk management is a crucial component of a comprehensive approach to risk management and essential for long-term success of all credit institutions. Nevertheless, more sophisticated methods of credit risk estimation are needed in order to adjust the level of regulatory capital with the risk profile of banks which leads to strengthening of financial system on local as well as on global level. Our paper thus provides analysis of preconditions fulfilled by Croatian banks.**

Index Terms—**AIRB, credit risk, qualitative preconditions, quantitative preconditions.**

I. INTRODUCTION

According to available information from the document of Public disclosures on solvency requirements that banks are obliged to disclose on their web sites, all Croatian banks are applying standardized approach for credit risk estimation. The main reason for that is that there is majority of small banks in Croatia [1] and there are just six large banks in Croatian banking system. For small banks it is just too expensive to implement internal ratings for credit risk management because the costs of its implementation would exceed its benefits. Just two of six large banks in Croatia are in the preparation process for internal ratings based approach (empirical research). In order to apply internal ratings based approach, i.e. advanced internal ratings based approach there is a set of qualitative and quantitative preconditions that has to be fulfilled according to supervisor's requirements. In Republic of Croatia, Croatian national bank has the role of banks' supervisor. The main hypothesis of this paper is: In

Croatian banks there are fulfilled qualitative and quantitative preconditions for passing from standardized approach to advanced internal ratings based approach. Because the final format of Basel II standard has been disclosed in 2004, Croatian banks have had enough time to take into account all its assumptions. Principally it is about key components needed for credit risk estimation. The main problem for small banks is that they do not dispose with enough historical data which complicates construction of database for credit risk estimation. The above hypothesis will be confirmed or refused by questionnaire method. In this research targeted population are all Croatian banks (31 of them) and research population is ten Croatian banks which is the result of returned questionnaires. The research was carried out from March till May 2012.

II. INTERNAL RATINGS BASED APPROACH

Internal ratings based approach is the main news from Basel II standard. By standardized approach all parameters needed for credit risk estimation are provided by external rating agencies, when banks, by internal ratings based approaches, are measuring key parameters inside a bank. In that way they can quantify key characteristics of credit capacity of their debtors when determining capital requirements. For every asset type under internal ratings based approach there are three key elements: credit risk components, risk weights and minimal capital requirements [2].

Key credit risk components are as follows [3]:
- Probability default,
- Loss-given default,
- Exposure at default and
- Maturity.

Those components have direct impact on the weighted assets calculation, i.e. on the capital requirements amount. That means that high amounts of those components implicate higher capital requirements and vice versa. For an IRB application, banks must have approval from supervisor according to which that approach can be introduced gradually through different categories of exposure.

A. Foundation Internal Ratings Based Approach (FIRB)

By this approach banks are estimating just one parameter – probability default, while other parameters are given by supervisor. For every exposure type banks are estimating, on the basis of historical data and statistical models, probability default (PD parameter) with the possibility of supervisor to define minimum amounts of that risk parameter for certain exposure types. For instance, according to Croatian national bank regulation minimum PD parameter for companies, institutions and citizens is 0.03%.

B. Advanced Internal Ratings Based Approach (AIRB)

By this approach all credit risk components are estimated inside of a bank. Banks that will use advanced internal ratings based approach will have maximum flexibility because almost all input data are estimated on their own. But for AIRB approach application banks must have data for loss-given default estimation as well as for exposure while the most of banks already have adequate data for probability default estimation. In that sense, banks should have data for certain time period for credit risk components estimation. For probability default that is two years for foundation approach and five years for advanced and for loss-given default and exposure that is seven, i.e. five years [4].

In order to pass on advanced internal ratings based approach, banks have to prove that they actually understand their risk exposures and that they understand mitigation techniques. Some of the encouragements for banks for AIRB approach introduction is profitability increase because it enables better risk and capital management.

III. QUALITATIVE AND QUANTITATIVE PRECONDITIONS FOR AIRB APPROACH APPLICATION

It is important to emphasize that Basel II allows banks to account with their own estimations of key risk parameters only if rigid qualitative and quantitative requirements are met. The accent is on the bank's ability to rank and quantify risk in consistently and confident way [5].

In Croatia, hence, the approval from Croatian national bank must be obtained which will be changed with the date of Croatia's entrance into European union. The reason is that then the responsible will be supervisor on consolidated basis which, regarding to ownership, in most cases would not be Croatian national bank.

Minimum preconditions that must be obtained by a bank for AIRB approach implementation are following:
- Development of documentary rating-system inside of which criteria and processes for rating, taking into account their risk characteristics, should be defined;
- Risk quantification in sense of risk parameters estimation (probability default, loss-given default and conversion factors). That estimation should include all relevant information, it should be based on empirical evidence and have materiality significance and also comprise certain conservatism level. When quantifying credit risk banks can use data from their own business or from external sources;
- Systematic data management (IT support), i.e. systemic analysis of available data and continuously estimation of data integrity, materiality and significance of available data;
- Development of stress test scenario where possible events or changes that could have unfavorable impact on institution's credit exposure should be identified. Also bank's own ability to bear through such changes should be estimated;
- Validation of internal estimations and models and corporate management and supervision that include

understanding and approval of all key components of rating systems and models.

Also, according to Basel II the application of IRB approach is possible just for those banks that meet certain qualitative and quantitative preconditions [6]:
- Designing allocation system – which imply quality distribution of bank's exposure through different risk levels without to high risk concentrations. According to Basel II, banks must have at least eight risk categories for allocation of its placements as well as clearly criteria for certain placements allocation into certain risk categories;
- Operational functioning - banks do not use AIRB approach just for credit approval process but also for credit price determining and credit risk management;
- Availability and quality of data - bank must use relevant data from internal or external sources which demands multiannual time series of data and also represents one of the biggest barriers for IRB approach application;
- System supervision and corporative management – all materially significant aspects of risk estimation process and rating determination must be approved.

IV. RESULTS OF EMPIRICAL RESEARCH ABOUT PRECONDITIONS FOR PASSING ON AIRB IN CROATIAN BANKS

The first question was about fulfillment of quantitative preconditions for passing on AIRB approach from standardized approach in Croatian banks. The answers from banks are as follows:

TABLE I: ANSWERS FROM CROATIAN BANKS ABOUT QUANTITATIVE PRECONDITIONS FULFILLMENT (AUTHORS EMPIRICAL RESEARCH)

Yes	30,00%
No	60,00%
Can't be evaluated	10,00%
Total	100,00%

TABLE II: Z TEST OF HYPOTHESIS FOR THE PROPORTION (AUTHORS)

Data		
Null Hypothesis	p =	0,5
Level of Significance		0,05
Number of Successes		3
Sample Size		9
Intermediate Calculation		
Sample Proportion		0,333333333
Standard Error		0,166666667
Z Test Statistic		-1
Upper-Tail Test		
Upper Critical Value		1,644853627
p-Value		0,841344746
Do not reject the null hypothesis		

It is assumed that the majority of banks have fulfilled quantitative preconditions for passing on AIRB. The test on assumed value of proportion in program PHStat2 is used. Test hypothesis are as follows:

$$H_0...p \leq 0,50$$
$$H_1...p > 0,50$$

With significance level of 5% zero hypothesis can't be rejected. Concrete, with that level of significance the majority of banks do not have fulfilled quantitative preconditions for passing on AIRB approach when measuring credit risk.

The second question was about qualitative preconditions fulfillment for passing on AIRB approach. The answers from banks are as follows:

TABLE III: ANSWERS FROM CROATIAN BANKS ABOUT QUALITATIVE PRECONDITIONS FULFILLMENT (AUTHORS EMPIRICAL RESEARCH)

Yes	40,00%
No	60,00%
Can't be evaluated	
Total	100,00%

It is assumed that the majority of banks have fulfilled qualitative preconditions for passing on AIRB. The test on assumed value of proportion in program PHStat2 is used. Test hypothesis are as follows:

$$H_0...p \leq 0,50$$
$$H_1...p > 0,50$$

TABLE IV: Z TEST OF HYPOTHESIS FOR THE PROPORTION (AUTHORS)

Data		
Null Hypothesis	p =	0,5
Level of Significance		0,05
Number of Successes		4
Sample Size		10
Intermediate Calculations		
Sample Proportion		0,4
Standard Error		0,158113883
Z Test Statistic		-0,63245553
Upper-Tail Test		
Upper Critical Value		1,644853627
p-Value		0,736455372
Do not reject the null hypothesis		

With significance level of 5% zero hypothesis can't be rejected. Concrete, with that level of significance the majority of banks do not have fulfilled qualitative preconditions for passing on AIRB approach when measuring credit risk.

V. CONCLUDING REMARKS

According to research results about level of qualitative and quantitative preconditions met by Croatian banks, set up hypothesis can't be confirmed. Concrete, in Croatian banks there are not fulfilled preconditions for passing from standardized approach to advanced internal ratings based

approach for credit risk measurement. Only three from ten banks have fulfilled quantitative preconditions and four from ten banks have fulfilled qualitative preconditions. Currently, all banks in Croatia are applying standardized approach according to information available on their web sites in the document of Public disclosures on solvency requirements. Regarding to the above mentioned there is a lot to do in Croatian banking system, i.e. Croatian banks regarding fulfillment of qualitative and quantitative preconditions needed for getting approval for AIRB approach from Croatian national bank. As long as Croatian banks are applying standardized approach, the level of regulatory capital can't be adjusted with the risk profile of banks. Regarding Croatian entrance in European Union in 2013, supervisor on consolidated basis will be responsible for application as well as for approval of internal ratings based approaches for banks that are operating in Croatia.

REFERENCES

[1] *Bilten o bankama nr 23*, Hrvatska narodna banka, 2011.
[2] M. Dimitrić, M. Kaštelan Mrak, and D. Škalamera-Alilović, "Internal Models for Risk Management in Banks – Implementation Possibilities in Croatia,'' *Economic Integrations, Competition and Cooperation*, Rijeka, pp. 4.
[3] Basel II International Convergence of Capital Measurementand Capital Standards: A Revised Framework – Comprehensive Version, BCBS, 2006.
[4] M. Varjačić, "Nova pravila upravljanja kreditnim rizikom banaka: The new basel capital accord–basel II," *Suvremeno poduzetništvo*, pp. 34-45, 2003.
[5] I. Martinjak, "Rezultati upitnika o novom Baselskom sporazumu o kapitalu,'' *Hrvatska narodna banka*, 2004.
[6] N. Šarlija. (2008). Rizici u bankama – Predavanja za kolegij Kreditna analiza. [Online]. *20(7)*. Available: http://www.scribd.com

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