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Methods of Increasing Bank Capital Effectiveness – part 2

1. Introduction

The present study continues the author's deliberations on commercial bank capital management. These deliberations are included in the series of three closely related articles. The first section¹ is devoted to the presentation of the idea and classification of bank capitals. The second section refers to the modern effectiveness measures based on bank capitals. The last, fourth section is devoted to the practical aspects of the considerations presented before and includes the summary of the whole tripartite publication.

One of the basic tools measuring effectiveness is the measure of profitability ratio. The broadly understood profitability determines the relation between effects and outlays; it is said to be a measure of management effectiveness, undertaken actions, conducted activities etc.:

$$\text{Profitability} = \frac{\text{Effect}}{\text{Outlay}}$$

In the world of finance profitability includes the relation between the effect expressed primarily in the form of effect (profit/loss) and outlay expressed by the invested capital or assets: capital profitability (ROC – *Return on Capital*):

$$\text{Capital Profitability} = \frac{\text{Profit}}{\text{Capital}}$$

Limiting the deliberation to the profitability of total capitals, own capitals, third-party capitals and fixed capitals (i.e. typical balance elements) but remembering the discussion from the first section of the present article, such capitals should be mentioned as the capital in the form of total capital

¹ See: T. Cicirko, Methods of increasing bank capital effectiveness – part 1, „Journal of Management and Financial Sciences”, Volume II, SGH, October 2009.

requirement, the capital in the form of own regulatory funds, economic capital or internal capital. Thus, we can speak about profitability with reference to:

a) own capitals (ROE – return on equity):

$$\text{ROE} = \frac{\text{Profit}}{\text{Equity}}$$

or

b) regulatory capitals (total capital requirement) (RORC – return on regulatory capital):

$$\text{RORC} = \frac{\text{Profit}}{\text{Regulatory Capital}}$$

The replacement of RC in the denominator with the internal capital (IC) creates another measure in the following form (*ROIC – return on internal capital*):

$$\text{ROIC} = \frac{\text{Result}}{\text{Internal Capital}}$$

The profitability ratios RORC and ROIC, for the same reasons as ROA, can be calculated based on the gross result:

$$\text{ROIC}_{\text{Gross}} = \frac{\text{Result}}{\text{Internal capital}} \quad \text{ROIC}_{\text{Gross}} = \frac{\text{Result}}{\text{Internal Capital}}$$

From the perspective of available capital effectiveness management, it is interesting to consider a ratio whose denominator is based on own regulatory equity (*RORE – return on regulatory equity*). The ratio calculation formula looks as follows:

$$\text{RORE} = \frac{\text{Result}}{\text{Own regulatory equity}}$$

The combination of this ratio with RORC, on the one hand, informs about the loss opportunities and on the other about the “capital security margin”. The larger the difference between RORC and RORE, the higher is the value of unused capital, which instead of generating profit incurs costs connected with its possession. Furthermore, the higher difference translates into a better solvency ratio.

The controversies concerning the denominator of profitability ratios indicated in the preceding section of the study also refer RORC, ROIC or RORE, but only in the area concerning the moment from which the values used for calculation are derived.

The following relations between ROE, RORC and ROIC² may be inferred:

$$ROE = RORC \times \frac{\text{Regulatory capital}}{\text{Own capital}} \quad ROE = ROIR \times \frac{\text{Internal capital}}{\text{Own capital}}$$

Similar relations may be inferred between ROA, RORC and ROIC:

$$ROA = RORC \times \frac{\text{Regulatory capital}}{\text{Assets}} \quad ROA = ROIR \times \frac{\text{International capital}}{\text{Assets}}$$

The directly proportional relation between ROE/ROA and RORC or ROIC is the reason why the bank, wishing to generate the expected value of own capitals/assets, should implement the policy of maximising the effectiveness of both regulatory and internal capital.

Taking into account the results of the deliberations concerning bank capitals³, their most important types are: own capitals, regulatory capitals in the form of total capital requirements, own regulatory equity, economic capital and internal capital. These capital categories may be used in the RAPM (*Risk Adjusted Performance Measurement*) model, i.e. in the integrated tool of profitability measurement considering the risk value. Unlike the profitability based on the regulatory capital, RAPM allows for a considerably more precise way of the risk capital covering of business transactions. The RAPM model is based on the risk capital called economic or internal capital. For example, the model of the standard calculation of regulatory capital uses the mandatory risk weights⁴, whereas for the purposes of RAPM these weights are set individually, for example, for every customer. Thus, in the regulatory capital model the risk weight for the entities without any awarded rating, it amounts to 100% (irrespective of the fact whether it is a large entity like “PKN Orlen S.A.” or an unknown “Fly-By-Night” firm), whereas in the models based on economic capital, the weights for both entities may be diametrically different.

² Own materials.

³ See: *Methods of Increasing Bank Capital Effectiveness – part 1.*

⁴ Cf. Ch. *Matten Zarządzanie kapitałem bankowym – alokacja kapitału i pomiar wyników (Bank capital management-capital allocation and measurement)*, Dom Wydawniczy ABC, Warszawa 2000, p. 74.

The broadest concept of RAPM also includes the basic regulatory capital profitability ratio:

1. RORC (*return on regulatory capital*)

$$\text{Regulatory capital profitability} = \frac{\text{Result}}{\text{Regulatory capital}}$$

2. RORAC (*return on risk adjusted capital*):

$$\text{Risk adjusted capital profitability} = \frac{\text{Result}}{\text{Risk adjusted capital (RAC)}}$$

3. RARORC (*risk adjusted return on capital*)

$$\text{Risk adjusted regulatory capital profitability} = \frac{\text{Result} - \text{Risk cost}}{\text{Regulatory capital}}$$

4. RARORAC (*risk adjusted return on risk adjusted capital*)

$$\text{Risk adjusted profitability of risk adjusted capitals} = \frac{\text{Result} - \text{Risk cost}}{\text{Risk adjusted capital (RAC)}}$$

The list of ratios has not been exhausted. The literature includes different acronyms or the same acronyms of different meaning.

Every ratio considers risk. However, the key role in the RAPM concept is played by the measures based on risk adjusted capital. The calculation of the risk value (in other words risk adjusted value) is nothing else but the calculation of capital to cover risk by means of the VaR method. The considerations in the first section⁵ indicate that the economic capital is included in the group of risk adjusted capital. Thus, the profitability ratios based on RAC include profitabilities calculated on the basis of economic capital, e.g. ROEC.

The actual difference between RORAC and RARORC is displayed in the approach to risk. In both measures the initial construction of the RORC ratio is risk adjusted, considered either in the numerator or denominator. The adjustment of the numerator by the risk costs means the reduction of effects by the standard risk costs (expected loss, EL), set as a derivative of historical loan default. The

⁵ See: T. Cicirko: Methods of increasing bank capital effectiveness – part 1, Journal of Management and Financial Sciences, Volume II, SGH, October 2009.

expected loss is hardly identified with pure risk because it constitutes cost (created reserve), and on the scale of the whole bank is calculated in the net profit. The adjustment of the denominator consists in the replacement of statistical risk capital in the form of regulatory capital with the capital indispensable to cover unexpected losses which are not secured by the created reserves. The total measure combining the risk adjustment of the numerator and denominator is the RARORAC ratio.

2. Economic profit

At the end of the 19th century Alfred Marshall formulated and described the idea of the innovation value measurement known at present as the residual income. There are some opinions claiming that the roots of the concept of the residual income date back to a more distant past. It may also be found in the accomplishments of D. Ricardo (mid-19th century) or R. Hamilton (the end of the 18th century)⁶. The works of A. Marshall make profitability measurement precise through the calculation of costs of lost opportunities. He indicated that the accounting profit did not consider the effects of alternative investments being the measure of the cost of lost opportunities. He suggested the replacement of the accounting profit with the residual income, whose general form may be presented as follows:

$$\text{residual income} = \text{profit} - (\text{capital cost} \times \text{capital})$$

The practical application of the idea of residual income took effect in the 1920's by General Motors, by Matsushita Electric (in the 30's) or General Electric (in the 50's)⁷. The development of the concept of residual income is the present measure in the form of economic profit (EP) and economic value added (EVA).

The economic profit is the difference between sales income and total economic costs. The economic costs include explicit (accounting) costs and implicit (invested capital costs). Sales income reduced by accounting costs (including interest of the third-party capital and income tax) create the category of net income, and after the adjustment by the implicit costs the economic profit is obtained⁸. The cost of capital is most often identified with the cost of own capital, i.e. the product of equity and the estimated rate of its interest.

⁶ B. Scarlett, Value Based Management, CIMA 1997, p. 12 and G. C. Biddle, R. M. Bowen, J. S. Wallace, Evidence on EVA, <http://ssrn.com>, p. 2.

⁷ S. D. Young, Some reflections on accounting adjustments and economic value added, „Journal of Financial Statement Analysis”, 1999, Vol. IV, No. 2, p. 7.

⁸ Economic profit is similarly described by J. M. McTaggart, P. W. Kontes, M. C. Mankins, The value imperative. Managing for superior shareholder returns, The Free Press, Nowy Jork 1994.

$$EP = Z_N - (E \times CoE)$$

where:

EP – economic profit,

Z_N – net profit,

E – equity,

CoE – cost of equity.

The calculation formula of economic profit may be modified to the following form:

$$EP = Z_B - (E \times CoE) - T$$

where:

EP – economic profit,

Z_B – gross profit,

E – equity,

CoE – cost of equity,

T – calculated income tax (CIT).

If the gross profit includes the interest paid on the subordinated loans, which belong to the equity, the effect should be raised by their value or adjust the capital costs. The calculation of the net profit is made through on of the following methods:

$$EP = Z_B + O_{PP} - (E \times CoE) - T$$

or

$$EP = Z_B - [(E - PP) \times CoE_{PP}] - T$$

where:

EP – economic profit,

Z_B – gross profit,

O_{PP} – interest on subordinated loans,

E – equity,

CoE – cost of equity,

T – calculated income tax CIT,

PP – subordinated loans value,

CoE_{PP} – the cost of equity adjusted by the cost of subordinated loans.

The economic profit may be calculated at the bank level, which is illustrated by the aforementioned calculation formulae, and at a lower level, e.g. for individual business areas: business lines, organisational entities or even products). In such a case, the information on the level of equity in the given area is required.

$$EP_{BANK} = \sum_{i=1}^n EP_{ODi}$$
$$EP_{ODi} = \sum_{i=1}^n [Z_{BODi} - (E_{ODi} \times CoE) - T_{ODi}]$$

where:

EP_{BANK} – bank economic profit,

EP_{ODi} – economic profit from an “i” area of bank operation,

Z_{BODi} – gross profit from an “i” area of operation,

E_{ODi} – equity allocated in an “i” area of operation,

T_{ODi} – calculated income tax CIT referring to an “i” area of operation.

An alternative solution is to calculate the gross economic profit (EP_{gross}), where tax issues are not considered and the calculations are made exclusively on the basis of gross profit. This simplification is recommendable in particular in the EP calculation for different operation areas due to possible problems and distortions resulting from the allocation of income tax from the bank level to its lower levels.

The calculation of the economic profit considering the risk costs in the form of the so-called standard risk costs (expected loss) is an interesting modification. The net profit includes the risk costs in the form of created reserves. The effect adjustment through the replacement of the created standard reserves with the risk costs (expected losses due to the transaction – EL) allows for the information on the possible risk adjusted possible EP level.

$$EP = Z_B - (E \times CoE) - T + R - K_R$$

where:

EP – economic profit,

Z_B – gross profit,

E – equity,

CoE – cost of equity,

T – calculated income tax CIT,

R – created reserves due to the concluded transactions,

K_R – risk costs due to the concluded transactions.

3. Economic value added

The example of the classical approach to the residual income is the economic profit. However, the modern finance school defines in detail both the return on capital and the capital itself, which as a result contributes to the new measure of the residual income in the form of the economic value added (EVA). At present, it is the most popular measure within the residual income concepts. It allows for the integration of the process of evaluation with the measurement of operation effects, which consequently unifies the decisions made within these two areas. EVA, measuring the invested capital, considers both own and third-party capital. The measurement of the return on capital uses the income before the repayment of interest (on principal) but after tax; this profit is called the net operating profit after tax (NOPAT). The economic profit includes the cost of the third-party capital cost in the form of the component reducing the effect in the course of its calculation. EVA treats this cost as an element of charge for the invested capital. The cost of the third-party capital is not separated but constitutes a component of the weighted average cost of capital (WACC)⁹.

The basic calculation formula EVA is as follows:

$$EVA = NOPAT - (C \times CoC)$$

where:

EVA – economic value added,

NOPAT – net operating profit after tax, i.e. profit before the deduction of costs of the third-party financing capitals but after the deduction of depreciation as well as reduced by tax expressed in terms of cash. This profit category is sensitive only to operating impulses, absolutely insensitive to the impact of factors related to financing¹⁰,

⁹ More on EVA and MVA in: M. Marcinkowska, *Kształtowanie Wartości Firmy (Corporate value creation)*, Wydawnictwo Naukowe PWN, Warsaw 2000; R. Myers, *Metric wars, CFO, The Magazine for Senior Financial Executives*, Vol. 12 iss. 10 October 1996; A. R. Shapiro, *Measuring Innovation: Beyond Revenue From New Products*, "Research-Technology Management" November–December 2006, Industrial Research Institute; Chikashi Tsuji, *Does EVA beat earnings and cash flow in Japan?*, "Applied Financial Economics", Nr 16, Faculty of Business Administration at Ritsumeikan University, Kusatsu-city 2006; E. Knap, *Wykorzystanie MVA i EVA w procesie tworzenia wartości (Application of MVA and EVA in the process of value creation)*, in: *Zarządzanie wartością firmy w dobie kryzysu (Corporate value management in the period of crisis)*, S. Kasiewicz, L. Pawłowicz (ed.), CeDeWu, Warsaw 2003.

¹⁰ A. Cwynar, W. Cwynar, *Zarządzanie wartością spółki kapitałowej – koncepcje, narzędzia, systemy (Capital company value management – concepts, tools systems)*, Fundacja Rozwoju Rachunkowości w Polsce, Warsaw 2002, p. 108.

C – invested capital (own and third-party); it is the sum of equity and all liabilities connected with the of capital providers' requirements concerning the return rate to be obtained. This capital is to be an approximated sum of cash brought into the company so far by investors; therefore its estimates include both equivalents of equity (reserves or research and development expenditure) and debt equivalents (operating leasing), expressing it in the economic accounting value (the so-called adjusted accounting value)¹¹,

CoC – cost of invested capital – e.g. average weighted cost of capital (WACC).

The economic value added is created only when the profitability of the invested capital exceeds the cost of its acquisition (WACC).

In the case of non-financial entities (manufacturing, commercial or service activities) the calculation of the NOPAT value seems to be uncomplicated. The category of the operating profit appearing in the profit and loss account nearly perfectly reflects the result of their statutory activity. It should be emphasised that the operating activity results are not affected by the costs resulting from the sources of asset financing; in other words: NOPAT is indifferent to the structure of the entity financing¹². It should also be indicated that the level of NOPAT should be affected only by the events from within the operating activity.

The NOPAT calculation may be made in two ways: the first one with the net profit as the starting point and the second when we begin the calculation from the income items. Both solutions are connected with the conducting of a thorough analysis of every item in the profit and loss account as well with the selection of the categories which are not connected in the strict sense with the operating activity. The example of these categories may be costs of leasing revealed in the operating area, which should be "shifted" to the capital costs, as in real terms they are costs of financing assets by the "credit in kind." Certain doubts may also arise with reference to the items revealed in incomes or financial costs, e.g. exchange rate differences or hedging instruments operations.

A certain controversy is also caused by the determination of the invested capital, in particular its part in the form the third-party interest bearing capital. And doubts appear in the case of the liabilities which do not have the character of the capital invested from the outside, i.e. the so-called trade liabilities (on

¹¹ A. Cwynar, W. Cwynar, Zarządzanie wartością spółki kapitałowej – koncepcje, narzędzia, systemy (Capital company value management – concepts, tools, systems), Fundacja Rozwoju Rachunkowości w Polsce, Warszawa 2002, p. 106.

¹² The aforementioned indifference does not refer to the issue of the amount of income tax paid because the taxable income is calculated on the basis of all the items which belong to the tax deductible costs, including interest costs.

account of supplies and services, taxes etc.), towards employees and other in-company liabilities. The trade liabilities, whose cost in the form of trade loan is calculable in real terms do not generate interest (financial costs), and possible cost are revealed in the operating activity (including lost prompt payment discount). In the author's opinion the calculation of the component value of EVA requires the application of the operating approach method extorting from NOPAT and invested capital a unanimous qualification of incomes and costs and from the operating effect the economic, not accounting dimension.

A financial entity, i.e. a bank has a different structure of a profit and loss account than non-financial entities. The operating activity result¹³ is an item including an interest capital cost. The aforementioned forms of EVA calculation are not adjusted to the banking sector. Thus, it is a mistake to directly use the result of operating activity to calculate the economic value added. This result should be first properly adjusted in order to obtain the combination of incomes and costs from the operating bank activity.

In this place, it is worth considering the issue of the definition of the bank operating activity. The activity is not conducted by the bank at the customer's account but the bank's own account, referred to as the so-called trade (investment) portfolio. The question arises whether this type of activity should be treated as operating activity. It seems that from the formal perspective it should, as according to the bank statutes, the bank is to conduct the trade activity. Then, the profits and losses generated by the trade portfolio should affect NOPAT. If banks do not conduct any investment activities of these activities are inessential for them, it seems appropriate not to include the effect of these activities in the NOPAT calculation.

The article presents below the author's self-designed proposal of the NOPAT calculation result for the bank possessing, apart from a bank portfolio, also a trade portfolio. The proposal includes two variants¹⁴:

- 1) variant 1 – when the starting point is net profit – see Table 1,
- 2) variant 2 – when the starting point is profit positions – see Table 2.

¹³ In profit and loss accounts there is a term: operating activity result in the reports of non-financial entities there is an item: result from operating activity.

¹⁴ The presented proposal.

Table 1. NOPAT calculation – variant 1

| | |
|---------------|---|
| I. | Interest income |
| II. | Interest costs |
| III. | Net interest income (I-II) |
| IV. | Commission and charges income |
| V. | Commission and charges costs |
| VI. | Net commission and charges income (IV-V) |
| VII. | Dividend income |
| VIII. | Result on financial instruments at fair value |
| IX. | Trade activity result |
| X. | Net foreign exchange gains |
| XI. | Remaining operating income |
| XII. | Remaining operating costs |
| XIII. | Deductions for credit and loan value |
| XIV. | General administrative expenses |
| XV. | Depreciation |
| XVI. | Operating activity result (III+VI+VII+VIII+IX+X+XI+XII-XIII-XIV-XV) |
| XVII. | Profit and loss share of associated and co-subordinated entities |
| XVIII. | Gross profit (loss) (XVI+XVII) |
| XIX. | Income tax |
| XX. | Net profit (loss) (XVIII-XIX) |
| XXI. | Net profit adjustment (a-b-c+d+e-f+g+h+i+j): |
| | a. share in profit and loss of associated and co-subordinated entities, remaining compulsory profit reduction (loss rise) |
| | b. result of extraordinary operations |
| | c. reserve value difference and result of assets evaluation update |
| | d. general administrative costs (i.e. operating leasing instalments, depreciation of assets used on account of financial leasing) |
| | e. remaining operating costs |
| | f. remaining operating incomes |
| | g. net foreign exchange gains (i.e. exchange rate difference concerning received credits, loans and other sources of financing) |
| | h. adjustment by financing costs (e.g. financial leasing instalments) |
| | i. commission costs (i.e. commission on received credits, loans and other sources of financing) |
| | j. interest costs (i.e. interest on received credits, loans and other sources of financing) |
| XXII. | NOPAT (XX-XXI) |

Source: own materials.

Table 2. NOPAT calculation – variant 2

| | |
|--------------|---|
| I. | Interest income (incl. credits, securities deposits etc.) |
| II. | Interest costs |
| III. | Adjustment of interest costs by financing costs (including interest on received credits, interest on subordinated loans, interest/discount on self-issued securities) |
| IV. | Interest result (I-II+III) |
| V. | Commission income |
| VI. | Commission costs |
| VII. | Commission costs adjustment by financing costs (commission of received credits etc.) |
| VIII. | Commission result (V-VI+VII) |
| IX. | Commercial activity result |
| X. | Net foreign exchange gains |
| XI. | Bank result (IV+VIII+IX+X) |
| XII. | General administrative costs |
| XIII. | Depreciation |
| XIV. | Legal persons income tax (CIT) |
| XV. | NOPAT (XI-XII-XIII-XIV) |

Source: own materials.

The author claims that when qualifying profits and costs within the operating area, one should be reasonable and consider the compliance between NOPAT and invested capital – the derivatives from the invested capital (i.e. interest) should not affect the level of the net operating profit after tax. Summing up the consideration in this area, it should be stated that it is necessary to analyse the profit and cost of the operating result in order to eliminate possible pollution of the accounting result of operating activity.

The EVA value would be calculated based on the formula:

$$EVA = NOPAT - (C \times CoC),$$

where:

EVA – economic value added,

NOPAT – net operating profit after tax,

C – sum of own and third-party capitals,

CoC – average weighted capital cost.

Due to the complicated and laborious NOPAT process, it is appropriate to retain, within the operational result, the costs derived from financing sources, and to adjust the other EVA element. In other words, C should be replaced with equity value E, CoC with the equity cost CoE. The formula of EVA calculation becomes:

$$EVA = NOPAT^* - (E \times CoE)$$

where:

*NOPAT** – NOPAT including financing cost,

E – equity value,

CoE – cost of equity.

The NOPAT* calculation for the bank possessing a bank and trade portfolio may look in the following way (variant* 1 – when the starting point is profit, is identical as variant 2 when the starting point is income positions – see Table 3):

Table 3. NOPAT calculation – variant* 1 and variant* 2

| | |
|--------------|---|
| I. | Interest income |
| II. | Interest costs |
| III. | Adjustment of interest costs by financing costs (including interest on received credits, interest on subordinated loans, interest/discount on self-issued securities) |
| IV. | Interest result (I–II+III) |
| V. | Commission incomes |
| VI. | Commission costs |
| VII. | Commission costs adjustment by financing costs (commission of received credits etc.) |
| VIII. | Commission result (V–VI+VII) |
| IX. | Result from commercial activity |
| X. | Net foreign exchange gain |
| XI. | Bnak result (IV+VIII+IX+X) |
| XII. | General administrative costs |
| XIII. | Depreciation |
| XIV. | Legal person income tax (CIT) |
| XV. | NOPAT* (XI–XII–XIII–XIV) |

Source: own materials.

4. Profitability measurement concept at the level of transaction, client and product

4.1. Profitability in ex-ante accounts

The operational tool improving the capital effectiveness is the measure of capital profitability calculated at the lowest level, i.e. a single transaction and a single client. Taking into account the deliberations on the allocation of the regulatory capital, at this stage, it should be assumed that the best solution is to treat capital on the bottom-up basis.

The profitability measure should be a multifunctional tool allowing the seller to set the transaction parameters in such a way as to generate the expected return or to answer a question concerning the amount of the margin so that the credit decision could be positive. This means as a consequence that the profitability measurement should be made in ex-ante accounts. In order to achieve this goal, the modified RORC or RORAC indicator may be used. Firstly, the measure based on regulatory capital is presented.

The regulatory capital is in this case arbitrary due to the fact that in the process of the bottom-up allocation the level of transaction of client is ascribed only with the credit risk capital requirement.

The formula of the regulatory profitability calculation is as follows:

$$\text{Business RORC} = \frac{\text{transaction result}}{\text{credit risk capital requirement}}$$

where:

Business RORC – regulatory capital profitability at the transaction level

The calculation of the credit risk capital requirement for a single transaction does not pose any real difficulty. The calculation of the numerator's value in this formula needs discussing. For the purposes of the calculation, BUSINESS RORC in the *ex-ante* account does not possess all the necessary information to calculate the transaction result, on the contrary to the *ex-post* approach. In order to estimate the result of the transaction the method of calculation should be modified (simplified). The transaction incomes should include only two items: interest incomes and commission, and costs should be limited to the expected risk costs. The indicator calculation formula is transformed into the following:

$$\begin{aligned} \text{RARORC}_{\text{BUSINESS}}^{\text{TR}} &= \frac{(P_{\text{Interest}} + P_{\text{Commission}}) - EL}{(Z_{\text{TR}} \times W_{\text{R}}) \times 8\%} \\ \text{RC}_{\text{CR}} &= (Z_{\text{TR}} \times W_{\text{R}}) \times 8\% \end{aligned}$$

where:

$RARORC_{EX-ANTE BUSINESS}^{TR}$ – profitability adjusted by the capital requirement risk on account of credit risk at the transaction level (*ex-ante*),

$P_{Interest}$ – interest income from the proposed transaction,

$P_{Commission}$ – applied transaction interest incomes adjusted by the effective interest rate (ESP),

EL – expected risk cost, the so-called expected standard risk costs,

Z_{TR} – the value engaged on account of the applied transaction (credit value exposition),

W_R – risk weight appropriate for the applied transaction (also depending on the kind of product and client risk),

RC_{CR} – credit risk regulatory capital = credit risk capital requirement

The standard risk costs (EL – expected loss) is calculated based on the calculation formula below:

$$EL = PD \times LGD \times EAD$$

where:

PD – the probability of default on the applied transaction,

LGD – the value of the lost credit exposition for the applied transaction,

EAD – the expected exposition value at the moment of default on the applied transaction.

Two issues are worth emphasising here. Firstly, the transaction profitability calculation does not include the costs of its servicing, i.e. the so-called operating costs, e.g. sales force remuneration, remuneration related costs, materials used, outsourcing costs, depreciation etc. Secondly, the obtained level of profitability is only a potential value, which may become a real result only when the assumed transaction and client parameters are fulfilled.

The *ex-ante* profitability at the level of transaction is not enough when the client possesses or plans to make use of different bank products. The effects generated by the so-called cross-selling or up-selling should be considered then. The profitability of a single transaction becomes unreliable and it is necessary to calculate the return on a particular client. The client profitability in the *ex-ante* account is calculated based on the following formula:

$$RARORC_{BUSINESS}^{KL} = \frac{WB_{EX-ANTE BUSINESS}^{KL} - K_{RR} - EL}{\sum_{i=0}^n [(Z_{TR} \times W_R) \times 8\%]_i}$$

$$WB_{EX-ANTE\ BUSINESS}^{KL} = \sum_{i=0}^n (P_{Interest} + P_{Commission})_i$$

where:

$RARORC_{EX-ANTE\ BUSINESS}^{KL}$ – adjusted by the profitability risk requirement on account of credit risk at the level of the client (ex-ante), calculated for n transactions (with consideration to the applied transaction),

$W_{EX-ANTE\ BUSINESS}^{KL}$ – business result obtained from the client enlarged by the result from the applied transaction,

$P_{Interest}$ – interest incomes with consideration to the applied transaction,

$P_{Commission}$ – commission incomes adjusted by the effective interest rate with consideration to the applied transaction,

K_{RR} – real risk costs, the so-called expected standard risk costs (reserves created on account of the transactions concluded with the client so far),

EL – expected risk costs, the so = called standard risk costs,

Z_{TR} – engaged value on account of the transaction (credit exposition value) with consideration to the applied transaction,

W_R – risk weight appropriate to the transaction (also to the product and client) with consideration to the transaction,

$i = 1, 2, \dots n$ – the number of transactions concluded with the client with consideration to the applied transaction.

The transaction profitability as well as the client profitability, after having been duly modified, can be calculated in a slightly different and shortened form:

$$RARORC_{EX-ANTE\ BUSINESS}^{TR} = \frac{M_{O,P} - K_{RR} - EL}{(W_R \times 8\%) \times 100\%}$$

where:

$RARORC_{EX-ANTE\ BUSINESS}^{TR}$ – requirement profitability on account of credit risk at the (ex-ante) transaction level rentowność

$M_{O,P}$ – interest margin [%] enlarged by the commission rate [%] and adjusted by the effective interest rate generated from the transaction,

K_{RR} – real costs of risk [%] (reserves created on account of the transactions concluded so far with the client in relation to the value of engagement on account of these transactions),

EL – expected risk costs [%] (expected loss from the applied transaction referred to the value of this transaction),

W_R – risk weigh appropriate for the transaction (also the product and client) with consideration to the applied transaction.

The tool supporting the seller's decision, allowing for the calculation, based on the aforementioned measures of potential profitability, of the future transaction profitability will not only provide the information on the return on the transaction or client but after the modification of the indicator, it will prompt the decision maker how much the value of incomes (or $M_{O,P}$) amount to, so that the transaction would generate the minimum expected profitability rate (set top-down).

The presented profitability calculation method at the level of transaction is not complicated and can be efficiently implemented into the decision processes in the bank. The only difficulties may be caused by the EL estimation as this parameter is not determined by the seller. As a rule, it is calculated with a econometric (statistical) model complex model supported not only by the parameters from the applied transaction but also with a considerable amount of historical data.

An essential element to form the level of the capital requirement for credit risk is the consideration given to the transaction collateral in calculations. The aforementioned model is a basic tool at the highest level of simplification and it does not include this issue. The inclusion in the capital requirement calculation of the kind and value of security may considerably change the level of transaction profitability and consequently the business decision. It seems extremely important that the business decisions supporting tool should allow for the introduction of information on security and enable the change in security parameters so that the transaction in question could bring the highest benefit to the bank.

The profitability measure built on the economic capital may become a tool supporting the business decision making process. It may be used to measure the profitability of a single transaction or the profitability achieved at the client level. The economic capital profitability in the ex-ante account is calculated based on the following formula:

$$RAROE_{EX-ANTE\ BUSINESS}^{TR} = \frac{(P_{Interest} + P_{Commission}) - EL}{EC_{TR}}$$

where:

$RAROE_{EX-ANTE\ BUSINESS}^{TR}$ – adjusted by the economic capital profitability risk generated by the applied transaction (ex-ante),

$P_{Interest}$ – interest incomes from the applied transaction,

$P_{Commission}$ – commission incomes adjusted by the effective interest rate from the applied transaction,

EL – expected risk costs, the so-called expected standard risk costs,

EC_{TR} – economic capital value generated by the applied transaction.

Due to the fact that the economic capital calculated at the transactional level, includes primarily the credit risk, similarly to the capital requirement, the real profitability will be based on the single risk covering capital. It should also be mentioned that the practice of the calculation of the economic capital covering credit risk is made at the client level. This means that at the beginning it is necessary to make the calculation of the economic capital covering the credit risk with consideration to the applied transaction. Only then can the allocation into particular client transactions be made, including the applied transaction and the profitability calculated.

The profitability of economic capital to cover the client credit risk in the ex-ante account may be calculated based on the following formula:

$$RAROE_{EX-ANTE BUSINESS}^{KL} = \frac{WB_{EX-ANTE BUSINESS}^{KL} - K_{RR} - EL}{EC_{KL}}$$

$$WB_{EX-ANTE BUSINESS}^{KL} = \sum_{i=0}^n (P_{Interest} + P_{Commission})_i$$

where:

$RAROE_{EX-ANTE BUSINESS}^{KL}$ – risk adjusted profitability of economic capital generated by the client (ex-ante) calculated for n transactions (including the applied one),

$WB_{EX-ANTE BUSINESS}^{KL}$ – gross result obtained from the client with consideration to the applied transaction,

$P_{Interest}$ – interest incomes with consideration to the applied transaction,

$P_{Commission}$ – commission incomes adjusted by the effective interest rate with consideration to the applied transaction,

K_{RR} – real costs of risk (reserves created for the transactions concluded with the client so far),

EL – expected risk costs, the so-called expected standard risk costs,

EC_{KL} – the value of the economic capital generated by the client with consideration to the applied transaction.

In conclusion, it should be said that the economic capital calculation models are complex, based on many variables and many data, which presently practically absolutely prevents the calculation of its value directly and ad hoc (e.g. for the purpose of business decisions). Furthermore, the calculation of the return at the transactional level is a secondary step possible after the primary calculation of the profitability on client. On the other hand, the practical measurement of the profitability based on the economic capital to cover the credit risk is possible in the ex-post account.

To conclude these deliberations, the calculation of profitability of individual banking products is also worth mentioning. The profitability calculation at the transactional or client level is appropriate for the corporate bank activity. Sales force have relatively large possibilities of adjusting transaction parameters to the demand of an individual client, e.g. they can set the level of margin, interest, commission etc. In other words, they make a special offer for the client through tailoring it. In the case of retail business the situation is as a rule different: the product is usually standardised. Clients' advisers can hardly change the product parameters, e.g. the level of commission is set top down and depends on the client's own contribution. This means that the seller has a limited room for manoeuvre and is not able to offer anything from outside the set area. It results from the fact that when the product is constructed, its parameters are selected in such a way as to make every transaction generate the assumed minimum rate of return. Thus, in practice it is not necessary to calculate the profitability to the profitability of every applied transaction as it is known in advance. However, the bank management may be interested in the information on the real profitability of the offered products. Therefore, this calculation is made from the historical perspective (ex-post).

4.2. Profitability in the ex-post account

The aforementioned model of profitability analysis at the level of transaction and client may also be used for reporting or informative purposes as well as the calibration of the ex-ante calculation tools. Admittedly, the use of the real figures allows us to obtain the information about the actual effectiveness of the undertaken business activity. In order to achieve this, the financial data used at the moment the application is considered are replaced by the actual information about the client and transaction. The calculations in the ex-post account should be made in monthly cycles in order to make use of the full information on the incomes and costs, i.e. to base on the adjusted result by the internal settlements and real risk costs (for example, considering in calculations the actual, not applied, use of credit by the client).

$$RARORC_{EX-POST BUSINESS}^{TR} = \frac{WB_R - K_{RR}}{RC_{TR}}$$

where:

$RARORC_{EX-POST BUSINESS}^{TR}$ – real profitability adjusted by the capital requirement risk at the transactional level (ex-post),

WB_R – transaction gross result (without reserves),

K_{RR} – real costs of risk (reserve created for the concluded transaction),

RC_{TR} – real capital requirement generated by the transaction.

The executed gross result on transaction is calculated as a sum of interest incomes and commissions (calculated in time – effective interest rate) adjusted by calculated transaction margins, commissions and charges without including reserve. The result is reduced by the real costs of risk based on the existing transaction and client parameters, e.g. actual involvement, client rating etc.

The denominator of the indicator is the result of the full and complete calculation of the capital requirement generated by the transaction including its all recognised security. The capital requirement should not include only the credit risk requirement. It should be enlarged, for example, by the credit risk requirement (if the client transactions generate such requirements). It should be emphasised that according to the general principles of the profitability calculation, there should be an average of value of the regulatory capital for the given period. This poses a strict demand concerning the effectiveness of the system calculating the capital requirements as they should be calculated at the end of every day. It will allow for the calculation of the average requirement value at the end of the month. The indicated differences between the calculation of profitability in the ex-ante and ex-post account should be considered at the moment of combining and analysing the results of the given transaction.

The aggregated results of the transaction of the given client, standard costs of risk and the regulatory capital are the basis of calculation of the real profitability on the given client:

$$RORC_{EX-POST\ BUSINESS}^{KL} = \frac{\sum_{i=0}^n (WB_{Ri} - K_{RRi})}{\sum_{i=0}^n RCTRi}$$

where:

$RORC_{EX-POST\ BUSINESS}^{KL}$ – real profitability of the capital requirement at the client level ex-post),

WB_{Ri} – executed gross result of an “i” transaction of the given client (without the creation of reserves),

K_{RRi} – real costs of risk of an “i” transaction of the given client (reserve created for an ”i” transaction concluded with the given client),

$RCTRi$ – real capital requirement generated by an “i” transaction of a given client.

The calculation of margins, commissions, gross results of standard risk costs etc. at the transaction level with the possibility of aggregation to the client level may constitute the basis for the analysis at different planes. Making use

of the additivity of the numerator and denominator of the presented measures, it is possible to calculate the profitability achieved by individual sellers (client advisers), the profitability of product sales units (branches, regions) or business lines. It is also possible to calculate the profitability of a business line, for example, corporate of retail. The formula of the profitability calculation is as follows:

$$RARORC_{EX-POST\ BUSINESS}^{LB} = \frac{WB_{LB} - K_{RR}}{RC_{LB}}$$

where:

$RARORC_{EX-POST\ BUSINESS}^{LB}$ – real profitability of capital requirement at the business line level (ex-post),

WB_{LB} – executed gross business line result (without reserves), for corporation line $WB_{LB\ CORPO} = \sum_{i=1}^n WB_{KLi}$ where WB_{KLi} gross result executed on an “i” within the corporation business line, for retail line $WB_{LB\ RETAIL} = \sum_{i=1}^n WB_{PRODi}$ where WB_{PRODi} gross result executed on an “i” product of a retail business line,

K_{RR} – business line real costs of risk (created reserves calculated on the basis of the real transaction data),

RC_{LB} – real capital requirement generated by the business line. RC_{LB} should be the sum of regulatory capital on account of the credit, market and operational risk related to the business line.

While considering the calculation in the ex-post account, it is also worth pointing to the possibilities of applying the economic capital to calculate the profitability of individual transactions. The calculation formula $RORC_{BUSINESS}^{TR}$, after replacing the regulatory capital by the economic capital, may become an additional measure of profitability. This measure should also be applied during the decision making process. The difficulty in calculating $ROEC_{BUSINESS}^{TR}$ lies in the practical possibilities of calculation of the economic capital at the level of a single transaction. The models used by banks usually allow for the direct calculation of the economic capital to cover the credit risk with reference to a particular client. The portion of capital with reference to a particular transaction is obtained in an artificial way through its allocation, whose the key is the capital requirement generated by every transaction. Furthermore, economic capital calculation models are limited to the calculations in the ex-post account, which makes it impossible to apply an additional measure while making current business decisions. Due to this, banks are now using economic capital to calculate profitability historically. The formula below shows how to calculate the profitability of economic capital at the client level:

$$ROEC_{EX-POST BUSINESS}^{KL} = \frac{\sum_{i=0}^n (WB_{Ri} - K_{RRi})}{EC_{KL}}$$

where:

$ROEC_{EX-POST BUSINESS}^{KL}$ – real profitability of economic capital at the client level (ex-post),

WB_R – executed gross result on an “i” transaction (without reserves),

K_{RR} – real costs of risk (created reserves calculated based on the real transactional data),

EC_{KL} – real economic capital calculated at the client level.

The transaction allocated economic capital (with reference to a single client) is used to calculate the individual profitability of every transaction according to the formula:

$$ROEC_{EX-POST BUSINESS}^{TR} = \frac{WB_R - K_{RR}}{EC_{TR}}$$

where:

$ROEC_{EX-POST BUSINESS}^{TR}$ – the real profitability of economic capital at the transactional level (ex-post),

K_{RR} – real costs of risk (reserves created on the basis of real transactional data),

EC_{TR} – transaction allocated real economic capital calculated at the client level.

In the ex-post account it is possible to calculate the profitability of products offered to retail customers. The calculations may be made on the basis of the regulatory or economic capital. The calculation formulae are as follows:

$$RORC_{EX-POST BUSINESS}^{PROD} = \frac{(\sum_{i=0}^n WB_{Ri}) - K_{RR}}{RC_{PROD}}$$

where:

$RORC_{EX-POST BUSINESS}^{PROD}$ – real profitability of capital requirement at the product (ex-post),

WB_{Ri} – executed gross result of an “i” client who possesses the product (without reserves),

K_{RR} – real costs of risk of an “i” transaction of the client (reserves created for an “i” transaction concluded with the client),

RC_{PROD} – real capital requirement generated by the product.

$$ROEC_{EX-POST\ BUSINESS}^{PROD} = \frac{(\sum_{i=0}^n WB_{Ri}) - K_{RR}}{EC_{PROD}}$$

where:

$ROEC_{EX-POST\ BUSINESS}^{PROD}$ – real profitability of economic capital at the product level (ex-post),

WB_{Ri} – executed gross result of an "i" client who possesses the product (without reserves),

K_{RR} – real costs of the product risk, (reserves created on the basis of the real transactional data),

EC_{PROD} – real economic capital calculated for the product.

Summing up the deliberations on the measurement of profitability at the lowest levels, it should be pointed to the possibility of application of the indicators in the decision making process. The implementation of measures, especially those in the ex-ante accounts, within the decision making process allows for its improvement on the one hand, and guarantees the pre-assumed results that should be obtained as a result of the decisions made by the sellers. The consideration of the profitability measures in the decision making process brings another advantage in the form of transfer of knowledge of risk and its impact on the results of the central, back office level on the "front line", i.e. sales staff. The sales units staff, apart from orienting their activities on the execution of sales plans, should also pay attention to the effectiveness of the decisions they make. The selection of more effective clients, with the identical transactional price terms, means the selection of the lower risk client, which should translate into the improvement of the bank credit portfolio.

The next section of the article will present a practical aspect of the implementation of instruments of capital effectiveness measurement in a commercial bank. It will also discuss the problem of effective allocation and re-allocation of capital and present the concept of the "capital bank."

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