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## **Methods of Increasing Bank Capital Effectiveness – part 3<sup>1</sup>**

### **1. Effective capital allocation**

The process of allocation may assume two forms<sup>2</sup>:

- passive allocation,
- active allocation.

The passive allocation is perceived as a process of assigning the available bank capital to particular activity areas (AA), connected with the evaluation of profitability of these AAs. However, without a built-in mechanism which would extort actions improving the profitability in certain areas (for example through the change in the amount of the allocated capital). In other words, the allocation in this form is connected, for example, with the mechanism of the AAs performance related bonuses. The calculated levels of profitability are only informative, not managerial. The active allocation includes a “built-in” mechanism extorting activities aimed at the improvement of the area profitability, and as a consequence, at the increase in the profitability on the scale of the whole bank. The process of allocation is connected with the evaluation of the AA profitability, and its results constitute the basis of assessment of the AA activity, and as a consequence the results determine, for example, the bonuses for the AA.

The introduction of the process of active allocation may not bring the expected effects in banks which possess capital surpluses (in such cases, it should be said that they are mismanaged institutions as they are not able to use the possessed capital resources).

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<sup>1</sup> This publication is a continuation of the article T. Cicirko: Methods of increasing bank capital effectiveness – part 1, “Journal of Management and Financial Sciences”, Volume II, SGH, October 2009.

<sup>2</sup> In practice, there is another form possible, between the passive and active allocation: the so-called semi-active allocation.

In the case of shortages of capital or its considerable limitation, one of the formulae shown below may be applied to calculate the profitability connected with the allocation of capital<sup>3</sup>:

Variant A

$$\frac{\textit{gross result}}{\max[\textit{used capital}; \textit{planned capital}]}$$

Variant B

$$\frac{\textit{gross result} - (\textit{surplus capital}^* \times \textit{penalty rate})}{\textit{used capital}}$$

\*) the capital surplus occurs when the used capital exceeds the planned capital,

Variant C

$$\frac{\textit{gross result} - (\textit{surplus capital}^* \times \textit{penalty rate})}{\textit{planned capital}}$$

The author considers variant C to be the most flexible formula. It combines the other presented variants A and B, which as a consequence allows for charging the AA with unused capital (denominator) and capital used in excess of plan (numerator).

This solution should discipline the AA to more accurately plan its demand for capital so that the amount of the planned capitals should be neither too low nor too high.

The bank capital management is closely connected with the bank effectiveness and risk management<sup>4</sup>. From this perspective, the introduction of the active capital allocation together with the implementation of the “double” discipline (variant C) should not reduce the planned profitability of capital, on the contrary it should improve it. However, the impact of the penalty rate on the bank profitability should be considered. The literature is silent on this point. The author’s self-designed research<sup>5</sup> in this area distinguishes three major cases:

- 1) “penalty” rate > the planned bank profitability rate,
- 2) “penalty” rate < the planned bank profitability rate,
- 3) “penalty” rate = the planned bank profitability rate.

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<sup>3</sup> Cf. Ch. Matten, *Zarządzanie kapitałem bankowym – alokacja kapitału i pomiar wyników* (Bank capital management – capital allocation and result measurement), Dom Wydawniczy ABC, Warsaw 2000, p. 220.

<sup>4</sup> M. Iwanicz-Drozdowska, *Zarządzanie finansowe bankiem* (Bank financial management), PWE, Warsaw 2010, p. 212ff.

<sup>5</sup> T. Cicirko, *Miary rentowności kapitałów w praktyce bankowej. Propozycje modyfikacji i zmian w modelach rentowności, Badania własne* (Capital profitability measures. Modification proposals and changes in profitability models), SGH, 2009.

The research<sup>6</sup> conducted by the author indicates that the choice of the penalty rate has a considerable impact on the profitability achieved by the AA, and as a consequence the profitability of the whole organisation. For the AA, every use of capital in excess of plan, earning the yield at the level lower than the penalty interest, causes the decline in the profitability of both AA and the bank. If the capital is to allocated effectively, which as a consequence is to increase the effectiveness of the whole entity, it is necessary to introduce a solution making the penalty rate at least equal to the planned profitability of the whole bank (from the rational point of view, this rate should not be lower than the cost of the capital acquired by the bank). If the effectiveness of capital use is to be increased, it is necessary to “charge” the AAs whose planned profitability is lower than the bank’s, with the rate not lower than the planned profitability of the whole entity, whereas the AAs with a higher profitability than that planned for the whole bank, with the rate not lower than the planned profitability of the given AA. The AAs which want to avoid the decline in their planned profitability, should invest in an additional capital only in these activities which could earn the rate of return not lower than the planned profitability rate of the whole bank. In consequence, there would be an increase in the profitability of the AA as well as the whole bank.

It should be emphasised here that there is a particular significance attached to the bank structure perceived as the sum of individual activity areas with different profitability within the whole bank activity.

## **2. Reallocation capital model**

### **2.1. Introduction**

The extension of the effective capital allocation is the so-called reallocation, i.e. the conducting of another (additional) allocation of capital during the fiscal year.

The solution presented below in an innovative approach to the question of reallocation. The author suggests that the reallocation should be conducted when there are some activity areas (organisational units, business lines, departments etc.) possessing unused capital, and on the other hand some entities using capital in excess of the planned level. The capital reallocation, with certain conditions to be fulfilled (e.g. see the assumption for the model presented below), allows for the transfer of the unused capital to the areas suffering from its shortages. This solution reduces the growing capital base by the unused part. In other words, the

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<sup>6</sup> T. Cicirko, *Miary rentowności kapitałów w praktyce...* (Capital profitability measures in practice...), *op. cit.*

entity is not forced to raise the capital base by the excess amount (the sum of used capitals in excess of plan), only by the excess amount reduced by the unused sum. The application of reallocation brings the best effects when the capital limits are imposed on the bank or when the increase in the capital base is becoming difficult and costly (e.g. in the period of the present financial crisis). It is not necessary to reduce business in the activity areas exceeding the use of budgeted capital.

## 2.2. Reallocation model assumptions

During the year, or individual periods (quarters – Q) there is an AA (e.g. a department, a business line, an organisational line, a branch etc.) possessing the excess capital (i.e. an AA using less capital than assumed in the plan), and an AA indicating a shortage of capital (i.e. an AA using less capital than assumed in the plan).

The reallocation of the capital should be conducted after fulfilling jointly the following conditions:

- the AA which in a certain period indicated the use of capital below the planned amount accepts the reallocation, i.e. voluntary transfer of capital to another AA. It reduces the planned capital amount and at the same time the profitability indicator of the AA transferring the capital in on the rise,
- in a given period another AA indicated the use of capital in excess of the planned amount.

The capital reallocation is not conducted when the AA possesses unused capital and agrees to abandon it, but there are no AAs to have used the capital in excess of the budgeted level.

The transfer of capital between areas requires the determination of the order of activities on both parts. In the case of several AAs with unused capital, the author suggests three solutions:

- I. the capital is collected from the AAs in the following order: at first from the AA with the lowest planned ROC to the AA with the highest planned ROC,
- II. the capital is collected from the AAs in the following order: from the AA with the highest RoC to the AA with the lowest planned ROC,
- III. the capital is collected from the AAs in a proportionate way, i.e. in the way depending on the share of the shortage of the given AA in the total capital shortage.

The order of capital collection does not affect the profitability on the bank scale, it only determines the profitability of individual AAs. The choice of one

of the presented solutions depends on the preferences of the bank management in relation to the individual areas. The author considers the last solution to be the fairest.

The identical dilemma should be solved with reference to the order of AAs which receive the capital. In such a case, one of the aforementioned solutions may be used by analogy.

### 2.3. Practical aspects of the capital reallocation model

Selected numerical simulations illustrating the reallocation of capital are shown below.

The general assumptions of the simulations:

- AA annual result is evenly divided into quarters (result  $Q = 1/4$  of annual result),
- a similar assumption refers to the level of used capital in the given quarter (used capital in the given  $Q = 1/4$  of the annual capital),
- when there is one AA which shows a shortage and one with an excess, it is not important which capital allocation method is used (the order of collection and receipt).

#### Simulation 1<sup>7</sup>

(one AA indicates unused capital, one AA indicates a shortage)

Financial data<sup>8</sup>:

**Table 1.**

Plan Q	OD 1	OD2	OD3	OD4	BANK
Gross result	100	400	500	1000	2000
Capital (C)	1000	2000	2000	3000	8000
ROC	10.00%	20.00%	25.00%	33.33%	25.00%
Used Q					
Gross result	95	440	500	1000	2035
Capital (C)	800	2200	2000	3000	8000
Deviation from the capital plan (C)	-200	200	0	0	0
ROC implementation	11.88%	20.00%	25.00%	33.33%	25.63%
ROC* before reallocation	9.50%	19.50%	25.00%	33.33%	

ROC\* – profitability calculated according to variant C

<sup>7</sup> Own materials.

<sup>8</sup> ROC\* – profitability calculated according to variant C – see point 1 of the present study.

Table 2.

REALLOCATION of capital					
acc. to A	OD 1	OD2	OD3	OD4	BANK
Capital plan (C) after reallocation	800	2200	2000	3000	8000
Deviation from the capital plan (C)	0	0	0	0	0
ROC* after reallocation	11.88%	20.00%	25.00%	33.33%	25.63%

REALLOCATION of capital					
acc. to C	OD 1	OD2	OD3	OD4	BANK
Capital plan (C) after reallocation	800	2200	2000	3000	8000
Deviation from capital plan (C)	0	0	0	0	0
ROC* after reallocation	11.88%	20.00%	25.00%	33.33%	

ROC\* – profitability calculated according to variant C

In simulation 1 there is an assumption that AA 1 did not use 200 capital units, whereas AA 2 consumed 200 capital units in excess of plan. Calculating ROC based on the implementation data the following levels of profitability are obtained: in AA 1 ROC = 11.88% (10% above the planned value), in AA 2 ROC = 20% (the plan was implemented). However, the calculation of the profitability including the capital budget and the charge for exceeding it indicates that AA 1 showed the profitability of only 9.50%, and AA 2 19.50%. As a result of the conducted reallocation, there is a plan reduction by AA 1 (from 1000 to 800 units), which allows for the increase in ROC\* up to 11.88%. The reallocation also changes the AA 2 budget (from 2000 to 2200 units) and in this way the plan of capital use has not been exceeded and the penalty charge avoided – ROC\* grows from 19.50% up to 20.00% (the profitability plan is implemented). The transfer of capital from AA 1 to AA 2 (on mutual consent) confirms that AA 1 does not plan to consume the unused capital this year. This allows for the resignation from actions to increase the capital base by the excess amount by AA 2 in order to maintain the solvency ratio at the unchanged level. Thus, the bank does not incur any additional costs due to the increase in the capital base by 200 capital units.

The reallocation of capital in the case of on AA with a shortage and one AA with a capital surplus brings identical results for both solutions A and C.

**Simulation 2<sup>9</sup>**

(one AA shows unused capital, two AAs show a shortage)

Financial data<sup>10</sup>:**Table 3.**

<b>Plan Q</b>	<b>OD 1</b>	<b>OD2</b>	<b>OD3</b>	<b>OD4</b>	<b>BANK</b>
Gross result	100	500	400	1000	2000
Capital (C)	1000	2000	2000	3000	8000
ROC	10.00%	25.00%	20.00%	33.33%	25.00%
<b>Used Q</b>					
Gross result	100	500	490	1175	2265
Capital (C)	800	2000	2100	3225	8125
Deviation from plan C	-200	0	100	225	125
ROC implementation	12.50%	25.00%	23.33%	36.43%	27.88%
ROC* before allocation	10.00%	25.00%	23.25%	36.67%	27.922%

**Table 4.**

<b>REALLOCATION of capital</b>					
<b>acc. to A</b>	<b>OD 1</b>	<b>OD2</b>	<b>OD3</b>	<b>OD4</b>	<b>BANK</b>
Capital plan (C) after reallocation	800	2000	2000	3200	8000
Deviation from plan C	0	0	100	25	125
ROC* after reallocation	12.50%	25.00%	23.25%	36.46%	27.92%

<b>REALLOCATION of capital</b>					
<b>acc. to C</b>	<b>OD 1</b>	<b>OD2</b>	<b>OD3</b>	<b>OD4</b>	<b>BANK</b>
Capital plan (C) after reallocation	800	2000	2089	3200	8089
Deviation from plan C	0	0	11	25	36
ROC* after reallocation	12.50%	25.00%	23.32%	36.46%	27.89%

There is an assumption made in the simulation 2 that AA 1 did not use 200 units of capital, whereas AA 3 consumed 100 units in excess of the plan, and AA 4 consumed 225 units in excess of the plan. Calculating ROC based on the implementation data the following levels of profitability were obtained: in the AA 1 ROC = 12.5%, in the AA 3 ROC = 23.33%, and in the AA 4 ROC = 36.43% (the plan was exceeded in every AA). However, the calculation

<sup>9</sup> Own materials.<sup>10</sup> ROC\* – profitability calculated according to variant C – see point 1 of the present study.

of profitability including the capital budget as well as the excess charge indicates that AA 1 showed a profitability of 10.00%, and AA 3 and AA 4 23.5%, and 36.67% respectively. As a result of the reallocation, the plan of use is reduced by AA 1 (from 1,000 – 800, which allows for the increase of the ROC\* level to 12.50% (irrespective of the variant of reallocation: A or C). The reallocation also changes the AA 3 budget, but only in variant C (from 2000 to 2089 units); it raised the ROC\* up to 23.32%. In variant A of the reallocation, the ROC\* amounts to exactly the same as before the reallocation (the plan of capital use did not change). The transfer of capital from AA 1 to AA 4 (in both variants: A and C) does not change the profitability change: it is a result of the additional capital investment in the activity earning the return equal to the penalty rate.

The reallocation allows the bank not to undertake actions to increase the capital base by the excess amount of 325 capital units, only by 125. Thus, the bank incurs lower costs related to the increase in the capital base not reducing its profitability.

### Simulation 3<sup>11</sup>

(two AAs show unused capital, one shows a shortage)

Financial data<sup>12</sup>:

**Table 5.**

Plan Q	OD 1	OD2	OD3	OD4	BANK
Gross capital	100	500	400	1000	2000
Capital (C)	1000	2000	2000	2500	7500
ROC	10.00%	25.00%	20.00%	40.00%	26.67%
Used Q					
Gross capital	100	550	400	1000	2050
Capital (C)	800	2200	1900	2500	7400
Deviation from plan C	-200	200	-100	0	-100
ROC implementation	12.50%	25.00%	21.05%	40.00%	27.70%
ROC* before reallocation	10.00%	22.50%	20.00%	40.00%	

<sup>11</sup> Own materials.

<sup>12</sup> ROC\* – profitability calculated according to variant C – see point 1 of the present study.



**Table 6.**

<b>REALLOCATION of capital</b>					
<b>acc. to A</b>	<b>OD 1</b>	<b>OD2</b>	<b>OD3</b>	<b>OD4</b>	<b>BANK</b>
Capital plan (C) after reallocation	800	2200	2000	2500	7500
Deviation from plan C	0	0	-100	0	-100
ROC* after reallocation	12.50%	25.00%	20.00%	40.00%	

<b>REALLOCATION of capital</b>					
<b>acc. to C</b>	<b>OD 1</b>	<b>OD2</b>	<b>OD3</b>	<b>OD4</b>	<b>BANK</b>
Plan of capital (C) after reallocation	867	2200	1933	2500	7500
Deviation from plan C	-67	0	-33	0	-100
ROC* after reallocation	11.54%	25.00%	20.69%	40.00%	

Simulation 3 assumes that AA 1 did not use 200 and AA 3 100 capital units, and AA 2 consumed 200 capital unit in excess of plan. Calculating ROC based on the implementation data the following profitability levels are obtained: in AA 1 ROC = 12.5%, in AA 3 ROC = 21.05%, and in AA 2 ROC = 25.00% (the plan was implemented in AA 2, and exceeded in AA 1 and AA 3). However, the calculation of profitability including the capital budget and excess charge indicates the profitability of AA 1 at the level of 10.00%, and AA 2 and AA 4 22.50%, and 20.00% respectively. As a result of reallocation the plan of use is reduced by AA 1 from 1000 units to 800, which allows for the increase in ROC\* up to 12.50% (in variant A of reallocation), or from 1000 to 867 units earning profitability at the level of 11.54%. Reallocation also changes the budget of AA 3, but only in variant C (from 2000 to 1933 units) – ROC\* rose to 20.69%. In AA 2 in variant A and C of reallocation, ROC\* accounts for exactly the same: 25.00% and is by 2.50 percentage points higher than before the reallocation.

Simulation 4 assumes that AA 1 and AA 3 did not use 200 capital units each, and AA 2 consumed 200 and AA 4 150 capital unit in excess of the plan. Calculating ROC based on the implementation data the following profitability levels are obtained: in AA 1 ROC = 12.5%, in AA 3 ROC = 22.22%, and in AA 2 ROC = 25.00% and in AA 4 ROC = 33.33% (the plan was implemented in AA 2 and AA 4, and exceeded in AA 1 and AA 3). The calculation of profitability including the capital budget and excess charge indicates the profitability of AA 1 at the level of 10.00%, AA 2 – 22.50%, AA 3 – 20.00% and AA 4 – 32.78%. As a result of the reallocation of capital according to variant A the profitability of all AAs improves, with unused capital that could not be used to charge AA 3. The profitability after

reallocation is lower than the profitability based on implementation values but higher than ROC before the reallocation. The reallocation of capital according to variant C charges AA 1, 3 and 4 with the costs of unused capital, whereas the costs of its consumption in excess of plan charge AA 3.

### Simulation 4<sup>13</sup>

(two AAs show unused capital, two AAs show shortages)

**Table 7.**

Plan Q	OD 1	OD2	OD3	OD4	BANK
Gross result	100	500	400	1000	2000
Capital (C)	1000	2000	2000	3000	8000
ROC	10.00%	25.00%	20.00%	33.33%	25.00%
Used Q					
Gross result	100	550	400	1050	2100
Capital (C)	800	2200	1800	3150	7950
Deviation from plan C	-200	200	-200	150	-50
ROC implementation	12.50%	25.00%	22.22%	33.33%	26.42%
ROC* before reallocation	10.00%	22.50%	20.00%	32.78%	

**Table 8.**

REALLOCATION of capital					
acc. to A	OD 1	OD2	OD3	OD4	BANK
Capital plan (C) after reallocation	800	2200	1850	3150	8000
Deviation from plan C	0	0	-50	0	-50
ROC* after reallocation	12.50%	25.00%	21.62%	33.33%	
REALLOCATION of capital					
acc. to C	OD 1	OD2	OD3	OD4	BANK
Capital plan (C) after reallocation	825	2175	1825	3175	8000
Deviation from plan C	-25	25	-25	-25	-50
ROC* after reallocation	12.12%	24.71%	21.92%	32.55%	

To sum up the aforementioned simulations, it should be said that the reallocation positively affects the profitability of all the bank units, its scale depending on the capital re allocation variant used. The decision on the variant

<sup>13</sup> Own materials.

to be applied should be made by the bank management bearing in mind the preferences of all AAs. The advantage for the whole bank is obvious, i.e. it does not have to increase the capital base in order to maintain the solvency ratio at the required level.

Apart from all the advantages, the reallocation has some disadvantages as well. First of all, the periodical (quarterly) plan verification is to be mentioned. The author thinks that this task is too labour-consuming to be conducted four times a year as it is connected with the adjustment of financial plans. It should be remembered that every change has to be approved by the bank supervising bodies, i.e. the supervisory council. Furthermore, the plans are made by operational units, which may unfavourably affect the implementation of their operating activity (sales). The reallocation conducted in the middle of the year while updating the plans of the current fiscal year seems to be an optimal solution.

The general capital allocation principle, the active allocation in particular, is the assignment of such an amount of capital to the respective activity areas (organisational units) that the relation between the activity and the capital requirement is reflected in the most realistic way. This principle is fulfilled thanks to the capital allocation in the areas which through their activities and decisions are able to fully affect and manage the position generating the broadly perceived capital requirements (both RC and IC). Thus, capital should not be allocated to other AA lines which are not able to manage the position generating the capital requirements as the impact on the level of profitability is not possible.

With reference to the profitability calculation based on the allocated internal capital, it should be remembered that an AA cannot be expected to achieve the profitability equal to the bank expected profitability. Due to the fact that the whole capital covering all essential risks (IC) is not always allocated in the AA, it is necessary to rescale the required profitability ratio at particular levels so that the bank profitability could achieve the desired and expected level by the owners and investors. The respectively higher rates of return should be expected from AA. In other words, the bank profitability should be rescaled into the AA profitability, appropriately increasing it: capital in the denominator is higher than the sum of denominators of individual AAs.

The simulations in the last section concerning the innovative approach to increasing effectiveness of capitals used by banks are an element of the research conducted by the author on a broader scale. This study quotes only a selected element in order to indicate the directions of activity undertaken by banks in recent years. The indicated solutions may be used especially in the case of the imposition on the bank capital limits and restrictions as a result of the present financial crisis. The shift of the unused budgeted capital between AAs allows banks

to increase the capital base only by the difference between the excess amount and unused amount. This solution saves the capital, which in the author's opinion became a limited and costly product in the period of crisis.

The research questions asked at the beginning of this study have been verified and it may be certainly said that:

- the evaluation of the profitability of own capital based on RORC or ROIC may provide false information on the profitability of the entity's organisational units,
- the ROC evaluation model considering the effective allocation may become an element which effectively increases the use of corporate capital.

### **3. Effectiveness measurement integrated model**

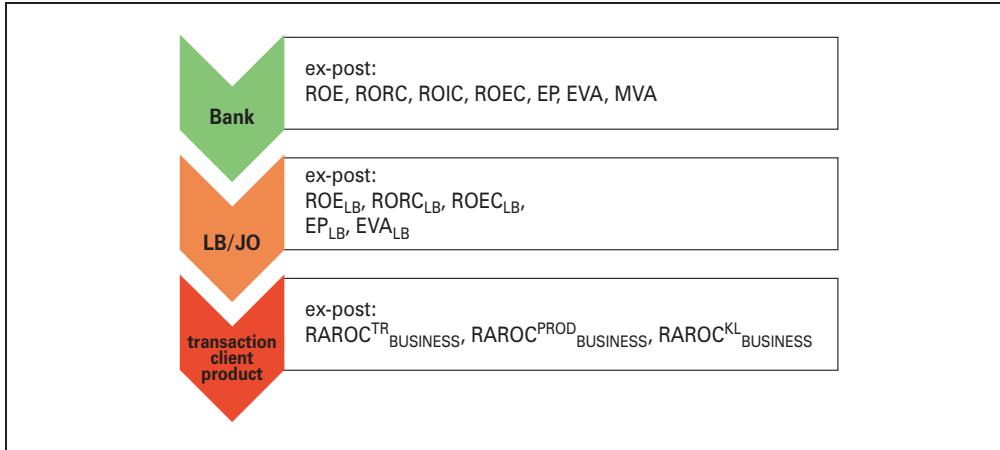
The effectiveness measurement integrated model should complement the bank capital management policy. The policy should be oriented at the optimisation of the rate of return on capital, which will allow for the creation of a stable base to increase the existing bank capital base in the following periods of operation. The implementation of this goal has to be conducted with the simultaneous control and retention of the solvency ratio at the level ensuring the appropriate capital adequacy.

The integrated model of effectiveness measurement should be multi-level and multi-tool. It is possible thanks to the implementation of the process of consumption measurement and capital effectiveness at every important organisational and structural level by means of appropriately selected tools. The model implementation should be used to introduce the specified responsibility for the generated effectiveness indicators. The proper instrument to be used is the application of the key performance indicators (KPI). The delegation of responsibility to the suitable staff for the amount of return on capitals calculated at different levels (from a transaction to the bank) improves the efficiency of capital management in the institution and disciplines the activity areas the effective use of capital.

The integrated model should also be a multi-phase tool assuming its permanent development to enable the application of more and more precise methods of effectiveness measurement with the simultaneous adjustment of tools to the current needs and technical possibilities of the bank. A three-stage model, graphically presented in Figure 1, may be proposed.

The model presented above imposes the duty of calculation of effectiveness measures based both on own, regulatory and internal capital or selected components

**Figure 1. Integrated effectiveness measurement model – overview drawing**



where:

ROE – own capital profitability,

RORC – regulatory capital profitability,

ROIC – internal capital profitability,

ROEC – economic capital profitability,

EP – economic profit,

EVA – economic value added,

MVA – economic value added,

LB – business line (activity segment),

JO – organisational unit (e.g. department or office),

$RAROC^{TR}_{BUSINESS}$ ,  $RAROC^{PROD}_{BUSINESS}$ ,  $RAROC^{KL}_{BUSINESS}$  – risk adjusted capital profitability calculated respectively at the level of transaction, product or client (the capital may be both regulatory and economic capital or individual components of these capitals).

Source: own material.

of these capitals. Depending on the level of model and measure, the calculation is made in an ex-post as well as ex-ante account. A detailed list of effectiveness measures at different levels of the model is presented in Table 9.

In the calculation of the profitability level (e.g. on transaction) the achieved result is compared with the capital most frequently covering the credit risk. The transition to a higher level of allocation (the client level) is the reason why in the denominator there may additionally appear e.g. the capital on account of market risk generated by the remaining client transactions. The achievement of the highest level of allocation (bank level) leads to the situation when in the denominator of the profitability ratio there is a cumulated capital to cover all risks to be covered by this type of capital. In the case of regulatory capital it

is the capital to cover credit, market and operating risk, whereas in the case of internal capital all risks identified by the bank are secured.

**Table 9. Effectiveness measurement integrated models measures**

Measurement level	Measurement tool	Capital (risks)	Time
Bank	ROC	Own capital Regulatory capital Internal capital	<i>ex-post</i>
	EP	Own capital	
	EVA	Own capital	
	MVA	Own capital	
Business line, organisational unit	ROC	Own capital Regulatory capital Economic capital	<i>ex-post</i>
	EP	Own capital	
	EVA	Own capital	
Client	$RAROC_{BUSINESS}$	Capital requirement for credit and market risk Economic capital to cover credit and market risk	<i>ex-post,</i> <i>ex-ante</i>
Product	$RAROC_{BUSINESS}$	Capital requirement for credit and market risk Economic capital to cover credit and market risk	<i>ex-post</i>
Transaction	$RAROC_{BUSINESS}$	Capital requirement for credit and market risk Economic capital to cover credit and market risk	<i>ex-post,</i> <i>ex-ante</i>

Source: own material.

This relation may be used in the process of price management (pricing), i.e. when determining the optimum level of prices for a given product, client, transaction etc.). Table 10 presents results, regulatory capitals at the level of the bank, business lines, products, clients and individual transactions.

**Table 10. Regulatory capital profitability calculated at different business levels**

	Bank													
	Total	LB 1									LB 2			
		Amount	Client 1					Client 2		Client 3	Total	Prod. 1	Prod. 2	Prod. 3
			Total	TR 1	TR 2	TR 3	Total	TR 1	TR 2	TR 1				
Result	3000	1 150	690	120	270	300	400	190	210	60	1 850	500	600	750
RC	12 900	4 660	2 850	350	1 070	1 430	1 660	1 100	560	150	8 240	2 550	2 570	3 120
CR	9 800	3 900	2 300	200	900	1 200	1 500	1 000	500	100	5 900	1 850	1 950	2 100
MR	2 000	–	–	–	–	–	–	–	–	–	2 000	600	500	900
OR	1 100	760	550	150	170	230	160	100	60	50	340	100	120	120
WNIP	2 000	767	460	80	180	200	267	127	140	40	1 233	333	400	500
RORC (incl. wnip)	20.1%	21.2%	20.8%	27.9%	21.6%	18.4%	20.8%	15.5%	30.0%	31.6%	19.5%	17.3%	20.2%	20.7%
RORC	23.3%	24.7%	24.2%	34.3%	25.2%	21.0%	24.1%	17.3%	37.5%	40.0%	22.5%	19.6%	23.3%	24.0%
RORC CR	30.6%	29.5%	30.0%	60.0%	30.0%	25.0%	26.7%	19.0%	42.0%	60.0%	31.4%	27.0%	30.8%	35.7%
Difference: RORC (incl. wnip) – RORC CR	10.5%	–8.3%	–9.2%	–32.1%	–8.4%	–6.6%	–5.9%	–3.5%	–12.0%	–28.4%	–11.8%	–9.7%	–10.6%	–15.0%
Difference: RORC (incl. wnip) – RORC	–3.1%	–3.5%	–3.4%	–6.4%	–3.6%	–2.6%	–3.3%		–7.5%	–8.4%	–2.9%	–2.3%	–3.1%	–3.3%

Source: own material.

where:

RORC CR = RORC<sub>EX-ANTE BUSINESS</sub> – profitability of transaction, client etc. based on the capital requirement for credit risk,

RC – regulatory capital (total capital requirement),

CR – capital requirement for credit risk,

MR – capital requirement for market risk,

OR – capital requirement for operating risk,

WNIP – intangible assets.

Applying the integrated model of effectiveness measurement the regulatory capital profitability calculation (RORC) was made at the indicated levels. The return on regulatory capital on account of credit risk  $RORC_{CR}$  (on the capital requirement generated by the given transaction, product etc.) was also calculated. The link between the aforementioned profitability measures allows for the application of this causality in the decision making and planning process. If the return on regulatory capital of 20.1% at the bank level is to be achieved, with the expected (weighted) structure of sales, capital requirements, it should be assumed that the return on the transaction of client 3 calculated as  $RORC_{EX-ANTE\ BUSINESS}^{TR}$  has to amount at least 31.6%. By analogy, the return calculated on client 2 ( $RORC_{EX-ANTE\ BUSINESS}^{KL}$ ) has to amount to 20.8%, with the profitability of individual transactions at the level of 15.5% and 30.0% respectively. In other words, the seller may be imposed with the duty of generating a minimum return of client of every transaction, which is to guarantee the achievement of the expected rate of return at the bank level. In order to set a minimum return on client, transaction etc., In order to determine a minimum return on client, transaction etc., it is necessary to apply a scaling factor, i.e. the factor which determines the relation of profitability at the transactional level (based on the requirement for credit risk) with the profitability at the bank level (based on the total capital requirement). The scaling factor may be calculated in two ways for two different purposes, which is presented in the example below.

$$RORC_{EX-ANTE\ BUSINESS}^{TR} = RORC_{BANK} \times W_{scaling}^{Result} \times W_{scaling}^{RC}$$

where:

$RORC_{EX-ANTE\ BUSINESS}^{TR}$  – expected profitability of capital requirement for credit risk at the transactional level (*ex-ante*),

$RORC_{BANK}$  – profitability of regulatory capital at the bank level,

$W_{scaling}^{Result}$  – scaling factor based on result,

$W_{scaling}^{RC}$  – scaling factor based on regulatory capital,

$W_{TR}$  – result at the transactional level,

$W_{BANK}$  – result at the bank level,

$RC_{CR}^{TR}$  – regulatory capital on account of credit risk at the transactional level,

$RC_{BANK}$  – regulatory capital at the bank level.

Knowing the initial parameters, i.e. the expected result, budgeted regulatory capital (divided into individual components) and return on capital, it is possible to rescale the profitability from the bank level to the “business” profitability. This means that it is possible to determine the average weighted profitability to be obtained from every transaction, see Table 12.



**Example**

Table 11 includes the sales plan and results at the selected levels of the bank business structure.

**Table 11. Profitability of regulatory capital calculated for the bank, business line and clients**

	Bank			
	Total	LB 1		
		Amount	Client 1 Total	Client 2 Total
Result	1 190	1 190	690	500
RC	4 510	4 510	2 850	1 660
CR	3 800	3 800	2 300	1 500
MR	–	–	–	–
OR	710	710	550	160
WNIP	2 000	1 832	1 160	672
RORC (incl. wnip)	18.28%	18.76%	17.21%	21.44%

Source: own material.

Abbr. see Table 10.

**Table 12. Results, profitability at the transactional level**

	Transaction with client X
Result	690
RC	2 850
CR	2 300
MR	–
OR	550
RORC (with WNIP)	24.21%
RORC <sub>BANK</sub> = 26.39%	
RORC CR	?

Source: own material.

Symbols as in Table 10.

Assuming that in the future transactions will be concluded only with client X, the average weighted return on RC<sub>CR</sub> has to amount to 30% in order to achieve the RORC of 26.39% at the bank level.

On the basis of scaling indicators it is possible to effect re-scaling including the intangible assets in the calculations.

**Table 13. Profitability of regulatory capital calculated for the bank, business line and clients**

	Bank			
	Total	LB 1		
		Amount	Client 1 Total	Client 2 Total
Result	1 190	1 190	690	500
RC	4 510	4 510	2 850	1 660
CR	3 800	3 800	2 300	1 500
MR	–	–	–	–
OR	710	710	550	160
WNIP	2 000	1 832	1 160	672
RORC (incl. wnip)	18.28%	18.76%	17.21%	21.44%

Source: own material.  
Symbols as in Table 10.

Taking into consideration the deliberations in the area of profitability measurement at the lowest levels: in both ex-post and ex-ante account.

**Table 14. Profitability of regulatory capital calculated for the bank, business line and clients**

	Bank			
	Total	LB 1		
		Amount	Client 1 Total	Client 2 Total
Result	1 190	1 190	690	500
RC	4 510	4 510	2 850	1 660
CR	3 800	3 800	2 300	1 500
MR	–	–	–	–
OR	710	710	550	160
WNIP	2 000	1 832	1 160	672
RORC (incl. wnip)	18.28%	18.76%	17.21%	21.44%
RORC	26.39%	26.39%	24.21%	30.12%
RORC CR	31.32%	31.32%	30.00%	33.33%
Difference: RORC (incl. wnip) – RORC CR	–13.04%	–12.55%	–12.79%	–11.89%

Source: own material.  
Symbols as in Table 10.

#### **4. “Capital bank” concept**

An alternative solution to all the presented tools increasing the effectiveness of capital management is a complex and integrated mechanism based on the concept of the “capital bank.” This mechanism fulfils the bank requirement in the area of business decision making, being an element of the motivational system and constituting the basis for the used capital effectiveness measurement, simultaneously controlling the bank capital adequacy.

The concept of the “capital bank” is a system of internal calculations on the basis Capital Transfer Prices (CTP). Through the establishment of a special central unit to manage the bank capital, the mechanism is to ensure:

- expected level of the bank capital adequacy,
- effective and optimal use of the capital available in the bank by the business units,
- effectiveness measurement and analysis.

The idea of the CTP concept is close to the internal calculations based on fund transfer rates. However, in this case it is concerned with the capital issues related to the capital adequacy the bank wants to ensure. The object of calculation may be regulatory funds, regulatory capital, internal capital and own capital.

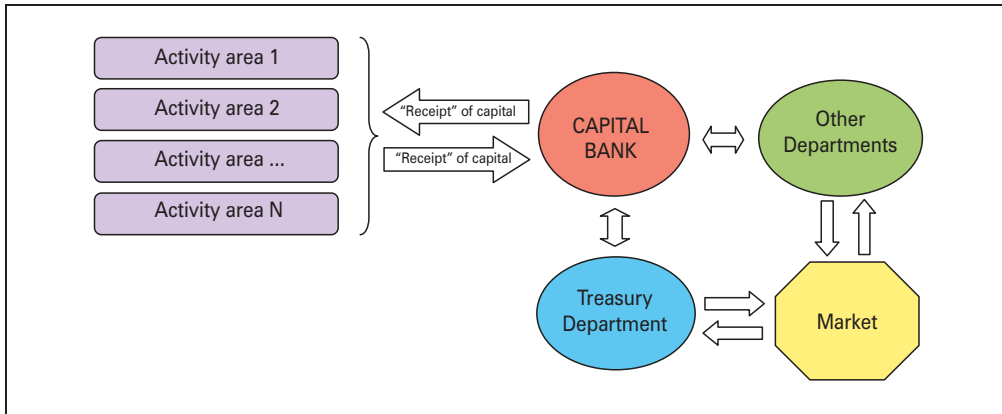
The basic assumption of the CTP concept is the creation of a bank central unit (department) which would combine the financial aspects (including capital planning, the allocation of capital, or used capital effectiveness measurement) and managerial (including bank activity management through capital management). This unit, called Capital Bank (Bank Kapitału – BK), would perform an advisory role in relation to the bank management and would recommend activities concerned with the maintenance of optimal structure of capitals and increasing the effectiveness of the available capital.

The BK’s main goal will be to supervise and control capital transfers between the internal units and external capital providers.

The process of internal settlements based on capital transfer rates is a cyclical activity including three stages:

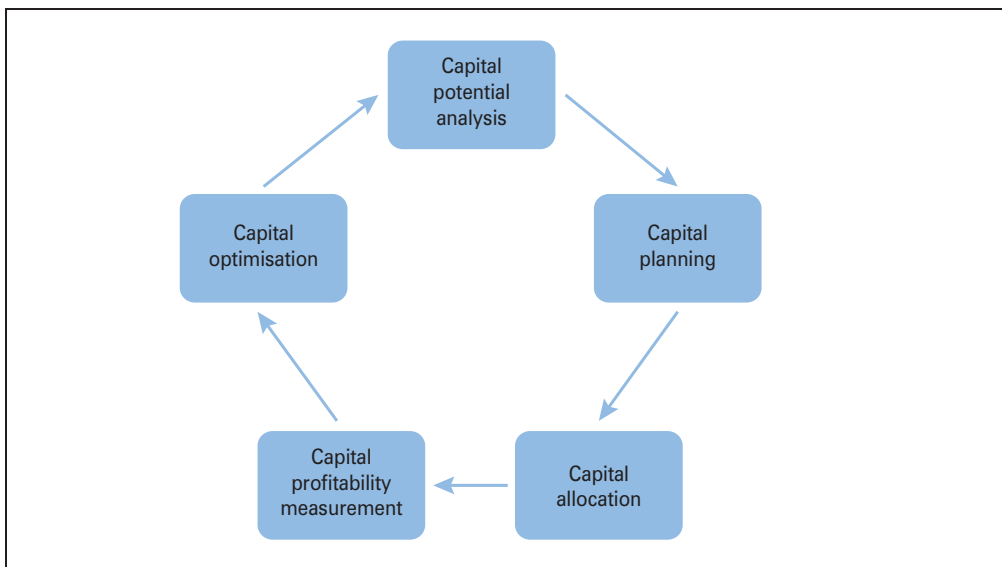
- 1) capital potential analysis,
- 2) capital planning,
- 3) capital allocation,
- 4) capital profitability measurement,
- 5) capital optimisation.

**Figure 2. The process of internal settlements based on capital transfer prices**



Source: own material.

**Figure 3. Stages of the internal calculation process**



Source: own material.

**Re: 1**

The analysis of the capital potential is conducted by the Capital Bank in cooperation with other bank units, in particular the Treasury Department and is aimed at:

- a) determination of the available capital level,
- b) potential extension of sources of own regulatory funds,

**Re: 2**

The process of capital planning is an element of an annual financial planning. Profit units plan business parameters such as the credit portfolio structure or the exposure amount that serve the purpose of calculation of the capital requirement value and internal capital. The planning process includes an element of negotiations between the sales units, the budgeting unit and the Capital Bank. The parties involved have to reconcile their interests, i.e. the feasibility of sales and their impact on the bank result with the maintenance of the proper level of capital security. The planning unit verifies sales values in relation to the market reality, follows the bank management's expectations of the result, and in cooperation with the BK guarantees planning of the required rate on return (for example ROE).

**Re: 3**

The financial plan accepted by the management is the basis for the allocation in profit units of the regulatory capital, internal capital, regulatory funds of bank own capital. The capital values will constitute basis for the implementation of the next stage, i.e. effectiveness measure. The allocation methods presented in this article are to be used at this stage.

**Re: 4**

The Capital Bank, i.e. a financial division unit, evaluates the effectiveness of the budgeted capital, analyses possible deviations from the plan, makes short-term capital forecasts including several scenarios, e.g. optimistic, realistic and the so-called black scenario, in other words, there is monitoring of the plan implementation and the level of capital adequacy (including the level of solvency ratio). The measurement of capital use effectiveness may be based on the tools described in this paper.

**Re: 5**

The capital optimisation is a stage oriented at the adjustment of regulatory funds to the capital demand on the one hand, and at the reallocation of capital in the need arises on the other.

At this stage there should also be some operating support for sales units conducted by the Capital Bank. This unit should substantively support the conclusion of transactions with high level of capital involvement so that the ultimate structure of the contract could generate a possibly lowest level of "risk appetite."

BK should analyse the calculation results of, for example, capital requirements in order to determine if, in the bank, they are not generated at a too high level as a result of no complete and updated transactional data in the information systems. The examples of the capital requirements calculations presented in section 3 prove that the lack of a single piece of information in the system or an incorrect entry (in particular in the area of security) may generate additional, unnecessary capital requirements.

It seems appropriate that the Capital Bank should apply the process of re-allocation for the purposes of capital management.

The implementation of tasks at different stages is laborious and requires the support of other organisational bodies of the bank. The Capital Management Committee is worth mentioning. It could be an ideal support for the BK activities and would be a proper link between the Capital bank and the bank management. It is suggested that the Committee chair should be performed by the management board member supervising the financial division (including the BK).

## **5. Summary and conclusions**

Despite the work done by the Basel Committee on the model of evaluation of the bank capital adequacy for nearly 40 years, every new international crisis reveals weaknesses and shortcoming of the current regulations and risk management process. As a consequence, the crises bring changes in the adequacy standards in the form of more restrictive principles of the measurement and evaluation of bank capital adequacy.

The first essential question arising in such situations is the issue of capital adequacy measurement in the form of solvency ratio. Is the level of 8% proposed in the 1980's sufficient? If so, do the capital requirements at this level secure the bank against risk nowadays? The number of risks included in the solvency ratio in combination with the extension of the bank own funds may be regarded as the movement in the right direction. However, experts claim that the CAR construction is obsolete as the current risk borne by banks is more complex and incomparably larger than during the time Basel I<sup>14</sup> was created.

The implemented cautionary regulations are aimed at the stability of the financial market through the bank security. The modern bank system is not indifferent to crises and it may catalyse them itself. It should be emphasised that no regulations may become a panacea to create the security of banks. In this area, the most depends on the management and staff as well as owners of

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<sup>14</sup> B. E. Gup, *The New Basel Capital Accord: Is 8% adequate?*, Thomson, New York 2004.

these entities – their reason and prudence, honesty and sense of responsibility for the money entrusted by their trustful customers<sup>15</sup> to them. The application of the best models and techniques will not ensure a success in the area of risk management.

The excessive confidence in rating agencies, the internal models of risk level calculation with a limited period of historical data as well as the disregard of the model assumption by the specialists, and additionally the lack of understanding of these models by bank managers, as well as underestimating the counterparty risk with reference to derivative instruments caused tragic effects in the form of subprime crisis.

It may be stated that as long as bank institutions exist at a very high leverage level (e.g. the capital relation of Tier 1 to RWA) and create “empty” money, they will be exposed to essential risk and their capital will not be entirely adequate.

One may consider some alternative methods to replace the Basel solutions. Basel I treated the public debt as a financial instrument free of risk. After the crisis the governments of the emerging markets refused to repay their debts, for example in Russia in 1998. Basel II related the weight of risk to the state rating. The restrictive solutions within the capital area are criticised, it is true about Basel II as well as Basel III. The increased capital requirements for banks may in a very short time cause a lower availability of credit in the economy and reduce the effectiveness of banks measured through the return on capital ratio (ROE). However, in a longer run they should contribute to better stability of the world financial system.

A series of publications have proposed numerous solutions in order to reduce the undesired impact of capital effectiveness measures on the capital adequacy. They also present individual effectiveness measuring tools which may be applied separately or used to construct an integrated effectiveness measurement model. This paper presents a model and suggests solutions supported by numerous simulations which, with consideration for the IT limitations are the most adequate research tool.

The implementation of Basel II in Poland was to bring benefit to commercial banks, including a lower joint capital requirement, in particular, the credit risk requirement, which is essential and constitutes the majority within the regulatory capital, the effects were to be obtained primarily thanks to the application of the internal ratings. However, these methods when the economic situation deteriorates (recession or crisis) result in a higher requirement than the standard method.

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<sup>15</sup> M. Marcinkowska, *Standardy kapitałowe... (Capital standards...), op. cit.*, p. 525.

This rule also refers to the internal capital whose major component is economic capital calculated on the basis of the VaR method. Taking into account the fact that the implementation of Basel II has not been fully completed – banks are intensively working at the moment to implement the advanced methods – and some new activities have been implemented to make new solutions come into effect. Basel III, which imposes more restrictive capital standards forces banks to strengthen the available capital in its “hardest” part, i.e. through the core capital.

The simulations presented in the last section of the publication are concerned with the innovative approach to increasing effectiveness of capitals used by banks, in particular in the case of limits and restrictions imposed on banks as an aftereffect of the present subprime crisis. The shift of the unused budgeted capital between business activity areas allows banks to increase the capital base only by the difference between the excess amount and unused amount. Such a solution saves the capital, which in the author’s opinion became a limited and costly product in the period of crisis.

It should be stated that it does not matter whether the profitability calculation is based on the regulatory or economic capital, some modifications can be introduced to the basic calculation formulae. They may also be applied in the situation of capital limitations. The modifications are aimed at the increase of effectiveness of the available capital base use.

The presented profitability calculation models, despite their advantages, have certain deficiencies. The author claims that variant C should be accompanied by the introduction of regulatory capital final states control combined, for example, with an additional result charge on account of the planned level excess. The tool constructed in such a way would be able to secure the bank goal, i.e. the appropriate rate of return on regulatory capital with a safe level of the capital solvency ratio and RC at the required (planned) level.

The example of the solution controlling the plan implementation may be based on the following mechanism:

$$\begin{array}{l} \text{Result charges} \\ \text{on account} \\ \text{of plan excess} \end{array} = \begin{array}{l} \text{Surplus of used capital} \\ \text{above the planned value} \end{array} \times \begin{array}{l} \text{Charge} \\ \text{rate} \end{array}$$

The surplus of capital used above the planned value is calculated as the difference between the value of the used and budgeted capital, however, for the correct functioning of this tool, the value of the surplus should have negative values. The tightening of the mechanism should be achieved by the selection of a considerably higher level of charge rate so as to effectively discourage the entity



from exceeding the planned level of charge. The result charge on account of plan excess has to decisively decrease the result. The setting of the charge rate depends on individual factors existing in the bank and may be entirely different, e.g. in another bank the charge rate will be effective at the level equal to the profitability of the whole area, and in another it may be a multiple of the business area profitability rate.

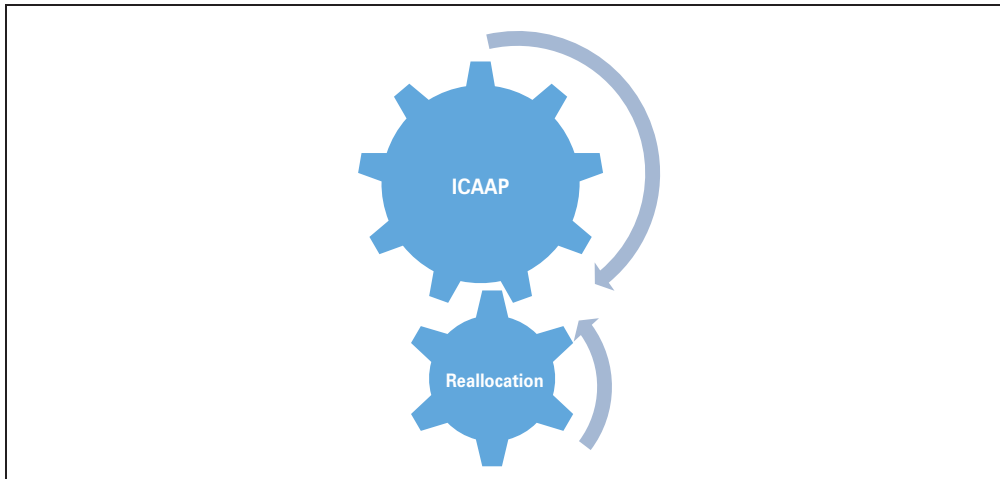
It is worth saying that the implementation of such a tool depends on the planning data. If in a bank it is possible to plan capital intensity only on annual basis, the mechanism will work properly. It is necessary to have quarterly or monthly plans, according to the author the optimal period is a quarter. It allows banks to systematically follow and control capital, at the same time it does not require high outlays connected with monthly planning.

If within the bank, there are some organisational units that do not use capital with the capital shortages that trouble some other units, it is worth considering whether or not to implement the process of effective allocation of capital, i.e. the so-called re-allocation of capital. This process allows for the transfer of the unused capital from the units which planned the capital at a too high level to the units which have some possibilities of additional consumption of capital. The process of reallocation has to determine the principles of transferring the capital between units so that the bank profitability will not deteriorate. On the contrary, the relocation should increase its effective use. The presented author's self-designed model of reallocation satisfies all the aforementioned expectations.

Recapitulating the aforementioned deliberations, it should be said that the profitability control used in practice and based on the regulatory and internal capital does not secure the unit against the loss of capital adequacy and that the application of additional tools increases the security of capital adequacy stability and favourably affects the effectiveness of capital use.

The proposal of including, into the ICAAP process, the active reallocation of capitals as one of the sub-stages seems to be rational and efficient. The bank is obliged to implement the ICAAP process annually, nothing should stand in the way to modify one of its stages, i.e. the stage of capital allocation. The re-allocation would be a sub-stage implemented in a quarterly cycle and would allow for the current monitoring of the capital use and its effectiveness. At the same time, it would allow for the operational management of the capital, e.g. the advance information about the "gap" of the available capital possible to appear at the end of the calculation year. Both processes would constitute an integrated self-driven controlling and managerial mechanism, Figure 4.

**Figure 4. ICAAP process model modified by reallocation**



Source: own material.

The last proposed solution is the self-designed “capital bank” concept. On the basis of the presented deliberations with reference to this area it should be stated that the process of internal settlements based on capital transfer rates may become an important instrument to enhance the process of bank management. It allows for:

- assignment of minimum “cost” for the used capital to the areas of business activity,
- enacting the basis for setting price parameters of transactions and products,
- elimination of capital deficits and surpluses in different areas (units) as well as in the whole bank,
- determination of transactional, product or client profitability including their impact on the structure of their own funds (transfer processes set minimal profitability level of transactions, products etc.),
- evaluation of business decision making based on the share of different activity areas in the bank capital (equity, own funds of internal capital),
- bank capital management through a specialised central unit and advisory body in the form the Capital Committee.

The existing economic conditions favour the deliberations on the changes within the bank capital management processes through the implementation of the presented concepts or at least some selected elements.

Firstly, the effectiveness measurement integrated model should be introduced, which, at the selected levels of the organisational structure would ensure reliable information on the generated profitability, at the same time monitoring the adequacy level.

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