NÁRODNÁ BANKA SLOVENSKA

MINIMUM CAPITAL REQUIREMENT FOR COVERING CREDIT RISK UNDER THE NEW BASEL CAPITAL ACCORD – BASEL II

Part 2

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The Basel Committee for Banking Supervision of the Bank for International Settlements (BIS) was established in 1975 with the aim of ensuring stability in the banking sector around the world. To this end it has developed approaches, methods and prudent banking rules for commercial banks. The Committee's first integrated paper was approved in 1988, entitled the Basel Capital Accord (BCA), termed also Basel I. This document has so far formed the basis for the activity and rules of national regulators around the world. With regard to the new trends in financial markets and approaches to risk management, the Basel Committee in 1999 began a widespread international consultation process for revising the BCA. The results of these five years of endeavour, consultation and compromise have resulted in a New Basel Capital Accord (NBCA), termed also Basel II, which was approved on 26 June 2004 with effect as of 2007. This approval of the New Basel Capital Accord represents a further step towards unifying the rules for banking supervision and raising the stability and transparency of the world's banking system.

A quantification of the minimum capital requirement in the case of the Internal Ratings Based (IRB) Approach is made on the basis of an assessment of a client's creditworthiness by the bank itself, i.e. the bank effectively takes over also the role of rating agencies. For this reason this approach's methods place greater demands of the qualitative and quantitative nature on the risk management system in banks.

In this article we shall deal with the minimum capital requirement for covering the credit risk of receivables towards sovereigns, banks, businesses and retail segments, and which forms the most extensive component of Basel II. Due to the considerable scope of the issue we shall here not deal with securitisation instruments and their risk-minimising effects. We shall deal with the individual methods of the new Capital Accord for calculating credit risk and the minimum capital requirement. We also aim to highlight and quantify the advantages provided by Basel II to small- and medium-sized enterprises. In the conclusion we examine how the implementation of the individual Basel II methods will influence the cost of credit across different ratings and sizes of business.

The procedure of quantifying the minimum level of regulatory capital for covering credit risk ($RC_{\min a}$) under this approach is opposite to that of the standard method. This approach first calculates $RC_{\min b}$ as the value of a loss from a unit of the nominal value of a receivable in the case of the client's default and then the level of the given client's risk weighting is derived from this. This reasoning is underlain by the following basic relations:

$$\frac{RC}{RWR} = \frac{RC}{R \,.\, RW} \geq 0{,}08 \qquad (1)$$

$$RC_{\min a} = RC \,.\, 0{,}08 = R \,.\, RW \,.\, 0{,}08 \qquad (2)$$

$$RC_{\min b} = \frac{RC_{\min a}}{R} = RW \,.\, 0{,}08 \qquad (3)$$

$$RW = \frac{RC_{\min b}}{0{,}08} = RC_{\min b} \,.\, 12{,}5 \qquad (4)$$

Kde:
RC – regulatory capital of the bank in mill. SKK
R – value of the receivable in mill. SKKSk
RW –risk weighting expressed as a decimal
RWR – risk-weighted receivables in mill. SKKk
$RC_{\min a}$ – minimum level of regulatory capital in mill. SKK for covering credit risk
$RC_{\min b}$ – minimum level of regulatory capital per koruna of the nominal value of a receivable corresponding to the unexpected loss from one koruna of the receivable's nominal value.

The IRB approach sets clear algorithms for calcula-

ting $RC_{\min b}$ for individual receivables. The basic components of these algorithms are:

1. Probability of default (PD). This is the probability that over the course of one year the debtor will default, and is given by the quality and creditworthiness of the client. The minimum value of this probability is set at 0.03% and features in the calculation as a decimal number, e.g. its minimum value 0.03% = 0.0003 [10].

2. Loss given default (LGD). This is the proportion of loss from a receivable in the total volume of the receivable in the case of the debtor's default. The value of this component is given by the quality of the loan transaction, meaning primarily the quality and quantity of the receivable's security. This variable, too, features in calculations as a decimal.

3. Maturity (M). This is that part of the agreed period in years remaining to the debtor for settling its liabilities towards the bank.

After calculating $RC_{\min b}$ we can determine the minimum level of regulatory capital for covering the credit risk ($RC_{\min a}$) via two methods:

a) direct method:

$$RC_{\min a} = RC_{\min b} \,.\, \text{EAD} \qquad (5)$$

b) indirect method: this method first calculates the risk weighting (RW) from RCminb according to the relationship (4), and which then features together with EAD in the calculation of $RC_{\min a}$ as follows:

$$RC_{\min a} = RW \,.\, EAD \,.\, 0{,}08 \qquad (6)$$

Both calculation methods feature a further basic component – exposure at default (EAD). The value of this component is given primarily by the type of loan and the manner of its drawing from the side of the debtor.

The IRB Approach is demanding primarily due to complexity and difficulty of models for determining the abovementioned components (PD, LGD, M and EAD). In the interest of a gradual preparation of the conditions for implementing the IRB Approach from the side of banks, Basel II allows two methods in the approach:

1. Foundation IRB Approach (FIRB)

In the case of this method only the value PD is determined by the bank and the remaining components are left to the national regulator, or are given by Basel II rules. For example, the LGD value under this method is set at 45% for standard (problem-free) receivables and at 75% for other receivables, and M is set at 2.5 years.

2. Advanced IRB Approach (AIRB)

Using this method, all four components (PD, LGD, M and EAD) are determined by the bank itself. In the case of loans with a maturity of more than 1 year the minimum value for M is set at 1 year and the maximum 5 years.

It is necessary to emphasise that this differentiation between the foundation approach and the advanced approach may be applied only in the case of receivables towards sovereigns, banks and businesses. In the case of retail receivables the bank must determine all the necessary components (PD, LGD and EAD) itself, regardless of the IRB method implemented. We shall here not deal with models for determining basic components, but shall return to the manner of these components' arrangement in the algorithms for calculating $RC_{\min b}$ and RW in the case of the individual categories of receivables under Basel II.

Receivables towards sovereigns, banks and businesses

For calculating $RC_{\min b}$ (the unexpected loss value) of these receivables Basel II sets a function that, after mathematical adaptation of its form, we can write as follows:

$$\mathrm{RC}_{\min b} = UL = \left[LGD \,.\, \Phi\left(\frac{\Phi^{-1}(PD) + \mathrm{S}^{0,5} \,.\, \Phi^{-1}(0{,}999)}{(1-\mathrm{S})^{0,5}}\right) - \right.$$

$$\left. - \mathrm{PD} \,.\, \mathrm{LGD}\right] \,.\, \frac{1 + (\mathrm{M} - 2{,}5)\mathrm{b}}{1 - 1{,}5\mathrm{b}} \qquad (7)$$

Where:

PD, LGD and M are as defined above,

Φ – the distribution function of the standardised normal distribution,

$\Phi^{-1}(PD)$ – inverse function to the standardised normal distribution,

PD . LGD – expected loss (EL) value,

S – correlation with the systemic risk factor regarding PD, where this variable is calculated by the following relationship:

$$\mathrm{S} = 0{,}12 \,.\, \frac{1 - e^{(-50 \,.\, PD)}}{1 - e^{-50}} + 0{,}24 \,.$$

$$\,.\, \left(1 - \frac{1 - e^{(-50 \,.\, PD)}}{1 - e^{-50}}\right) \qquad (7.1)$$

Where e is the basis of the natural logarithm.

The value S is under this relationship indirectly proportional to the value PD, i.e. S falls with a growth in PD and vice versa [1].

b – the variable of the progressivity of the effect of a loan's maturity, where this is calculated as follows:

$$b = (0{,}11852 - 0{,}05478 \,.\, Ln\,(PD))^2 \qquad (7.2)$$

Where Ln is a natural logarithm.

After constructing the function for calculating RC_{minb}, or respectively UL, we can in accordance with (4) write the risk weighting function in its expanded form as follows:

$$RW = 12{,}5 \cdot \left[LGD \cdot \Phi\left(\frac{\Phi^{-1}(PD) + S^{0,5} \cdot \Phi^{-1}(0{,}999)}{(1-S)^{0,5}}\right) - PD \cdot LGD\right] \cdot \frac{1 + (M - 2{,}5)b}{1 - 1{,}5b} \qquad (8)$$

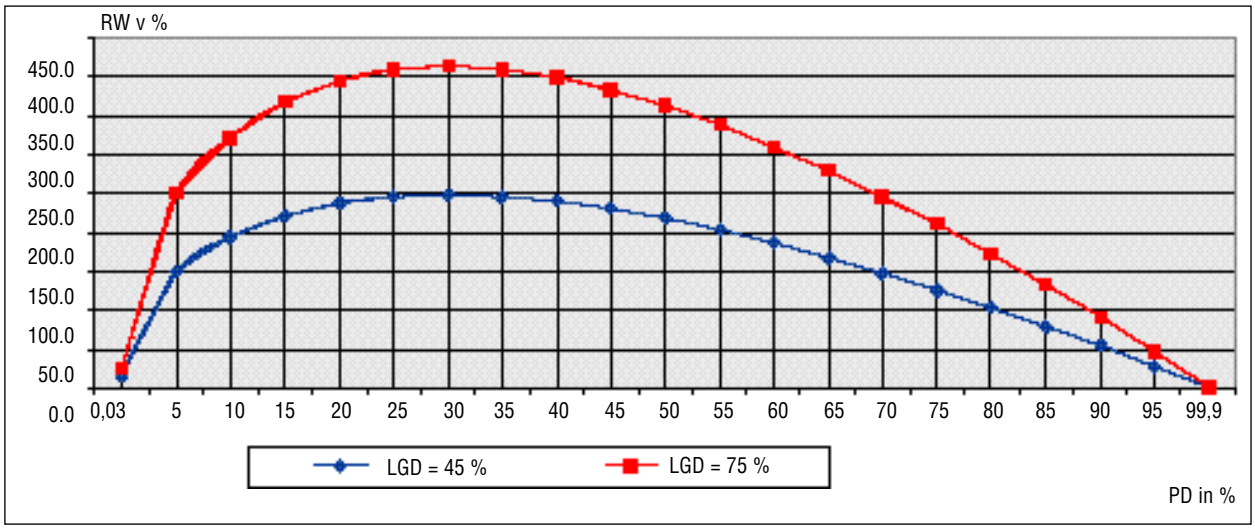
This function is growing in the case of LGD = 45%, or respectively 75% and M = 2.5 years, in PD from 0.03% to 30%, and declining in the interval 30% to 99.9%. The maximum of the function is given by the level of LGD as shown in the following graph 1.

From the practical aspect the most interesting risk-weighting values are in the relevant values of the probability of default, i.e. PD in the interval from 0.03% through to 10%.

As is clear from graph 2, the risk weighting is very sensitive to the value PD. A risk weighting of less than 100% is achieved in the case of an LGD = 45%, or respectively 75% and M = 2.5 in the case of a PD less than 1.266%, or respectively 0.365%.

Graph 1 Risk weighting in % for LGD of 45% and 75%, with M=2.5 and PD in the interval 0.03% to 99.9%.

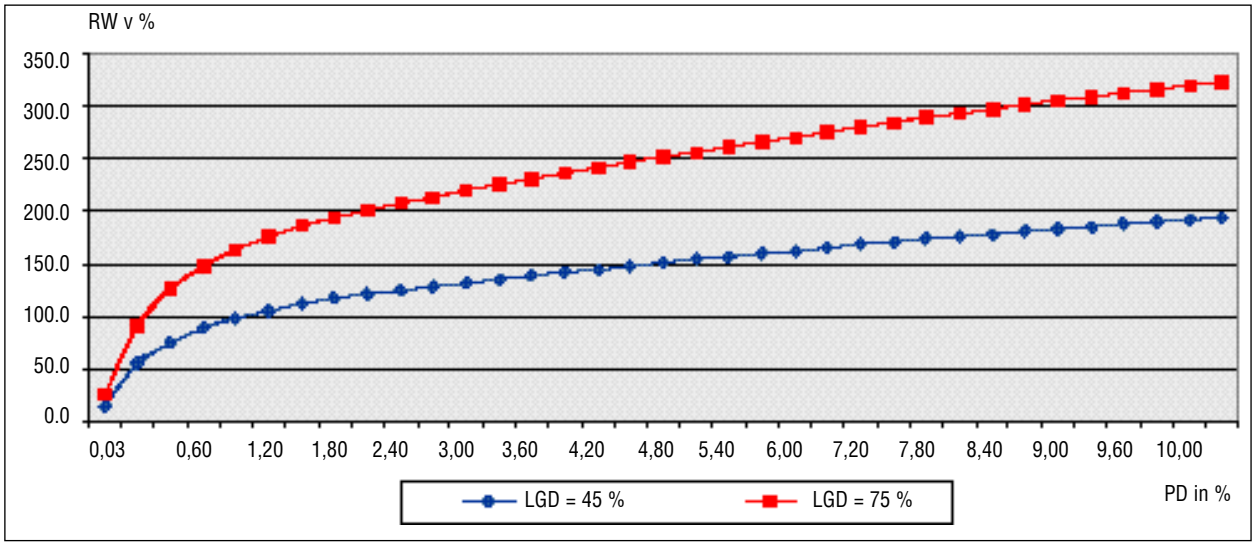
(Sovereigns, banks, businesses)



Source: own processing.

Graph 2 Risk weighting in % for LGD of 45% and 75%, with M=2.5 and PD in the interval 0.03% to 10%.

(Sovereigns, banks, businesses)



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To be continued in 12/2005