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Comparison of Different Methods of Credit Risk Management of the Commercial Bank to Accelerate Lending Activities for SME Segment

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Abstract:

The contribution is dealing with selected assessments of the most important risk in the banking sector in the Czech Republic. The aim of this article was to quantify capital requirement for individual methodologies of credit risk management on the designed portfolio with corporate loans with use of collateral using collaterals as techniques to reduce credit risk of commercial bank. Firstly, the aim of this article is to quantify the capital requirements using the Internal Rating Based Approach with collateral usage. Afterwards, achieved results have been compared with the methodology of the Standardized Approach and Internal Based Approach. The article is highlighted aspects of transition to developed methods of Internal Rating Systems with significant savings on equity, which allows banks accelerate lending activities and so increase provided services for small-medium sized companies.

Key Words: *Standardized Based Approach, Foundation Internal Rating Based Approach, Probability of default, credit risk management*

JEL Classification: *G22, G18, G32*

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1. Introduction

Due to the fact that banks use huge amount of external financial sources in their business models (amount of these sources reached more than 95 %), it is necessary to adjust this area by some legislative framework. This legislative framework consisting primarily of the regulatory agreements of Basel III sets legal rules which govern the capital adequacy of banks. Therefore following rules have to be followed for establishing of the effective loans portfolio of commercial banks.

The aim of this article is to quantify capital requirements of the designed portfolios with corporate loans using selected approaches of credit risk management with variable types of collaterals. Next aim was to show possibilities how to potential mitigates capital requirements in the case of transition on sophisticated methods of credit risk management.

2. Literature review

According to McKinsey (Härle et al., 2010), the cost of additional capital due to implementation of Basel III within the current state of portfolio of European commercial banks are estimated at € 1,100 billion of additional Tier 1 capital, €1300 billion of short-term liquidity and €2300 billion of long-term resources. At the same time there is an estimation of a reduction in average ROE by 4% in the banking sector. According to authors, the transition to Basel III represents an impulse for banks which have not begun with improvements of their approaches for the optimal level of risk-weighted assets (RWA) yet, because these approaches make the capital and liquidity much less available and much more expensive. Certain solutions for banks (Härle *et al.*, 2010) could be seen in a reduction of the value of risk-weighted assets (RWA) within the credit risk management. In this context, banks are particularly concerned about the loss of capital and liquidity, which are derived from ineffective implementation of the new regulation. Authors see two major events which banks may face challenges of Basel III with: the improvement of capital efficiency especially in the trading portfolio and the determination of the sub-optimal liquidity management practices and Fraudulent Financial Reporting (Suryanto, 2016).

The benefit of this article is impacts quantification of the implementation of sophisticated approaches to credit risk management. In the article, the structure of elemental designed portfolio is calibrated and appropriate capital requirements in order to optimize the equity usage in banks are gradually quantified (Belás, Cipovová, Novák, & Polách, 2012).

The current results demonstrate that the requirement of capital could decrease by approximately 30 %, which means using of an internal rating model could increase the profitability on equity up to 13 %, depending on the structure of the assets, the amount of the interest margins and the profitability ratio. Even saving capital

through “the improved credit risk management”, which was considered one of the important stabilizing elements in this system, does not work in banking practice and therefore the system of internal ratings should be adjusted to the new regulatory conditions (Belás, & Cipovová, 2013, Thalassinos, Liapis & Thalassinos, 2014).

The issue of capital adequacy of commercial banks, the quality and functioning of the models for credit risk measurement in the macro-economic framework examined the study (Belás, & Polách, 2011, Thalassinos *et al.*, 2010).

3. Methodology

According to Basel II, commercial banks can use not only Standardized approach (STA) but also Internal Rating Based Approach (IRB) for credit risk measurement and for calculation of required amount of equity.

Standardized approach for credit risk measurement exactly determines risk weights for credit assets. For example, for corporate loans applies: if the bank has available rating scores of recognized rating agency (STA+ ER approach), this rating classifies individual exposures (EaD) to six level of credit quality. First level of credit quality means that given assets has risk weight of 20 % and sixth level of rating quality is assigned risk weight of 150 % to given assets (Czech National Bank, 2007c). If there is no available rating scores of recognized rating agency (STA–ER approach), risk weight of 100 % of given state is assigned to given assets. The amount of capital requirements (KP) for individual exposures is calculated through this formula:

$$KP = EAD \times RW \times k, \quad (1)$$

Where k is a coefficient of capital adequacy (0,08).

If the bank uses Fundamental Internal Rating Based Approach (FIRB), only the Probability of default can be estimated by own approaches and other parameters is determined by a national regulator. If the bank uses Advanced Internal Rating Based Approach (AIRB), then all risk parameters can be estimated by own approaches a models including a Probability of default (PD), Loss Given Default LGD, Exposure at Default EaD and the maturity. IRB is enabling to calculate own calculations of risk weights of exposures, which significantly determine appropriate capital requirements (Czech National Bank, 2007a), (Czech National Bank, 2007b), (Czech National Bank, 2007c).

The Internal Rating Based Approach determines that inputs parameters which are required to calculate an appropriate amount of equity (such as PD, LGD, EaD, M) can be estimated by own approaches of an individual bank institution on the basis of national regulator permission.

The value of risk weighted assets (RWA) is calculated by formula as follows:

$$RWA = RW \; x \; EAD \quad (2),$$

Risk weight (RW) is defined by the following formula:

$$RW = 12{,}5 \; x \; 1{,}06 \; x \; (LGD \; x \; N\left(\frac{1}{\sqrt{1-R}} \; x \; G(PD) + \frac{\sqrt{R}}{\sqrt{1-R}} \; xG(0{,}999) - PDxLGD \right)$$

x s (3),

Where s is the maturity, N(x) is a function of the normal distribution of random variable (N (0, 1)), G (z) is the inverse cumulative distribution function for a standard random variable, "R" is the correlation of systemic risk, "M" is effective maturity and "s" is adjusted maturity. The way how to calculate these parameters is set by a national regulator. Probability of default to corporate exposures or institution exposures is at least 0,03 %. Probability of default of borrowers is 100 %. The value of M (maturity) which is used by institution which have no permission to use own LGD, represents 2,5 years. LGD for subordinated exposures without eligible collateral is 75%. Estimates of PD are based on the usage of historical experience and empirical evidence, not only on a personal assessment. (Czech National Bank, 2007a), (Czech National Bank, 2007b), (Czech National Bank, 2007c).

Based on this requirement, PDs which were obtained by ČEKIA Company (today known as Bisnode Česká republika a.s. with nearly 20-years history) for the effective modeling portfolio of business loans in the context of capital adequacy have been used. Methodology of ČEKIA's rating model is in accordance with the rules of Basel II". (Bisnode, © 2001-2013)

Belás, Cipovová, Novák, & Polách (2012) present the theoretical-methodological and practical aspects of validation of internal rating models of commercial banks.

4. Results and Discussion

Within the focus of this article, the issue of the resulting capital requirements diversity using the methodology of credit risk management of Basel II has been considered, where different types and levels of collateral and also varying degrees of rating quality has been changed. In this case, a simple and a comprehensive approach of Standardized Approach and foundation approaches of Internal Rating Based Approach with and without collateral instruments have been put into this comparison. On the beginning of this research, four hypotheses have been set:

1. In the transition from STA approach to the foundation IRB approach with collateral instrument, saving of the capital requirement is less than 15 %
2. Increasing the ratio of collateral from 140 % to 210 %, there is a reduction of required regulatory capital by up to 10 %

3. The biggest saving on the equity will be achieved by the type of the collateral – cash.

Additional aim of our research was to compare changes that occur with different rules to ensure deductibility by using selected methods of credit risk management of Basel II. Firstly, four bank claims has been set, each worth of 5 million EUR with a maturity of 3 years. Each claim has different probability of default (see Table 1). On the base of second determined hypothesis, the basic amount of collateral in a ratio of 140 % of given exposure has been designed as follows: cash collateral (35 %), shares as collateral (35 %), real estate as collateral (35 %), and claim as collateral (35 %). Next procedure was to increase the collateral up to 210 % of given exposure where the composition of that collateral has been consisted of cash collateral (70 %), real estate as collateral (70 %), and claim as collateral (70 %). Information about the external rating assignment to each claim has been taken from S&P agency and is seen in the table below:

Table 1. Input data for research

Claim	E	Rating	PD	Risk weight
1	5 000 000	AAA	0,03 %	0,2
2	5 000 000	AA	0,09 %	0,5
3	5 000 000	BB	0,21 %	1
4	5 000 000	B	3,7 %	1,5

Source: Own Source and modified by (S&P, 2010)

Based on established parameters, using complex STA approach and foundation IRB approach by different types of collateral by ratio at 105 % of the given exposure, capital requirements have been calculated. Results can be seen in Table 2 as follows:

Table 2. Estimates of capital requirement (CR) using the methodology of Basel II for the various types of collateral

Types of collateral	CR by STA approach	CR by IRB approach	Percentage change between the STA and the IRB approach
Cash	1 216 000,00	901 296,94	**-26%**
Monetary gold; Shares and exchangeable funds involved to the main index of the regulated market	1 501 102,72	1 112 548,29	**-26%**
Real estate; Movable assets	2 560 000,00	1 739 344,97	**-32%**

Claim from commercial relation	2 560 000,00	1 720 370,30	**-33%**

Source: Own Source

An interesting tendency can be seen in Table 2, where in the transition from STA approach to foundation IRB approach, capital requirements is decreased in range from 26 to 33 %. Here the first set hypothesis is rejected. As shown Table 3, real estate such the most commonly used collateral in practice, considerable additional cost from holding equity to the bank is produced. Compare to the cash as the collateral, real estate brings up to 111 % higher capital requirements within STA approach and up 97 % higher capital requirements within IRB approach.

Capital requirements of the exposure value (5 000 000 EUR) by STA and IRB approach has been calculated. Within the calculation, credit quality changes in exposure using upper and lower ratio of collateral has been intended. Results can be seen in Table 3 and 4.

Firstly, collateral by ratio at 140 % of the exposure has been set as follows: cash collateral (35 %), shares collateral (35 %), real estate (35 %) and claim collateral (35 %).

Table 3. Estimates of capital requirement (CR) using STA approach and IRB approach for the given types of collateral and by changing credit rating of the exposure (140 %)

Credit quality of the exposure	CR by STA approach	CR by IRB approach	Percentage change between the STA and the IRB approach
Rating AAA	269 939,64	199 427,02	**-26%**
Rating AA	674 849,10	384 961,86	**-43%**
Rating BB	1 349 698,20	622 331,04	**-54%**
Rating B	2 024 547,30	1 882 778,40	**-7%**
Total	**4 319 034,24**	**3 089 498,32**	**-28%**

Source: Own Source

If all exposure in the portfolio would have AAA rating, the capital requirement difference between STA approach and IRB approach would be about 26 %. Comparing best rated exposure with the worst rated exposure, escalating deterioration of credit quality will increase the capital requirements. Within STA approach, capital requirements of the exposure with a rating of B is 7,5 times higher than capital requirements of the exposure with a rating of AAA. Within IRB approach, this difference is 9,5 times higher. Using horizontal analysis, difference

between STA approach and IRB approach is achieved. The percentage difference is ranged from 7 % to 54 %. The exposure quality is closer to default; the diversity of approaches would be smaller then. Even to the extent that capital requirement of the IRB approach will be higher than using STA approach. Here the principal character of Basel II is clarified, where only exposures with highest quality rating in bank's portfolio have to be hold. If the bank's portfolio is included only exposures with better rating than BBB (corresponding PD is less than 0,88 %), than more advanced methodologies of credit risk management can reduce capital requirements by tens of percent.

Secondly, collateral by ratio at 210 % of the exposure has been set as follows: cash collateral (70 %), real estate (70 %) and claim collateral (70 %). Estimates of capital requirement by STA approach and IRB approach are seen as follows:

Table 4. Estimates of capital requirement (CR) using STA approach and IRB approach for the given types of collateral and by changing credit rating of the exposure (210 %)

Credit quality of the exposure	CR by STA approach	CR by IRB approach	Percentage change between the STA and the IRB approach
Rating AAA	184 000,00	126 428,08	**-31%**
Rating AA	460 000,00	244 049,11	**-47%**
Rating BB	920 000,00	394 530,87	**-57%**
Rating B	1 380 000,00	1 193 599,79	**-14%**
Total	**2 944 000,00**	**1 958 607,85**	**-33 %**

Source: Own Source

Using both credit risk approaches by increasing collateral ratio from 140 % to 210 %, total amount of capital requirement is decreased in the range of 32 – 37 %.

If STA approach without assigned external rating has been used, capital adequacy ratio of the selected exposure has been calculated by total amount of 400 000 EUR (CR = 100% * 5 mil. Kč * 8 %). In term of total exposure (20 mil. EUR), capital requirement would be 1,6 mil EUR.

Conclusion

The article is highlighted aspects of transition to developed methods of Internal Rating Systems with significant savings on equity, which allows banks accelerate lending activities and so increase provided services for small-medium sized companies.

Aim of this article was to highlight the main changes in the capital requirement calculations by using advanced methodology of credit risk management under Basel II and also by using techniques to reduce credit risk with collaterals. First hypothesis, that in the transition from STA approach to the IRB approach with collateral instrument, saving of the capital requirement is less than 15 %, has been rejected. Reason is an percent change of induced saving which has been achieved in the range from 26 % to 33 %, what is 3 times larger savings as say QIS 5 issued by Basel Committee (Bank for International Settlement, 2005).

Second hypothesis, which argues that increasing the ratio of collateral from 140 % to 210 %, there is a reduction of required regulatory capital by up to 10 %, has been also rejected because of our achieved savings about more than 32 – 37 %.
Hypothesis No 3 has been confirmed because the collateral which is provided the highest saving for the bank is cash then shares then real estate and the claim as the collateral which provided the lowest amount of saving on the equity in any cases of portfolios and any cases of rating quality.

It's interesting to observe the fact that if the exposure is ensured by many smaller collateral ratios, resulting capital requirement would be much higher as in the case where the exposure is not ensured. But at the moment, where the exposure is ensured by only one type of collateral with a higher ratio, capital requirement would be smaller than in the case where the exposure is not ensured. Reason is the calculation of capital requirements, which is summed each case of collateral.

Usage of own methodology for credit risk measurement can bring substantial saving on equity through which the bank can accelerate their performance. This approach is very current, because represents significant minimization effect in relation to impacts of new banking regulation of Basel III.

Results of our calculations show that IRB methodology is beneficial only for big banks that are able to choose their clients (with AAA rating, low credit risk and default rate). On the other hand, if the bank would like to make an offer to client with the rating B and worse, compared to the competitor who is used only Standardized Approach without External Rating, it has competitive disadvantage, because of higher entitlement on the amount of bank's equity which has to be hold and which could represent higher prices of provided loans. On the other hand, because of the possibility still using the old STA methodology and their non-sensibility on PDs, small banks could focus on worse customers and offer them lower (better) interest rate because of the possibility to hold lower amount of the capital.

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