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EVOLUTION OF CAPITAL ADEQUACY RATIO

ABSTRACT. The capital adequacy ratio (CAR) determines the ratio of a bank's core capital to the assets and off-balance liabilities weighted by the risk. The core capital of the bank is supposed to absorb the potential losses due to the risk of the banking activities. It has been specified that the value of this coefficient cannot be lower than 8%. Throughout the years the way of calculating the ratio has been changing, which is the subject of this paper. In the article the situation of Polish and Ukrainian banking sector has also been analyzed from the point of view of the coefficient in question.

Introduction

Banks as public confidence institutions are subject to strict supervision and their activity is regulated by a number of regulations. In 1988 a new index was introduced, that banks have been obliged to obey. The capital adequacy ratio (CAR) determines the ratio of a bank's core capital to the assets and off-balance liabilities weighted by the risk. The core capital of the bank is supposed to absorb the potential losses due to the risk of the banking activities. It has been specified that the value of this coefficient cannot be lower than 8%. Throughout the years the way of calculating the ratio has been changing, which is the subject of this paper. In the article the situation of Polish and Ukrainian banking sector has also been analyzed from the point of view of the coefficient in question.

1. Regulatory capital

Before discussing issues connected with the capital adequacy ratio, core capital should be defined for the purpose of calculation of the index. It is a is very important category from the point of view of supervisory boards, which check its value in concern for protection of depositors and other creditors against losses. The core capital under supervision is called regulatory capital. Regulatory capital in this approach is different from the accounting notion of ownership capital or shareholders' equity. In one aspect the regulatory capital is a broader concept, in another – narrower than in accounting. The regulatory capital contains outside capital (e.g. subordinated debt), and at the same time its value is reduced by subtracting certain other items.

According to the Polish banking law[1] and the resolution of Banking Supervision Commission[2], the regulatory capital of a bank include:

- Tier 1 capital (basic funds): a bank's core capital;
- Tier 2 capital (complementary funds) – liabilities other than core capital, e.g. subordinated debts (blocked in the long run and reimbursable at the end in case of the bank's bankruptcy);
- core capital deductions – items correcting the core capital, including stocks possessed by the bank, uncovered loss from previous years, current year loss, unrealized profits on the ground of real estate valuation constituting an investment, missing reserves for the risk of bank activity.

The bank must keep the value of the regulatory capital at the level not lower than specified capital requirements. It results from the fact that high risk connected with deposit and credit operations gives rise to operational losses in this area, whose amount can be roughly estimated. Such losses must be covered by the bank's core capital. The ratio of the bank's regulatory capital and its items expose to risk, expressed in terms of weights, is called the capital adequacy ratio.

2. CAR according to the resolutions of Basel I from 1988

The first rules of CAR estimation were presented in July 1988 by the Basel Committee on Banking Supervision under the guidance of Peter Cook (therefore some authors call it "Cook ratio"). The index has been defined as the ratio of a bank's core capital to its assets and off-balance liabilities weighted by the risk. Core capital was supposed to be a "cushion" which protects the bank against the credit risk losses. At the same time it has been determined that the ratio should be not lower than 8%.[3] The CAR soon became a worldwide standard of measuring banks' solvency. The method of its calculation according to the rules of 1988 is as follows:

$$W_{1988} = \frac{k_{tier1} + k_{tier2} - k_{deduction}}{r_{cred}} \geq 8\%$$

$$r_{cred} = r_{bs} + r_{obs}$$

where:
W_{1988} – CAR as defined in 1988
$k_{tier\,1}$ – basic funds
$k_{tier\,2}$ – complementary funds
$k_{deduction}$ – items deducing the sum of funds
r_{cred} – credit risk exposure
r_{bs} – balance items credit risk
r_{obs} – off-balance items credit risk exposure

Credit risk exposures in the denominator of the fraction are calculated on the basis of the system of weights for balance and off-balance items. For this purpose assets have been

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divided into four groups according to the risk connected with them and four weighs of risk have been assigned to them (0%, 20%, 50%, 100%).

The acceptance of the model based on uniform weights has undoubtedly been a big step forward, for it made possible to calculate the capital adequacy ratio and comparing it between banks. At the same time however the system was criticized, among others for identical treatment the credits from non-financial entities. Risk connected with credits for such institutions is not identical, but highly variable.

What is important, the CAR of 1988 took into account only credit risk, which resulted from the then conviction that it is the basic kind of risk threatening the bank's security. Other kinds of risk were not accounted for, such as derivatives risk. These drawbacks made amendments to the ratio formula necessary.

3. Amendment of CAR calculation standards in 1996

In January 1996 the Basel Committee accepted the amendment of the Capital Accord by introducing also the market risk to the CAR. Its new formula was as given below:

$$W_{1996} = \frac{k_{tier1} + k_{tier2} - k_{deduction} + k_{tier3}}{r_{cred} + 12{,}5 r_{mark}} \geq 8\%$$

where:
W_{1996} – CAR of 1996, with amendments of 1998,
k_{tier1} – basic funds,
k_{tier2} – complementary funds,
k_{tier3} – tier 3 capital,
$k_{deduction}$ – items deducing the sum of funds,
r_{cred} – credit risk exposure,
r_{mark} – market risk exposure.

The method of estimating the regulatory capital for covering credit and market risk was also changed as compared to the Accord of 1998. The core capital was increased due to including tier 3 capital. The above formula indicates that the measure of market risk is multiplied by 12.5 (i.e. the reverse of the minimal capital adequacy ratio at the level of 8%) and added to the market risk exposure. In order to find the value of regulatory capital necessary to cover the market risk, banks should quantify the risk at first. For this purpose banks may use either of the methods allowed by Basel regulations:

– the standard method devised by supervisory authorities,
– the method based on market risk measurement using internal models that allow to estimate the so called Value at Risk (VaR); these models may be applied by banks only with the consent of supervisory authorities and must conform to specific quantitative and qualitative requirements.[4]

4. CAR according to the New Capital Accord (Basel II) of 2004

Another approach to the capital adequacy measurement was presented in the New Capital Accord (Basel II). The work on the document started in 1999 already, but the final

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[4] Uchwała nr 5/2001 Komisji Nadzoru Bankowego z dnia 12 grudnia 2001 r. w sprawie zakresu i szczegółowych zasad wyznaczania wymogów kapitałowych z tytułu poszczególnych rodzajów ryzyka, w tym z tytułu przekroczenia limitów koncentracji wierzytelności, sposobu i szczegółowych zasad obliczania współczynnika wypłacalności banku, z uwzględnieniem powiązań banków z innymi podmiotami zależnymi lub działającymi w tym samym holdingu oraz określenia dodatkowych pozycji bilansu banku ujmowanych łącznie z funduszami własnymi w rachunku adekwatności kapitałowej oraz zakresu i sposobu ich wyznaczania

version was ready only in 2004. The necessity to introduce changes in the estimation of CAR was the result of three factors:

1. dynamic development of financial markets and introducing new banking products,
2. too simplified classification of credits and weights attributed to them, established in 1988,
3. banks' pursuit of expanding the possibility of using their own internal models to determine capital requirements for particular types of assets.

The Basel Committee proposed to base the capital adequacy measurement on three complementary pillars, namely:

1. Minimum Capital Requirements – consisting in determining minimal requirements regarding capital adequacy, including credit, market and operational risk,
2. Supervisory Review Process – giving supervisory authorities additional opportunities to assess whether the regulatory capital is satisfactory for the risk scale and profile, through monitoring the state of their capitals and supervisory interventions,
3. Market Discipline – according to which banks are obliged to disclose information on risk profile and the level of capitalization, through reports and detailed description of procedures.

The new formula of CAR calculation is given below:

$$W_{2004} = \frac{k_{tier1} + k_{tier2} - k_{deduction} + k_{tier3}}{r_{cred} + 12,5(r_{mark} + r_{oper})} \geq 8\%$$

where:

W_{2004} – capital adequacy ratio according to Basel II of 2004,

$k_{tier\,1}$ – basic funds,

$k_{tier\,2}$ – complementary funds,

$k_{tier\,3}$ – tier 3 capital,

$k_{deduction}$ – items deducing the sum of funds,

r_{cred} – credit risk exposure,

r_{mark} – market risk exposure,

r_{oper} – operational risk exposure.

The New Capital Accord provides for different methods of credit, market and operational risk measurement. The comparison of the New Capital Accord with previous regulations is presented in table 1 below.

Table 1. Comparison of the capital accords of 1996 and 2004

Pillar	Name		Basel I	Basel II
I	Minimum Capital Requirements	credit risk	- standardized approach	- standardized approach - basic IRB model approach - advanced IRB model approach
		market risk	- standardized approach - VaR model approach	- standardized approach - VaR model approach
		operational risk	none	- basic index approach (BIA) - standardized approach (STA) - advanced measurement approach (AMA)
II	Supervisory Review Process		none	- monitoring the state of banks' capitals - supervisory interventions
III	Market Discipline		none	- reporting - detailed description of procedures

Source: own compilation

4.1. Methods of estimating the capital requirement for credit risk

The calculation of capital requirement for credit risk is currently based in Poland on Resolution No. 380/2008 of the Financial Supervision Commission of 17 December 2008.[5] The total capital requirement for credit risk is calculated as the sum of assets and off-balance liabilities, multiplied by 8%. In order to measure the credit risk, banks may use one of the three following:

1. the Standardized Approach, in which the risk weights depend on the rating given by an external agency, and in the absence of such a rating the risk weights are imposed by regulations;
2. the primary Internal Rating-Based Approach (IRB), which allows banks to use their own rating system to evaluate borrowers and determine the likelihood of their default, assuming that the parameters of the likely loss given default (LGD) are calculated by the supervisory authorities,
3. the Advanced Internal Rating-Based Approach (Advanced IRB) – in which the bank sets all parameters of risk on its own.

These methods rely heavily on ratings, understood as a category to which the economic entity in question has been classified on the basis of its financial situation. Therefore, each category of credit rating is characterized by a certain probability of default on repayment of the loan plus interest.

4.2 Methods of estimating the capital requirement for market risk

As regards market risk, banks may use one of the two methods of estimating the capital requirement, namely:

1. the basic (standard) method, strictly based on determined weights of risk,
2. the Value at Risk (VaR) model[6], which can only be used after obtaining the consent of the supervisory board, and is based on an internal model developed by the bank.

4.3 Methods for estimating the capital requirement for operational risk

Pillar I of the New Basel Capital Accord also specifies the methodology for calculating the capital requirement for operational risk coverage. The operational risk has been defined by the Basel Committee as a potential monetary loss as a result of inadequate and erroneous internal processes, human actions and system operations as well as activities external to the bank. This applies especially to computer system failures, legal errors, and other disturbing events. Banks may use one of three methods of determining the capital requirement for the operational risk, namely:

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[5] Uchwała Nr 380/2008 KNF z dnia 17 grudnia 2008 r. – w sprawie zakresu i szczegółowych zasad wyznaczania wymogów kapitałowych z tytułu poszczególnych rodzajów ryzyka, w tym zakresu i warunków stosowania metod statystycznych oraz zakresu informacji załączanych do wniosków o wydanie zgody na ich stosowanie, zasad i warunków uwzględniania umów przelewu wierzytelności, umów o subpartycypację, umów o kredytowy instrument pochodny oraz innych umów niż umowy przelewu wierzytelności i umowy o subpartycypację, na potrzeby wyznaczania wymogów kapitałowych, warunków, zakresu i sposobu korzystania z ocen nadawanych przez zewnętrzne instytucje oceny wiarygodności kredytowej oraz agencje kredytów eksportowych, sposobu i szczegółowych zasad obliczania współczynnika wypłacalności banku, zakresu i sposobu uwzględniania działania banków w holdingach w obliczaniu wymogów kapitałowych i współczynnika wypłacalności oraz określenia dodatkowych pozycji bilansu banku ujmowanych łącznie z funduszami własnymi w rachunku adekwatności kapitałowej oraz zakresu, sposobu i warunków ich wyznaczania.

[6] The essence of the VaR method consists in determining the maximum loss the bank may incur in a specified unit of time (eg one day) with given probability, the so called confidence level.

1. the Basic Indicator Approach (BIA),
2. the Standardized Approach (STA)
3. the Advanced Measurement Approach (AMA).

The Basic Indicator Approach

The Basic Indicator Approach assumes that the more profitable an activity, the bigger a bank's exposure to the operational risk. Therefore, the standard formula can be written in short as follows:

Capital requirement = 15% * average gross profit

The coefficient of 15% is supposed to reflect the average level of operational risk in the banking system and was centrally determined by the Basel Committee. The crucial thing in this method is to accurately calculate the gross profit.

The formula for calculating the capital requirement for operational risk using the Basic Indicator Approach is relatively simple and easy to apply. Unfortunately, it is unfavorable for banks with high financial results.

The Standardized Approach

In the Standardized Approach banks isolate eight areas (so-called business lines) and calculate the gross profit separately for each of them. Then the amount of capital requirement is calculated for each business line by multiplying the gross result by the beta factor. The total capital requirement for operational risk is the sum of the capital requirements calculated separately for the eight areas.

Table 2. Business lines and beta factor

Business line	*Beta factor*
Investment Banking	18%
Trading and sales	18%
Retail brokerage activities	12%
Commercial Banking	15%
Retail Banking	12%
Payment and settlement	18%
Intermediation services (agency)	15%
Asset management	12%

Source: own elaboration on the basis of Resolutions of the FSC 380/2008 of 17 December, 2008, Annex No. 14, Section 18, table 3

This method is more difficult than the basic indicator approach, since banks have to separate costs and revenues related to a specific area of operations (business line). In both approaches the value of the capital requirement is linked to the financial result.

The Advanced Measurement Approach

Banks using the Advanced Measurement Approach estimate exposures to operational risk and amount of capital charge on their own. However, the implementation of this procedure requires the construction of a complex model and a detailed data set. Using this method calls for the consent of banking supervision.

5. The value of the capital adequacy ratio in the Polish banking sector

Regulations of the New Basel Capital Accord also had an impact on the situation in the Polish banking sector. Changes in capital adequacy ratio in Poland are presented in Table 3, which shows separately the value of this coefficient for the cooperative and commercial banking sectors.

Table 3. Values of the capital adequacy ratio in the Polish banking sector from 1994 to 2008

year	median		average	
	commercial banks	cooperative banks	commercial banks	cooperative banks
1994	20.8	14.2	11.5	2.2
1995	18.5	14.0	11.5	8.4
1996	17.5	11.7	12.3	8.8
1997	16.9	12.4	12.5	11.1
1998	15.0	12.9	11.7	11.8
1999	16.6	13.5	13.2	12.8
2000	16.2	13.8	12.9	12.8
2001	16.0	15.4	15.1	13.9
2002	16.8	15.5	13.8	13.4
2003	14.8	15.8	13.7	14.2
2004	16.2	15.7	15.5	14.1
2005	15.1	16.0	19.6	18.3
2006	13.8	15.3	16.4	17.4
2007	12.1	15.5	16.2	18.6
2008	11.5	14.4	19.1	16.5

Source: own compilation based on reports about the situation of banks at: http://www.knf.gov.pl/opracowania/sektor_bankowy/raporty_i_opracowania

The data in Table 3 show that initially the capital adequacy ratio in cooperative banks was at a significantly lower level than in commercial banks. However, at the end of the period, this tendency changed, as can be seen clearly in Figure 1. In years 2006–2007 the ratio in the sector of cooperative banks was even higher than in the other, which was mainly due to a decline in the value of CAR in the sector of commercial banks.

The observed decrease in the capital adequacy ratio of commercial banks in years 2006–2007 was caused by increased lending, mainly for the non-financial sector. This raised the capital requirement for credit risk which has not been adequately compensated for by a sufficient increase in the core capitals. Consequently, the value of the capital adequacy ratio of commercial banks decreased.

At the beginning of 2008 the New Basel Capital Accord was fully implemented. As a result, banks began to include the capital requirement for operational risk in their calculations. This caused a decrease in the value of capital adequacy ratio in the sector of commercial banks to the value of 14.7% (on June 30, 2008), but already at the end of 2008 the value of the index increased again. This was mainly due to an increase in the value of the core capitals, which resulted from keeping about 60% of profits of year 2007 in banks.
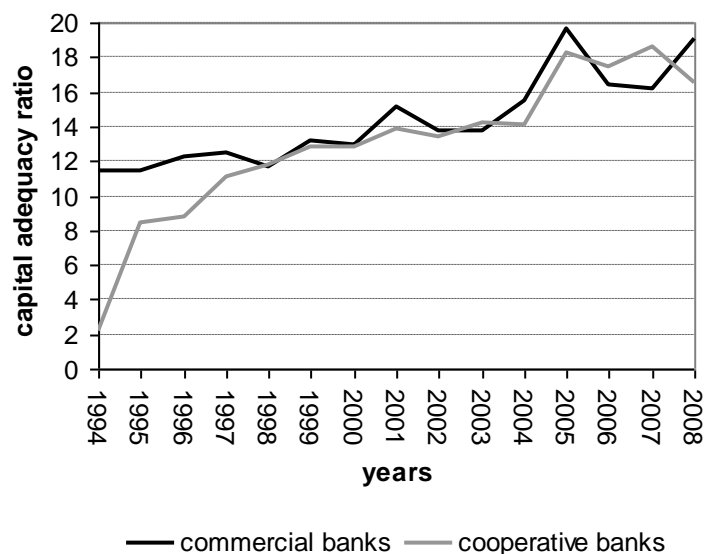
Figure 1. Average values of the capital adequacy ratio in the Polish banking sector from 1994 to 2008
Source: own compilation.

The introduction of the provisions of the New Basel Capital Accord contributed to a decline in CAR, but it did not exceeded the minimum level of 8%. This problem appeared only in a few banks, as shown in Table 4.

Table 4. Distribution of banks according to the value of the capital adequacy ratio

	Value of capital adequacy ratio (%)	as of December 31,			
		2005	2006	2007	2008
number of commercial banks	below 8	0	0	0	1
	8–10	2	2	4	12
	10–12	10	10	19	17
	12–15	11	18	11	6
	over 15	31	21	16	16
number of cooperative banks	below 8	1	1	1	1
	8–10	44	60	63	35
	10–12	79	86	93	133
	12–15	132	126	119	148
	over 15	332	311	305	262

Source: own compilation based on reports on the situations in banks at: http://www.knf.gov.pl/opracowania/sektor_bankowy/raporty_i_opracowania

When comparing data from the Polish and Ukrainian banking sectors, one can observe similar tendencies – in 2007 the value of capital adequacy ratio fell, although in Ukrainian banks the decrease was not significant (see Table 5). On the other hand, the introduction of the New Capital Accord provisions has not contributed to big changes in the value of the index, contrary to pessimistic expectations. Banks coped very well with the implementation of

the Accord rules, both in Poland and Ukraine. Moreover, due to an increase of the core capitals, there was a rise in the level of the ratio.

Table 5. The capital adequacy ratio for the banking sector in Ukraine

As of December 31,	Value of capital adequacy ratio
2008	14.01%
2007	13.92%
2006	14.19%

Source: own compilation based on reports on the situation of banks at: http://www.bank.gov.ua/Engl/Publication

It should also be noted that in the period between 2006 and 2008 the value of CAR was higher in Poland than in Ukraine. On the one hand, it increases the security of banks; on the other however the high level of core capitals limits the profitability of banks since they use the financial leverage to a smaller extent.

Conclusion

Introducing the New Basel Capital Accord entailed significant changes in the banking sector. First, banks had to implement new methods of risk measurement. In addition, a new formula for calculating the capital adequacy ratio might have contributed to significant decreases of its value, which was confirmed by data from the Polish banking sector. Accordingly, banks decided to raise core capital in order to prevent negative consequences of the decline in CAR. As a result, both in Poland and Ukraine, the average value of this ratio for the banking sector is at an appropriate level, well above the minimum.

An undoubted advantage of the New Capital Accord is a comprehensive approach to risk. It also provides opportunities for the use of ever more effective instruments. However, the complexity of the rules is a real challenge even for best experts. In order to implement new systems and all changes, banks will have to incur high operating costs. The more sophisticated models will be used to calculate capital requirements, the bigger the expenditures will be.

It is also worth noting that in addition to the first pillar, associated with the Minimum Capital Requirements, the Basel Committee introduced second and third pillars, designed to control an additional risk generated by the bank. The second pillar relates to banking supervision which controls all the process of evaluating the risk. The third pillar is associated to external reporting. Banks must show which method they have adopted for risk assessment. Therefore customers will be able to estimate the level of risk generated by the bank, which can be very important information especially in the situation of volatile financial markets.

References

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Uchwała nr 2/2007 Komisji Nadzoru Bankowego z dnia 13 marca 2007 w sprawie innych pomniejszeń funduszy podstawowych, ich wysokości, zakresu i warunków pomniejszania o nie funduszy podstawowych banku, innych pozycji bilansu banku zaliczanych do funduszy uzupełniających, ich wysokości, zakresu i warunków ich zaliczania do funduszy uzupełniających banku, pomniejszeń funduszy uzupełniających, ich wysokości, zakresu i warunków pomniejszania o nie funduszy uzupełniających banku, oraz zakresu i sposobu uwzględniania działania banków w holdingach w obliczaniu funduszy własnych.

Uchwała nr 5/2001 Komisji Nadzoru Bankowego z dnia 12 grudnia 2001 r. w sprawie zakresu i szczegółowych zasad wyznaczania wymogów kapitałowych z tytułu poszczególnych rodzajów ryzyka, w tym z tytułu przekroczenia limitów koncentracji wierzytelności, sposobu i szczegółowych zasad obliczania współczynnika wypłacalności banku, z uwzględnieniem powiązań banków z innymi podmiotami zależnymi lub działającymi w tym samym holdingu oraz określenia dodatkowych pozycji bilansu banku ujmowanych łącznie z funduszami własnymi w rachunku adekwatności kapitałowej oraz zakresu i sposobu ich wyznaczania

Uchwała Nr 380/2008 KNF z dnia 17 grudnia 2008 r. – w sprawie zakresu i szczegółowych zasad wyznaczania wymogów kapitałowych z tytułu poszczególnych rodzajów ryzyka, w tym zakresu i warunków stosowania metod statystycznych oraz zakresu informacji załączanych do wniosków o wydanie zgody na ich stosowanie, zasad i warunków uwzględniania umów przelewu wierzytelności, umów o subpartycypację, umów o kredytowy instrument pochodny oraz innych umów niż umowy przelewu wierzytelności i umowy o subpartycypację, na potrzeby wyznaczania wymogów kapitałowych, warunków, zakresu i sposobu korzystania z ocen nadawanych przez zewnętrzne instytucje oceny wiarygodności kredytowej oraz agencje kredytów eksportowych, sposobu i szczegółowych zasad obliczania współczynnika wypłacalności banku, zakresu i sposobu uwzględniania działania banków w holdingach w obliczaniu wymogów kapitałowych i współczynnika wypłacalności oraz określenia dodatkowych pozycji bilansu banku ujmowanych łącznie z funduszami własnymi w rachunku adekwatności kapitałowej oraz zakresu, sposobu i warunków ich wyznaczania.

Ustawa z dnia 29 sierpnia 1997 r. Prawo bankowe, Dz. U. 1997 nr 140 poz. 939 z późn. zm.

Directive 93/6/EEC.

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