

Methods of increasing bank capital effectiveness – part 1

1. Introduction

One of the goals of every rationally working enterprise, including a bank, is making the most effective use of the capital at its disposal. Bearing in mind that capital becomes a limited resource for banks and at the same time it is not gratuitously obtained, it should be managed in such a way as to ensure its maximum efficiency. A helpful instrument in the process of increasing capital effectiveness is the process of its allocation. However, in order to carry out allocation, first the process of measurement and calculation must be completed.

Banks as institutions of public trust are subject to special regulations that force the possession of capital (own funds) at an adequate level. The notion of bank capital is not explicit and is diversely perceived. The definitions quoted in the literature differ from one another, which does not mean at all that they are incorrect. They only present a different point of view or emphasize various capital aspects.

In the practice of bank management there are numerous kinds of capital of different significances for business and relations with the environment¹. Below some basic views of bank capital are presented.

According to J. F. Sinkey² there are three approaches to present the value of capital:

- book value,
- regulatory,
- market.

Book value capital (balance capital) is the capital whose value corresponds to the amount “completing” the value of liabilities up to the assets amount. The amount of capital equals the sum of the following balance items³:

- subordinated liabilities,
- core (funds) capital,

¹ M. Iwanicz-Drozdowska, Zarządzanie finansowe bankiem, (Bank financial management) PWE, Warszawa 2005, p. 208.

² J. F. Sinkey, Commercial Bank Financial Management (In the Financial Services Industry), Prentice Hall, Upper Saddle River (New Jersey) 2002.

³ Accounting Law of 2002, Dz.U. (Journal of Laws) No. 76, item 694, with later amendments.

- due payments for core capital (negative quantity),
- own shares (negative quantity),
- supplementary (funds) capitals,
- revaluation capital (funds),
- remaining reserve capitals (funds) (including general banking risk fund, remaining),
- past years profit (loss),
- current year profit (loss).

Regulatory approach is a little different. It is generally accepted that bank regulatory capital consists of three elements:

- Tier 1 – core capitals (funds),
- Tier 2 – supplementary capital (funds),
- Tier 3 – short-term funds.

In the regulatory approach there are no unanimous definitions of capital due to the opportunity to apply diverse solutions by supervisory authorities. In other words, under the jurisdiction of one supervisory authority capital include, for instance, short term subordinated loans while under another they do not. Nevertheless, individual definitions of capital are not essentially divergent and concern less important elements.

Market approach estimates capital value as a product of the issued shares by their market (stock market) price.

According to C. Matten four kinds of capital are to be distinguished⁴:

- physical capital – used by bank money managers interested in what capital is available, what instruments there are to acquire it and what the acquired funds are to be invested in,
- regulatory capital – used by supervisory authorities to secure depositors and other creditors against losses,
- risk capital – estimated in order to determine a potential bank loss with a given profile, what is the loss probability and if the bank effectiveness is measured with risk taken into account,
- economic capital – estimated in order to determine return on capital, to secure the risk of unexpected losses the bank is exposed to.

M. Iwanicz-Drozdowska⁵ claims that in bank financial management both regulatory capital (including in fact physical capital) and economic capital are

⁴ C. Matten, Zarządzanie kapitałem bankowym, (Bank capital management) Dom Wydawniczy ABC, 2000, pp. 30–40.

⁵ M. Iwanicz-Drozdowska, Zarządzanie finansowe bankiem (Bank financial management) PWN, 2005 p. 210.

important. These two kinds of capital may be described as financial capital. The role and significance of financial capital can be first of all referred to:

- process of obtaining a bank licence and its later retainment, among others due to cautionary regulations and other legal regulations,
- process of bank management in order to gain value added for shareholders with acceptable risk level on their part.

Besides financial capital it should be distinguished that:

- human capital – defined as resource of skills, knowledge, health and vital energy contained in every man (society)⁶. This capital forms a basis for the capital of innovativeness and entrepreneurship, whose existence and value depend on the methods of management,
- innovativeness and entrepreneurship capital – defined as an advantage due to the introduction of new solutions in the field of management and offered bank products,
- reputation capital – depending on financial capital and the two above-mentioned, though they cannot affect it. Defined as bank ability to develop mutual relations with the environment, i.e. customers, investors and employees.

To conclude, there is also available capital, mentioned among others by the Basel Committee on Banking Supervision⁷. Available capital is not legally defined, that is why it may be understood in a number of ways. It is often compared to equity or sum of core, supplementary and reserve funds corrected by profits/losses of past years and the current period increased by the value of subordinated loans. Available capital is sometimes defined as risk capital or risk capital increased by invested capital, which, in turn, is understood as capital corresponding to the value of purchased fixed and intangible assets. It seems that among possible definitions of available capital, the most adequate is to perceive it as a capital maximum amount, to be allocated in a direct way to the organisational units or bank business lines.

Polish legal regulations require banks to keep amounts of share capital and additional balance items described by the Bank Supervision Authority at a level not lower than higher than the following values⁸:

- sum of capital requirements on accounts of individual kinds of risk and capital requirements on account of exceeding limits and contravention of other norms determined in the law,

⁶ Ibidem p. 211.

⁷ Range of practices and issues in economic capital frameworks, Basel Committee on Banking Supervision, March 2009.

⁸ Article 128 Banking Law, Act of 29 August 1997 with later amendments.

- the amount estimated by the bank indispensable to cover all identified essential kinds of risk in the banking business and changes in the business environment, taking into account the expected risk level (internal capital).

In conclusion to this part of the considerations, it should be stated that the indicated approaches are linked together and to a certain extent they are mutually complementary. Taking into consideration the approaches presented above, it seems that further discussion should be devoted to three kinds of capital: **regulatory, internal and economic**, although balance capital or available capital can be, by no means, forgotten.

2. Regulatory capital

Trying to determine and define the regulatory capital, one should remember its triple nature. It forces us to look at it from different perspectives, first: capital resources (own funds), second: total capital requirement, third: internal capital. The “triplity” of regulatory capital results directly from article 128 of the Banking Law whose regulations among others oblige banks to maintain the solvency ratio (capital adequacy ratio – CAR) at a level of at least 8%⁹.

$$\text{Solvency ratio} = \frac{\text{Regulatory own capital}}{\text{Total capital requirement} \times 12.5} \geq 8\%$$

The result from the above equation that regulatory own capital, called colloquially regulatory capital, corresponds to at least the total capital requirement amount. It should be borne in mind that their own regulatory funds do not directly correspond to the bank’s own capital, in the sense of balance. But they are calculated on the basis of a supervisor’s recommendations and correspond to the sum of core capital, supplementary capital and third tier capital, i.e. Tier 1 + Tier 2 + Tier 3. In other words, due to capital requirements, regulatory capital should exceed them. From the point of view of funds, it will be as large as permitted by the existing capital base, i.e. Tier 1, 2 and 3. It should be additionally remembered that regulatory capital should also be higher than internal capital.

⁹ In the case of a bank beginning its operational activity at the level, CAR should be maintained at the level of at least 15% for the first 12 months of activity, then for another 12 months of activity at the level of at least 12%. Additional limitations as far as the ratio and the level of regulatory capital are included in Resolution No. 380/2008 of the Financial Supervision Authority.

2.1. Regulatory capital as own regulatory funds

Regulatory own funds, although due to the name may be associated with balance funds, it is possible, only theoretically, to put an equation mark between them. Own regulatory funds (own funds) correspond to the sum of Tier 1, Tier 2 and Tier 3, set according to the recommendation of the Polish supervisor.

Article 127 of the Banking Law Act and Resolution¹⁰ No. 381/2008 of the Financial Supervision Authority (KNF) of 17 December 2008 determines the elements of own funds and detailed rules of setting bank owned funds.

Bank owned funds consist of:

- 1) Core funds (Tier 1),
- 2) Supplementary funds decreased by items defined in the Banking Law (Tier 2),
- 3) Other items defined by the Financial Supervision Authority (Tier 3).

Re 1. Bank core funds include

- 1) bank basic funds composed of:
 - in a state bank – statutory fund, spare fund and reserve fund,
 - in a joint stock company bank – paid and registered initial capital, spare capital and reserve capital, excluding any liabilities on account of preferred shares,
 - in a cooperative bank – paid members' share fund, resource fund and reserve fund,
 - in a foreign bank branch – funds defined in the regulations of the branch;
- 2) core funds additional items which include:
 - general risk fund for unidentified banking risk,
 - past years' retained profit,
 - profit in the course of approval and net profit of the current reporting period, calculated according to the accounting rules, decreased by any anticipated charges and dividends, in amounts that do not exceed the profit verified by chartered accountant,
 - other items defined by the Financial Supervision Authority;
- 3) items decreasing core funds that include:
 - bank owned shares estimated according to the balance value, decreased by write-offs caused by a permanent loss of their value,

¹⁰ Resolution on other reductions in core funds, their volume, scope and conditions of reduction in bank core funds, other bank items recognized as supplementary funds, their volume, scope and conditions of their classification as bank supplementary funds, reductions in supplementary funds, their volume, scope and conditions of their reductions in bank supplementary funds; and scope and methods of determination of bank activity in holdings in calculation of own funds.

- tangible and intangible assets according to the balance value
- past years' loss,
- loss in the course of approval,
- current period net loss,
- other decreases in bank core funds defined by the Financial Supervision Authority.

KNF Resolution No. 381/2008 defines balance items, which reduce core funds. The reductions of core funds in the case of premises determined in the resolution are:

- bank capital involvement in financial institutions, credit institutions, banks and insurance companies,
 - missing amount of reserve for banking risk,
 - amounts of expected losses and negative amounts resulting from the calculations referred to in § 76–79 of Annex no. 5 to the KNF Resolution no. 380 of 17 December 2008 on bank capital adequacy¹¹ (in the case of banks calculating amounts of risk weighted exposures using the methods of internal ratings),
 - exposure amount on account of securitisation items,
- (the above items amount to 50% of the balance value) and
- unrealised losses on debt capital instruments classified as available for sale,
 - unrealised profits on account of evaluation of real estate constituting investment,
 - net profit from capitalisation of future income from securitised assets supporting credit quality for securitised items.

Re 2. Supplementary funds consist of:

- 1) capital (fund) from revaluation of material tangible fixed assets created on the basis of separate regulations,
- 2) balance items, the qualification of which is to be decided by the Financial Supervision Authority through general resolution or individual decision.

¹¹ KNF Resolution No. 380/2008 of 17 December 2008 on the scope and detailed principles of setting capital requirements on account of individual kinds of risk, including the scope and conditions statistical methods application and the range of information enclosed to applications for the permission to use them, principles and conditions of recognition of liability transfer agreements, subparticipation agreements, credit derivative agreements and other agreements than liability transfer agreements and subparticipation agreements, for the purpose of determination of capital requirements, conditions, scope and ways of using evaluations by external institutions in relation to credit rating and export credit agencies, method and detailed principles of calculation of the bank solvency ratio, scope and method of bank activity in holdings in calculation of capital requirements and solvency ratio and determination of additional balance items indicated together with own funds in capital adequacy account and the scope, way and conditions of their determination.

According to the Banking Law Act, the Financial Supervision Authority agrees to classify the following items as supplementary funds, provided the conditions mentioned in the Act are met:

- a) additional amount within the responsibility of cooperative bank members, in part defined by KNF,
 - b) subordinated liabilities, understood as liabilities on account of accepted funds by a bank in amounts and principles determined in the decision made by KNF at the request of the bank, reduced at the end of each year in the last 5 years of the agreement by 20% of the amount – funds meeting according to the agreement together the following conditions:
 - funds taken for the period of at least 5 years (period of agreement),
 - funds cannot be withdrawn from the bank before the expiry date,
 - funds are subject to return last in the case of bank collapse or liquidation,
 - return of funds is not secured by the bank directly or indirectly;
 - c) funds from own or other resources,
 - d) liabilities on account of securities with indefinite maturity dates as well as other instruments of a similar kind,
- 1) other proposals defined by the KNF in order to make banking business secure and bank risk management correct,
 - 2) reduction in supplementary funds defined by the Financial Supervision Authority.

Supplementary funds and different components of these funds are subject to the following limitations:

- they must not exceed core funds,
- the volume of the additional amount of responsibility of cooperative bank members must not exceed shares paid by them,
- the amount of subordinated liabilities, regarded as supplementary funds, must not exceed 50% of core funds in a state bank, joint stock company bank and foreign bank branch,
- the sum of subordinated liabilities recognised as supplementary funds and the additional amount of responsibility of cooperative bank members must not exceed half of bank core funds.

KNF Resolution no. 381/2008 defines balance items which, having met certain conditions, may become other items of supplementary funds. They are:

- unrealised profits on debt instruments classified as available for sale,
- unrealised profits on capital capital instruments classified as available for sale,

- unrealised profits from real estate investments,

(the above items are to be accounted for up to 60% of the amount – before income tax as well as

- positive amounts resulting from revaluation and reserves accounted for in the calculations, referred to § 76–79 of Annex no. 5 to the Resolution on bank capital adequacy (in the case of banks calculating amounts of weighted exposures using the method of internal ratings) up to 0,6% of amounts of risk weighted exposures calculated with these methods.

KNF Resolution no. 381/2008 defines additionally the balance items which reduce supplementary funds. The reductions in supplementary funds in the case of premises quoted in the Resolution are:

- bank capital involvement in financial institutions, credit institutions, banks and insurance companies,
- missing amounts of reserves for the banking risk,
- amounts of anticipated losses and negative amounts resulting from calculations referred to in § 76 – 79 of Annex no. 5 to the Resolution on bank capital adequacy (in the case of banks calculating amounts of weighted exposures using the method of internal ratings),
- exposure amount on account of securitisation items.

The above items are considered in the reduction of supplementary funds amounting to 50% of the involvement balance value. Moreover, if 50% of the sum of items mentioned above is bigger than the sum of supplementary funds, the difference should be taken away from the bank core funds.

Recognition of funds as supplementary funds made up of their own and other resources on account of securities with an indefinite time of maturity and other similar instruments is determined by fulfilment of the following conditions:

- funds made up of their own or other resources may be used freely by the bank to cover unidentified risk, and their amount has been calculated according to the accounting rules in force, set by the banks' management and verified by chartered accountants,
- liabilities on account of securities of indefinite maturity date and other similar instruments must not be subject to repayment on the creditor's initiative without prior consent of the Financial Supervision Authority. Moreover, the agreement must provide the bank the opportunity to postpone repayment of interest on these items, in the case of bank bankruptcy or liquidation the accepted funds will be subject to return last, and conditions of issue must ensure the opportunity to cover the losses with the amount of debt together with unpaid interest on these items.

Re 3. The banks whose scope of business is significant can make use of short-term capital when setting capital adequacy norms, referred to in KNF Resolution No. 380/2008. Short-term capital is the sum of the following items, if positive:

- market profit, accruing till the reporting day reduced by known liabilities,
- losses (with a negative sign) on all operations recognised as bank portfolio, accruing till the reporting day, excluding losses on the account of changes in exchange rates and prices of goods, within the scope in which it has not been included in their own funds or covered in another way,
- liabilities on account of granted subordinated loans meeting conditions defined in the Resolution,
- capital value of subordinated entities after meeting conditions defined in the Resolution.

The amount of regulatory funds set on the basis of these rules, in other words, the regulatory amount fund, is the base to confront it the total capital requirement and internal capital.

2.1. Regulatory capital as total capital requirement

In an attempt to define regulatory capital (RC) one should also consider it from the point of view of the total capital requirement, calculated on the basis of rules in the KNF Resolutions from 380/2008 to 386/2008. The KNF resolutions, being the Polish equivalent of the New Capital Agreement (NCA, Basel II¹²), include the essence and major assumptions of the NCA, additionally introducing their own special solutions. The basic idea of Basel II is retained, i.e. the so-called three pillars. According to this idea Pillar I is responsible for regulatory capital.

Within Pillar I the bank is obliged to calculate capital to cover three major risks: credit, operational¹³ and market.

In the case of a significant scope of trade activity the bank calculates capital requirements on account of:

- credit risk,
- market risk, including:
 - currency risk,
 - goods price risk,
 - securities capital price risk,
 - debt instruments price special risk,
 - interest rate general risk,

¹² In June 2004 Basel Committee published the final version of NCA.

¹³ It is worth mentioning that operational risk is not fully included in Pillar I of Basel II.

- settlement risk, delivery risk and contracting parties' credit risk,
- exceeding the limits of involvement concentration and limits of large involvement,
- exceeding the threshold of capital concentration,
- operational risk.

Banks whose trade activity is not significant calculate capital requirement on account of the following kind of risks:

- credit risk,
- operational risk,
- market risk, including:
 - currency risk,
 - goods price risk;
- exceeding the limits of involvement concentration and limits of large involvement,
- exceeding the threshold of capital concentration.

In order to calculate the capital requirement on account of three risks one may use:

- to measure the credit risk:
 - standard method,
 - advanced methods based on internal ratings, including: the basic model of Internal Rating Based Approach Foundation – IRBF or advanced Internal Rating Based Approach Advance IRBA;
- to measure market risk:
 - standard method,
 - method of VaR model (value at risk);
- to measure operational risk:
 - basic method: Basic Indicator Approach – BIA,
 - standard method Standard Approach – SA,
 - advanced method Advance Measurement Approach – AMA.

However, Pillar I does not cover all risks that appear in banking. Risks not fully included in Pillar I are: securitisation, residual and operational risks. There should be a question asked here: And other important risks? The answer is as follows: all important banking risks should be covered by capital within the NCA Pillar II, i.e. internal capital.

2.2. Regulatory capital as internal capital

The NCA Pillar II wants banks to work out Internal Capital Adequacy Assessment Process – ICAAP. The definition of internal capital accepted by the Polish supervisor determines the capital amount which **secures all important kinds**

of risk identified in banking, also risks resulting from the changes in business environments. This capital is to reflect the real business risk of a given bank. Its value should cover the level of unexpected losses assumed by the bank within a definite time horizon. The internal capital assessed by the bank is secured by regulatory funds. The Polish supervisor allows the following methods of internal capital assessment¹⁴:

- 1) **method based on minimal capital requirement**, on the basis of which the amount of required internal capital is calculated. This method is based on the assessment and estimation of the amount of additional capital to cover risks partly or as a whole which are not secured by the total capital requirement;
- 2) **method of component blocks** to enable to identify all important risks identified in banking. To cover every important risk, capital is estimated with consideration to the results of stress tests, to be done taking into account the most negative but at the same time most probable scenario. Internal capital is the sum of individual capitals covering a given risk;
- 3) **method of reference of the current level of internal capital (top-down method) consists of referring maintained internal capital in a given period of time to individual risks identified in banking**. In other words, the total amount of capital is “divided” in order to cover individual risks and at the same time, limits the risk generating activity. If the level of risk generated by a given activity is fully covered by the referred capital, there is no necessity to undertake action ensuring capital adequacy. In the case of the lack of capital, the capital base maintained by the bank should be increased or activity limited in order to reduce the level of risk down to the adequate level;
- 4) **economic capital models which**, in order to calculate the internal capital, used advanced quantitative methods allow us to estimate the so-called capital at risk – CAR, also referred to as economic capital – EC or risk adjusted capital – RAC. Economic capital means the amount of capital that covers all the unexpected with an assumed level of tolerance to risk in a definite time horizon. The measurement of risk capital is practically based on VaR methodology, which measures the value of possible unexpected loss to suffer on account of a given risk or activity.

¹⁴ Compare: Adekwatność kapitału. Fundusze własne. Podręcznik inspekcji w miejscu. (Capital adequacy. Own funds. On the spot inspection manual) NBP, Warszawa 2007, pp. 25–27.

Their own regulatory funds should exceed the amount of internal capital, which is calculated on account of all important risks identified in banking. As an example, the following list of risks covered by internal capital may be given:

- credit,
- market,
- operational,
- business,
- capital,
- strategic,
- reputation,
- business cycle,
- country,
- insurance
- and others.

It is worth mentioning that the list of risks secured by the total capital requirement is decisively shorter than the list of risks covered by internal capital. It should also be said that calculating the internal capital, the bank uses its own internal models to calculate it, unlike the total capital requirement calculation whose methods are imposed top-down.

A broader explanation should be given to the question of economic capital, which is sometimes mistakenly identified with internal capital.

3. Internal capital versus economic capital

Economic capital (EC) is defined as an indispensable amount of capital for every transaction which will cover the economic risk connected to it, assuming that this capital was calculated on the basis of the internal bank method.

Economic capital is a measure of risk indicating the volume of expected losses. In other words, it reflects the reduction of the value of profit from a given transaction, organisational or business unit on account of expected losses which are treated as a cost of running activity and should be secured by purpose provisions, and in particular by the generated income. Economic capital most often covers the following risks:

- credit,
- market,
- operational,
- business.

It should be also stressed that economic capital does not cover losses suffered in extreme situations. The level of economic capital is calculated mostly on the

basis of VaR methods or EaR (Earning at Risk) and is determined by basic parameters of quantitative methods, i.e. confidence bracket (tolerance level) and time horizon. The indicated parameters have a significant impact on the economic capital. The higher the confidence level, the higher the value of capital. The longer the time horizon (in the case of credit risk), the more likely bank bankruptcy, and higher the value of capital. It must be said here that the time horizon for market risk calculation is significantly shorter (one or two days) than in the case of credit risk (most often annually). In order to calculate the total value of capital, it is indispensable to accept the identical time horizon for calculation of capital to cover all measurable risks.

Economic capital is sensitive indeed to slight changes in the confidence level: e.g. at the level of 99.00% the amount of capital can be twice lower than at the level of 99.50%. It should be stated that the decision over the above mentioned parameters for calculation of economic capital is a strategic decision to be approved by the highest bank authorities. Its significance results from the fact that the level of economic capital is determined by the so-called "risk appetite," which in turn takes into account not only the owner's expectations (the appropriate rate of return), but also those on the part of the supervisor (capital adequacy and financial stability) and investors together with rating agencies (insolvency risk). The risk appetite determines the size of risk the bank is able to accept. The level of appetite is reflected among others by the bracket of confidence, which decides the amount of the rating level given to the bank: the higher the bracket of confidence, the higher the rating, e.g. AA rating requires a level of tolerance of 99.97%.

In conclusion, in order to determine the bracket of confidence for EC calculation, the bank authorities should first determine the risk appetite, which results in the earlier calculation of the target level of capital which is be able to accept this risk. It should be remembered, however, that hedging against unexpected losses does not depend only on the level of their own funds, but also on the revealed profitability and liquidity of assets.

The calculated value of economic capital forms basis for determination of the total economic capital on a banking scale. The total value may be calculated through:

- nominal sum of individual economic capitals,
- accounting for the effect of diversification between individual risks in the sum.

In the first case, it is assumed that extreme events can appear simultaneously, i.e. that all risks secured by economic capital are fully correlated with one another. In other words, the black scenario appears simultaneously in all measured risks.

The other approach draws different assumptions: the measured risks are not interdependent, so extreme events do not occur simultaneously in all measured risks (the black scenario will occur in the case of market risk and it will not occur at all or on a definitely smaller scale in the case of credit risk). It is therefore necessary to account for the correlation between different risks.

In practice correlation is considered after the process of risk aggregation from the lowest level at which economic capital is calculated, e.g. the level of transaction, up to the highest level: most often the level of the entity (bank). Practice also indicates that risks correlation is most often estimated through the linear correlation ratio (table 1 presents an exemplary correlation matrix). The basic objection against this method concerns the assumption that multidimensional decomposition is usual, which does not have to be practically significant. Besides, correlation between risks are determined on the basis of historical data, which in turn does not have to comply with the current risk profile. Additionally, used time series of data may not encompass a full business cycle with its scope, which as a consequence may result in an under estimation of the capital and ultimately to no capital adequacy of the bank. However, there are three facts in favour of the use of the variance/covariance method. First, it is an intuitive method and easy to interpret (results can be easily and logically explained). Second, calculation algorithm is not complicated and third, the total (aggregated) amount of the capital is determined analytically from the capital securing individual risks accounting for mutual correlations.

The final reliance level is estimated and accepted for calculation on the basis of expert knowledge. The degree of reliance should be subject to constant monitoring or verification if appropriate premises occur.

Table 1. Exemplary correlation matrix

	Credit risk	Market risk	Operational risk
Credit risk	1	0,75	0,5
Market risk	0,75	1	0,25
Operational risk	0,5	0,25	1

Source: own material.

A non-standard method to be used in risk aggregation are copula functions¹⁵. The use of copula functions enables us to eliminate the deficiency to be found in the variance-covariance methods – the deficiency concerning the assumption of

¹⁵ Copula – maths copula is a multidimensional decomposition on a unit square (unit cube for three dimensions) with uniform edge decompositions.

the “normality” of multidimensional decomposition. The copula functions, derived from the family of the Archimedes functions, possible to use in capital markets data analysis are: Copula Gumbela, Copula Franka, Copula Ali-Mikhail-Haq.

The use of copula functions enables us to eliminate the assumptions concerning the forms of loss decompositions. With an appropriately chosen copula form it is possible to definitely better approximate the behaviour of the so-called “tail” of loss decomposition (i.e. determination whether the “tail” is wide or narrow). Unfortunately, the method has its deficiencies that are manifested mainly in a higher degree of algorithm complexity (simulation becomes indispensable). Additionally, the obtained amount of capital may be sensitive to the chosen copula form, due to which the results are not intuitive and it may be difficult to explain them. Some difficulties may refer as well to the availability of data, on the basis of which the method calibration is made.

It conclusion it should be said that the calculation of internal capital based on the model of economic capital, most common in commercial banks in Poland may bring an “incomplete” effect. Because of the use of among other VaR based methods for calculation of economic capital, the obtained value of capital may cover only these significant risks in banking that are to be measured through quantitative methods. The definition of internal capital indicates that this capital can cover (secure) all significant kinds of risk identified in banking activity. **The assumption that internal capital is equal to economic capital will not always appear to be true.**

The assumption that both capitals are equal results in the fact that one does consider capital to cover risks difficult to measure or ones that the bank is not able to measure. The author claims that economic capital measured on the basis of quantitative methods should be increased by the capital to cover all other significant risks identified in banking.

It seems that the capital reflecting the amount of capital to cover remaining significant risks the bank is not able to measure through quantitative methods should consist of the following elements:

- **capital to cover significant risks difficult to measure estimated with non-quantitative methods**, e.g. method close to the estimation of capital to cover interest rate risk in the bank portfolio, expert method or another simplified method. For this purpose, one can also use a method based on qualitative and non quantitative estimation of the risk level – when the risk level exceeds the internally determined quality thresholds, expert estimation of the amount of capital can be made (e.g. using the internally drawn up and tested matrix of transition). For instance, capital

to cover capital risk¹⁶ can be estimated as amount of the growing cost of obtaining additional amount of capital in the pessimistic scenario concerning interest rates, availability of capital sources of the time flow,

- **capital covering remaining significant non-measurable risks** whose direct measurement is not possible. The level of such capital can be estimated, for instance, through percentage dependence of its level from risk weighted assets or balance sums, interest results or gross results etc., with the capital calculation base to reflect most credibly its connection with the risk for which the capital has been estimated.

Summing up all the considerations it should be stated that internal capital should be the sum of economic capital calculated on the basis of non-quantitative methods e.g. expert or qualitative and economic capital estimated for the remaining significant risks. The results from the presented deliberations show that economic capital is a component of internal capital.

It should be mentioned here that internal capital should secure the bank against the effects of extreme occurrences. In the author's opinion losses from extreme occurrences are not covered from economic capital. In this connection it is necessary to account for the amount of internal capital for the results of the so-called stress tests carried out by the bank. Stress tests of all the identified significant risks are the basis for evaluation of the potential effects of the impact of unfavourable changes in the economic environment on the financial situation of the entity. As a result they offer a reply to the essential question of whether or not the estimated level of internal capital ensures full security to bank activity. Stress tests are litmus paper to indicate the banks' stability in extremely unfavourable conditions. Again in conclusion, stress tests are indispensable tools to dynamically evaluate the degree of demand for additional capital, they complete capital measurement methods when the limited scope and amount of data reduces the predictive power of internal models applied by the bank.

Thus, internal capital is the sum of economic capital covering significant risks difficult to measure, calculated on the basis of non-quantitative methods, capital covering remaining significant unmeasurable and capital (the so-called buffer capital) covering losses incurred from extreme situations.

Comparing regulatory capital, understood as the total capital requirement and internal capital it is clearly seen that these are two completely different

¹⁶ Capital risk defined as risk resulting from the lack of adjustment of own funds quality to the scale and complexity of banking activity or bank difficulties to obtain additional capital, especially when this process must be carried out quickly and in time of unfavourable market conditions.

categories, concerning only the same bank. Below, table 2 presents the major differences between both capitals.

Table 2. Internal capital versus total capital requirement

Total capital requirement	Internal capital
Regulated by Basel II Pillar I	Regulated by Basel II Pillar I
Secures against three kinds of risk: credit, operational and market	Secures against all significant risks identified in the bank activity
Estimated by methods imposed by Basel II	Estimated by bank internal methods (own models)
Corresponds to the amount of capital requirement determined by solvency ratio	Corresponds to internally estimated amount of capital
Makes sum of requirements of individual risks (does not account for the effect of diversification)	Makes sum of economic capital (accounting for effect of diversification or not), capital to cover other significant risks as well as buffer capital
Calculated with the top-down set level of confidence (99.9%)	Calculated with the internally set confidence brackets, depending on the level of risk appetite and expected external ring
Used as buffer of insolvency and stability of the financial system	Used to optimise the use of available own funds (including also balance capital)

Source: own material.

Being aware of what the bank capital is and knowing its most important kinds, it is worth presenting measures of its effectiveness and mechanisms to raise this effectiveness. The above issues will be included in the following article.

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