Bank Management using Basel II-Data:
Is the Collection, Storage and Evaluation of Data calculated with internal Approaches Dispensable?

by

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Abstract:

Banks all over the world are still concerned with the implementation of the new Basel Accord for Capital Adequacy which refines – among others – the minimum capital requirements. In the last years huge silo-like structures for data acquisition, data management, and data processing have been created to comply with these new standards. In addition to the compulsory regulatory practices, banks run cost-intensive internal management systems for risk/return management as the existing regulatory systems underlie a number of limitations, which avoid an adequate measurement of the risk exposure. However, a precise measurement of the risk exposure is crucial for the optimal allocation of the scarce resource "economic capital". In this paper it is questioned whether in addition to the regulatory requirements, the differing data acquisition and processing for the internal management systems is really needed with respect to a bank-wide portfolio optimization.

It is shown that under specific conditions, an optimization approach utilizing the compulsory data output of the Basel Accord for Capital Adequacy can lead even to a better bank performance compared to using data generated with typical internal risk models based on VaR or CVaR – despite of the theoretical deficiencies of the Basel framework with respect to the measurement of credit exposure. This effect may not only enable better data integration but also allows for cost savings on internal risk management systems.

A case study is presented that shows that a German commercial bank is already applying the proposed approach.

Key words: bank wide risk/return management, economic capital, regulatory capital, Basel II, internal bank management systems, risk management

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1. Introduction

With the goal of gradually improving the quality of solvency-evaluation procedures of banks as well as strengthening the role of the risk management in banks, (Basel Committee on Banking Supervision 2003, p. 2) the Basel Committee on Banking Supervision (BCBS) issued internationally uniform standards in a first consultation paper as of June 1999 (Basel II) for the revised version of the Basel minimal capital requirements for banks of 1988. The new guidelines have been obligatory in many European countries since the beginning of 2007, but not yet in the USA where this step is planned for large banks with total banking assets of $250 billion or more or total on-balance-sheet foreign exposure of $10 billion or more for the beginning of 2009. (FED 2003, p. 6, FED 2005)

Current studies confirm that the costs of the implementation of these standards are immense: The Tower Group estimates that the US-American banks will spend approximately $12 billion solely on the conversion to Basel II through 2008. (*Mearian* 2005) According to an inquiry in 2005 among 63 European and North American banks, 45% of the interviewed executives count on costs of more than EUR 50 million for the implementation of Basel II in their institutes until 2007. The majority of these costs will be spent for IT projects, in particular for such concerning credit risk management. (*Putz* 2006, p. 258 ff.) A further study (Accenture et al. 2004, p. 161) amounts the expenditure for reorganization of information systems between 40% and 80% of the total volume and concludes that the number of assigned IT experts clearly exceeds those of the assigned banking people.

In addition to that, almost any larger financial institution operates complex internal systems to control and structure their portfolio, as the measures of Basel II suffer several limitations (see Section 2.2) and thus do not adequately indicate the risk exposure. However, an accurate indication of risk exposure is a substantial condition for an optimal utilization of the scarce resource "economic capital". The transformation of the information systems under high time pressure according to Basel II results in most institutions in building up an independent reporting system apart from already existing systems. These silo systems show almost no integration and common data basis. (*Buhl/Faisst* 2005, p. 403) Despite the difficult circumstances for implementing the new Basel accord, banks are expected to improve the interlinking of the risk management and finance function. (*Alexander/Hixon* 2005, p. 18)

This paper deals - exemplarily by an analysis of credit and market risks - with the central issue to what extent the collection, storage and evaluation of data calculated with internal approaches is dispensable by the use of Basel II-data for bank management, although regulatory based procedures do not indicate the underlying risk properly. We will investigate in the following sections if a management system based on Basel II-data can substitute an internal management system and additionally generate potential for cost savings. The synergetic use of a uniform data basis would additionally entail cost savings particularly on the IT side, e.g. in the personnel employment for system operation, maintenance and servicing as well as for a complex collection, preparation and an evaluation of internal risk data. (*Putz* 2006, p. 261 ff.)

To answer the aforementioned research question this contribution starts with a short introduction to the Basel II-accord and its limitations from an economic perspective. In Section 3, a bank management system will be introduced as basis for the further analysis. In Section 4, it is examined

in which situations it can be economically reasonable to use Basel II-data for a bank management system. Section 5 covers a Case Study about practical experiences of a Basel II-data based bank management system. The main findings are summarized in Section 6. This section also contains an outlook to the future of bank management systems.

2. Fundamentals of Basel II

Acting as financial intermediates, banks fulfill the important economical tasks of risk, period, and lot size transformation, whereby the taking of risks represents an important component of the core business of banks. (*Willinsky* 2001, p. 43, *Aziz/Rosen* 2004, pp. 13-14)

Because of the immense macro-economic importance (*Podpiera* 2006, p. 321) and the progressing globalization, national and international banking supervisory authorities have developed uniform, cross-national guidelines for "soundness and stability" of the banking sector, (Basel Committee on Banking Supervision 2004, pp. 1-2) whereby this process is not yet finished.

This set of rules prescribes banks to cover their risk exposure with capital which is equivalent to setting an upper limit for the total risk taken by the bank. The BCBS issued internationally uniform standards (Basel II) as a revised version of the Basel accord of 1988. The Basel II standards have been obligatory in many European countries since the beginning of 2007, but not yet in the USA where this step is planned for the beginning of 2009. Central to the new regulation standards are on the one hand a stronger support of the capital requirements of banks to its economic risk and on the other hand the attempt to consider more adequately newer developments in the internal risk management of the banking institutions. A closer co-operation with the supervisory authorities as well as extended disclosure obligations, called market discipline, represent the two further pillars of the new Basel accord. (Basel Committee on Banking Supervision 2004, pp. 2-3) These two pillars are not covered in detail in the context of this contribution. For a brief overview of the objectives and the three pillars of Basel II see Figure 1.
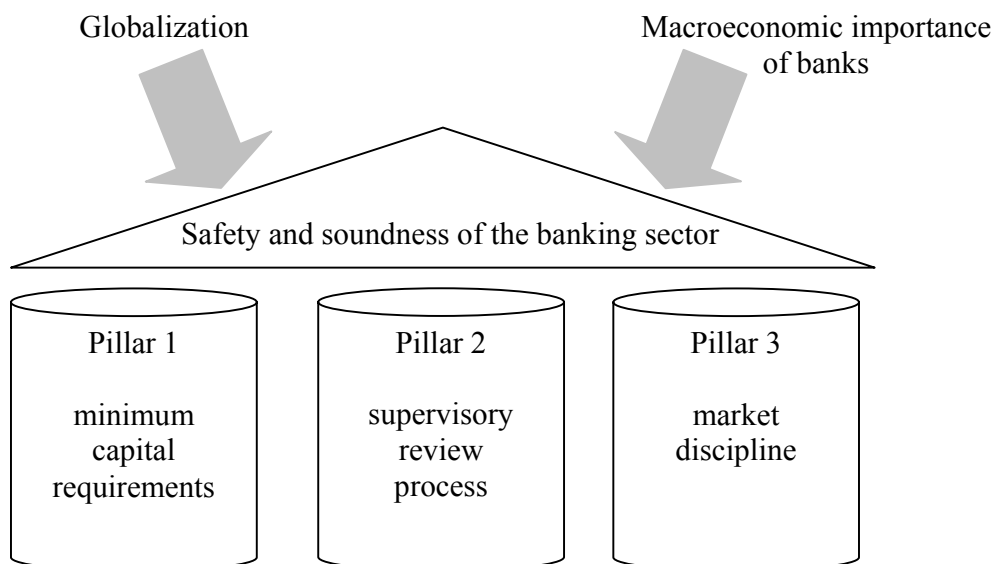

Fig. 1: Structure of Basel II

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2.1.   Minimum capital requirements according to Basel II

The first pillar provides new rules for setting minimum capital requirements on market, operational and credit risks. (*Jokivuolle,* 2006, p. 467) The general requirement for banks within the Basel II rules is to "hold total capital equivalent to at least 8% of their risk weighted assets" (Basel Committee on Banking Supervision 2004, p. 2), whereby the capital requirements are extended by operational risks in comparison to Basel I:

$$\frac{\text{Regulatory capital}}{\text{Risk weighted assets Credit Risk} + 12{,}5 \cdot \text{Re quirements (Market Risk} + \text{Operational Risk)}} \geq 8\%$$

"Total risk weighted assets are determined by multiplying the capital requirements for market risk and operational risk by 12.5 […] and adding the resulting figures to the sum of risk weighted assets for credit risk." (Basel Committee on Banking Supervision 2004, p. 12)

Concerning the measurement of market risks, no changes have been made in the development from Basel I to Basel II and thus, in analogy to many internal management concepts, the Value-at-Risk (VaR) is applied. (FED 2003, p. 21) The internal management concept which will be presented in Section 3 however uses the Conditional Value-at-Risk (CVaR), which is – from a theoretical point of view – superior to the VaR (except in the case of a normal distribution). (*Uryasev et al.* 1999, p. 2 ff.) Dealing with operational risks is fundamentally different from other kinds of bank risks and very difficult: on the one hand, it is very hard to determine a probability distribution for operational risks due to the very rare but high-impact occurrence of appropriate events. On the other hand an attribution of operational risks to single profit centers or transactions is hardly feasible. That is why operational risks are not considered in this contribution because they can hardly be integrated in an internal bank management system which aims to attribute all risks to the level of single transactions. Nevertheless, operational risks should be taken into account on a top level.

Credit risk is the most important risk category. (*Ward* 2002, p. 9) One of the basic principles of the Basel II-framework is that there are several options for an ascending degree of sophistication that banks can use to calculate their minimum capital requirements. The idea is that according to Basel II, banks should move gradually to the more sophisticated approaches, which are derived from economic capital models (*Jokivuolle* 2006, p. 467) as they provide incentives to lower the minimum capital requirements. Seen from a regulatory point of view, there are basically two different concepts for measuring credit risks. On the one hand the *Standardized Approach*, which defines risk weights for the different groups of debtors based on external ratings and on the other hand the *Internal Ratings Based Approach* (IRB-Approach), which defines risk weights on the basis of internal measurements. (Basel Committee on Banking Supervision 2003, p. 3 ff.)

In contrast to the measurement of market risks, where the VaR is used both internally and externally, and to the measurement of the operational risks, where internally the *Advanced Measurement Approach* is frequently used, substantial differences between internal (VaR-based) approaches and the regulatory approaches can be asserted particularly in the context of Basel II and credit risk measurement. (*Haas* 2006)

The *Standardized Approach* is merely an update of the Basel I-framework and does not rely on risk weights derived from economic capital allocation models. The main extension with respect to the

Basel I accord is that risk weights are a step-wise function of credit assets' external credit ratings. Unrated corporate credits would be subject to the current 100% risk weight. (*Jokivuolle,* 2006, p. 467)

A more sophisticated option is the *Internal Ratings Based Approach* (IRB-Approach) which is further comprised of two possibilities: the *Foundation Approach* (FIRB) and the *Advanced Approach* (AIRB). In these approaches, banks use their own internal ratings on customers' creditworthiness to determine the minimum capital requirement set against exposure to the customer's credit risk. A bank implementing one of the IRB-Approaches has to estimate an average probability of default (PD) for customers belonging to a given internal rating category. This PD, reflecting the credit risk of the exposure, is then used as an input parameter to the risk weight function provided by the Basel II-framework. The most advanced IRB-approach allows banks to use their internal risk models for the estimation of the parameters of the risk weight function (PD, Loss Given Default and Exposure at Default) to determine their minimum capital requirements.

2.2. Shortcomings of the minimum capital requirements according to Basel II

Even though the new Basel regulations represent the total risk of banks better than the regulations of 1988 (*McDonough* 2002, p. 4), there are various differences compared to internal procedures:

On the one hand this is due to the fact that the supervisory procedures are the result of a tuning process between supervisory authorities and the bank industry and therefore represent a compromise. This leads to various methodical inadequacies of the regulatory procedures in relation to economic state-of-the art approaches. (*Rowe* et al. 2004, p. 17) On the other hand, no accurate regulations for internal approaches exist and therefore banks can choose them freely.

The main issue here is the separated consideration of risks in Basel II, which takes place independently of the selected approach. The necessary total capital equivalent of the bank, which corresponds to 8% of the risk weighted assets, arises as a result of an addition of the necessary capital requirements of the individual risk positions. This proceeding has the shortcoming that (potential) diversification effects are not considered and the individual risk categories are not assessed on an integrated basis. As a consequence risks are usually systematically overestimated according to Basel II compared with the economic, internal bank management concepts. (c.p. Table 1) Due to the deficiencies of regulatory procedures, Basel II prescribes a parallel application of "an effective internal process" for the determination of credit risks. (Basel Committee on Banking Supervision 2004, p. 101) Detailed descriptions of how this process has to look like are not provided in the consultation paper. The suitability of the approaches has to be judged by the appropriate banking supervision authority. (Basel Committee on Banking Supervision 2004, p. 163)

Both for the reporting according to Basel II and for internal approaches, large data sets are generated and administered on the common basis of the generated business data. Before answering the central question in which scenarios the collection, storage and evaluation of data calculated with internal approaches is dispensable by the use of Basel II-data for a bank management by scenario analysis, Section 3 deals with an internal management concept. It may stand here on behalf for other internal management concepts.[1]

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[1] E.g. *Buhl/Faisst* (*Buhl/Faisst* 2005, p. 403 ff.) introduce an inter-branch controlling approach based on covariance as risk measure.

3. Internal risk/return management concept due to *Theiler*

The risk/return management concept due to *Theiler* (*Theiler* 2002) as a typical example for an internal bank management concept allows, in contrary to Basel II, an accurate quantification and attribution of the risk exposure to the level of single transactions with consideration of the diversification effects in the portfolio context. Moreover the approach guarantees that a unique concave, monotonously growing efficiency line is generated which is of crucial importance for the scenario analysis in Section 4.2.

The *Theiler* approach pursues an integrated view on risk and return, whereby only market and credit risks are considered, but no operational risks.[2] For measuring market and credit risks, *Theiler* uses the CVaR (*Uryasev et al*. 1999), and for capital allocation the "Euler-principle" is employed (*Theiler* 2002, p. 95 ff.). The *Theiler* approach consists of two steps. The objective of the first step in the sense of an ex-ante planning process is the deduction of a risk-return-optimal (μ, CVaR) bank portfolio[3] under the condition that the internal and regulatory risk exposure is limited. A limitation of the risk exposure means in this context that on the one hand the internal risk which is measured by the CVaR to a certain confidence level, and on the other hand the regulatory deducted risk exposure, are covered by the provided economic and regulatory capital of the bank, respectively. (*Theiler* 2002, p. 148)

By *economic capital*, we mean the according to internally criteria available capital, while regulatory capital designates the capital defined externally according to banking supervision criteria.

The optimization problem, which is covered in detail in Section 4, can be formulated as follows: (*Theiler* 2002, p. 148)

Maximization of the expected bank portfolio return

Subject to constraints:

(I) Internal risk $\leq$ Economic capital ($\rightarrow$ "*Internal constraint*")

(II) Regulatory risk $\leq$ Regulatory capital ($\rightarrow$ "*External constraint*")

The objective of the optimization is a maximization of the expected return of the bank subject to an internal and an external constraint. This optimization problem can be transformed into a linear optimization problem (*Theiler* 2002, p. 116) and thus be solved by using linear optimization, so that the computation complexity is bounded.[4]

After deriving an optimal banking portfolio in the first step, the objective of the second step is to calculate consistent target figures for the different profit centers for the budgeting process. (*Theiler* 2002, p. 187) Hence it is guaranteed that the profit centers behave in such a way that the current banking portfolio moves towards the determined optimal planning portfolio (Step I). The second

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[2] Dealing with operational risks on single-transaction level is very difficult. For that reason the *Theiler* approach does not deal with operational risks on single-transaction level, whereas we have to take account for operational risks on the top level.

[3] By the determination of a (μ, CVaR)-optimal portfolio it is meant here that management chooses from the set of risk-efficient portfolios the appropriate, i.e. the optimal one.

[4] *Theiler* uses the optimization approach developed by *Uryasev*. (*Uryasev et al*. 1999)

step is beyond the scope of this contribution. The basis for the following analysis forms the optimization problem of the first step.

4. Bank management based on regulatory capital

In this section, the research question is analyzed by the example of the *Theiler* approach above. Before we deal further with this issue, it should be examined which capital bases and expenditures exist at some selected major American and German banks, i.e. in which height economic and regulatory capital are held, because these two figures determine the constraints of the optimization problem.

4.1. Economic and regulatory capital

A survey due to Deutsche Bundesbank (Deutsche Bundesbank 2002, p. 41) points out that most German banks use the so-called *core capital* as available economic capital. Regulatory capital which is defined in the context of regulatory requirements consists of *core capital*, *supplementary capital* and *Tier III capital*. This is why the economic capital in most cases is a subset of the regulatory capital and thus smaller. At the same time, banks define their internal available capital basis dedicated to cover the risk exposure tighter than it is demanded by regulatory requirements. This is confirmed by the following table which shows the extent of utilization ratios of the internally and externally defined capital base of a selection of major American and German banks[5] based on their business reports in 2005:

Bank	JPMorgan Chase & Co. 2005	Wachovia 2005	Deutsche Bank 2005	Dresdner Bank 2005	Commerz-bank 2005
Allocated Economic Capital in Mio. $	43,800	16,932	14,496	8,260	8,160
Economic Capital in Mio. $ Utilization Ratio	105,500 42%	-* -*	-* -*	15,104 70%	16,963 48%
Allocated Regulatory Capital in Mio. $	68,051	32,325	23,530	10,529	14,133
Regulatory Capital in Mio. $ Utilization Ratio	102,437 66%	43,709 74%	39,985 59%	21,489 49%	22,086 64%

*Data not published.

Table 1: Extend of utilization ratios of the economic and the regulatory capital (JPMorgan Chase 2005, Wachovia 2005, Deutsche Bank 2005, Dresdner Bank 2005, Commerzbank 2005)

The *allocated economic capital* is the allocated part of the *economic capital*, e.g. the amount of capital which from an internal point of view is necessary for the coverage of the risk exposure. The *allocated regulatory capital* however describes the allocated part of the *regulatory capital*, e.g. the amount of capital which from a regulatory point of view is necessary for the coverage of the risk exposure.

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[5] The values of German banks are converted with the exchange rate from 2005-12-31 (EUR 1.00 = $ 1.18).

The utilization ratios are defined as the quotient of allocated economic capital and economic capital and of allocated regulatory capital and regulatory capital, respectively. They clearly show that both significant internal and significant external risk buffers exist. JP Morgan Chase for example has an internal risk buffer of 58% of economic capital and an external risk buffer of 34% of regulatory capital. Explanations for the low level of the utilization ratios are, besides the volatility of the market, both internal and external safety considerations and rating targets. Risk buffers must be held to be protected against market fluctuations because the complete exhausting of economic capital in connection with extreme market fluctuations could lead to insolvency. The influences of external ratings are difficult to quantify, because no guideline catalogue for ratings is published. However it can be assumed that smaller risk buffers tendentiously lead to a rating downgrade.

In Section 2.2 the separate treatment of the different risk categories in the context of Basel II has already been criticized. The comparison between the figures of the allocated economic capital and the allocated regulatory capital confirms that the banks internally estimate their risk smaller than the regulatory approaches do. As can be seen in Table 1, the more accurate risk measurement of the internal approaches is accompanied also by a more closely sized internal capital base for the coverage of risks, the economic capital. The neglected diversification effects in the regulatory approaches (potentially) lead to a systematic overestimation of the risk, but the associated regulatory capital base is defined larger, too. How this different composition of risk and risk coverage effects the overall bank portfolio and its optimization is discussed in the next section.

4.2.   Bank management based on regulatory capital

The basis of the considerations under which conditions a bank management based on Basel II-data is economically reasonable is the optimization approach due to *Theiler* (see Section 3). For this purpose first an overview of the visualization of the optimization is provided. Subsequently different scenarios are analyzed, depending on which of the two constraints is binding and whether transaction costs are considered or not. Finally the results of the scenario analysis are briefly summarized.
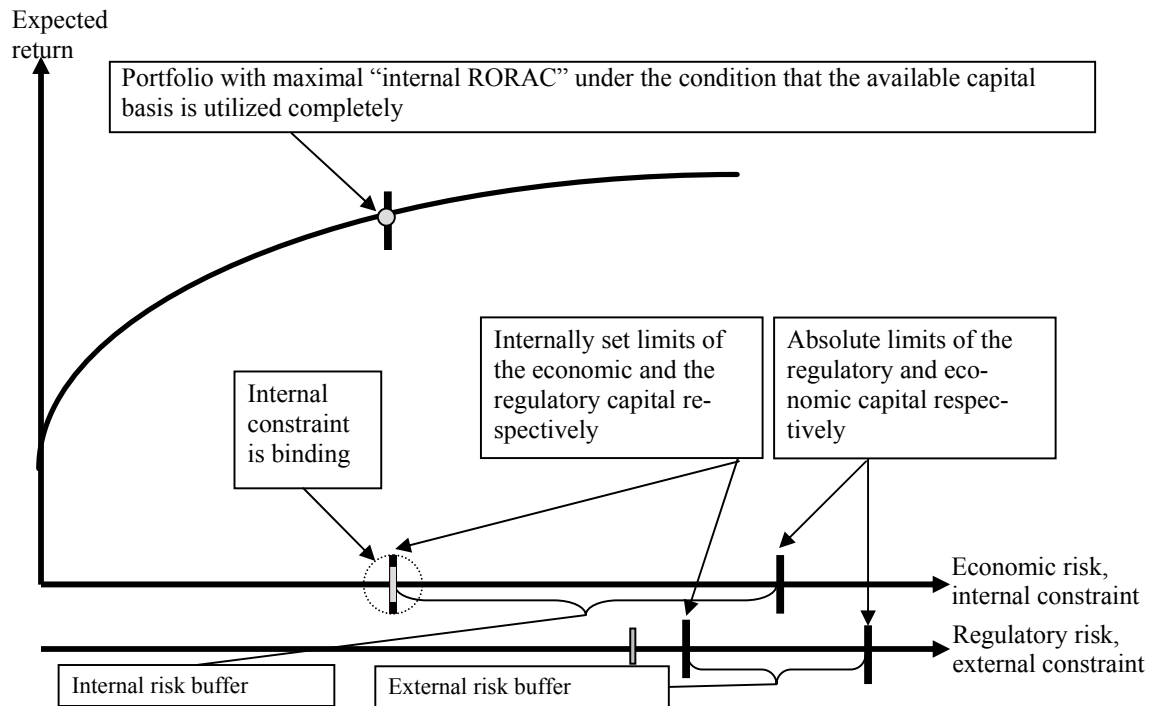
The optimization can be visualized as follows:

Fig. 2: Visualization of the optimization at a shortage of economic capital

On the ordinate, the absolute expected return of the overall bank portfolio is denoted. There are two abscissas: the upper one, which indicates the economic risk measured by the CVaR (corresponds to the allocated economic capital), is relevant for the determination of one point in the coordinate system. On the lower one the risk determined by Basel II (corresponds to the allocated regulatory capital) is represented. The efficiency line is the geometrical place of the efficient portfolios – from an internal point of view – with increasing (and completely allocated) economic capital. Each portfolio on this line is characterized by the fact that to a given economic risk, i.e. to a given CVaR of the overall bank portfolio, no portfolio with a higher return is attainable. On the abscissas both absolute limits which indicate the maximally available risk capital from an internal and a regulatory point of view, respectively, and the internally set limits – according to the aspired risk buffers – are denoted. The actual extent of utilization of these limits, i.e. the determined economic and regulatory risk respectively, is visualized by the smaller grey bar on the abscissas. Thus to each portfolio on the efficiency line the expected return and the economic risk of the portfolio can be read off directly, whereas the pertinent regulatory risk cannot be read off directly, because it deviates from the measured economic risk due to the different approaches of risk measurement (see Section 2.1). Since for both abscissas the same scaling is applied, the measured regulatory risk is, contrary to the measured economic risk, not located directly under the pertinent portfolio.

In Fig. 2 the internally set limit of the economic capital is reached: The grey bar for the internal extent of utilization is located accurately on the absolute, internally set limit of the economic capital, whereas the regulatory extent of utilization could be higher as can be seen in Fig. 2 on the lower abscissa. From the presetting of the extent of utilization limits result both internal and external risk buffers, whose existence was touched on above (see Section 4.1). For the optimization only the internally defined limits of the economic and regulatory capital, which determine the internal and external constraint of the optimization (see Section 3), are relevant, not the absolute limits. Due to the fact that the regulatory capital is defined wider than the economic capital (see Section 4.1) the absolute limit of the regulatory capital is normally higher than the absolute limit of the economic capital. Further it must be pointed out that, due to the tendentious overestimation of risk in Basel II (see Section 4.1) to a given portfolio a higher external than internal risk is denoted, i.e. in sum more regulatory capital than economic capital is necessary for the same transactions. Thus the bar of the internal extent of utilization in Fig. 2 is located to the left of the bar of the regulatory extent of utilization. After this introduction into the optimization model different scenarios are analyzed in the following.

4.2.2. *Internal constraint is binding, external constraint irrelevant*

It is important to keep in mind that we rely on the assumption that the management has the objective to maximize the expected portfolio return. According to the *Theiler* approach, it is assumed that transactions are made in descending order of the widely used risk adjusted performance measure *Return on Risk Adjusted Capital* (RORAC) (*Aziz/Rosen* 2004, pp. 36-37) until one of the two constraints is binding. The RORAC of a transaction is defined as the expected return of the transaction divided by the allocated economic capital to this transaction, therefore called "internal RORAC". The first possible case that the internal constraint is binding, i.e. that the economic capital is the scarce resource, is illustrated in Fig. 2. The resulting portfolio is a portfolio with maximal "internal RORAC" under the condition that the available capital basis is fully utilized. In this case the economic optimum is reached and it is not possible to gain higher (expected) returns.

4.2.3. *External constraint is binding, internal constraint irrelevant, transactions costs not taken into account*

Now the second possible case is analyzed: Not the internal, but the external constraint is binding, i.e. the regulatory capital is the scarce resource. If the internal constraint is not binding in the same point (i.e. at the same risk level) as the external constraint, it is possible to conclude further transactions and to increase the bank's risk from an internal point of view, thus further economic capital can be allocated. In this case, the expected bank portfolio return can be increased by substituting transactions which are risk/return optimal from an internal point of view for transactions which are risk/return optimal from an external point of view. (*Theiler* 2002, p. 221 ff.) This means that transactions with an optimal "internal RORAC" are replaced by transactions with an optimal "external RORAC", i.e. with a RORAC whose capital basis in the denominator is now determined by external procedures in the Basel II-framework. In this way the portfolio return can be increased by simultaneously raising the economic risk. However this is only possible on a flatter efficiency line because the bank portfolio now contains transactions, which are favorable with respect to the external constraint, but which would not be concluded from an internal point of view. Hence, to increase the return, a flatter efficiency line is accepted because of the scarcity of the regulatory capital. The reallocation can be continued until either no further transactions which have

a better "external RORAC" than the transactions contained in the actual portfolio (portfolio 2 in Fig. 3) can be found, i.e. there are no transactions which better utilize the scarce resource regulatory capital, or the internal constraint is binding. Thus another distinction of cases is necessary.

In the first case the same portfolio (portfolio 2 in Fig. 3) would have been reached if the expected return of the bank portfolio had been maximized with respect to the external constraint straight from the beginning, which shall be illustrated by Fig. 3. Although the external constraint is binding in this case, portfolio 2 is not in a vertical line above the internally set limit of the regulatory capital because only the upper abscissa is relevant for the chart as already explained.
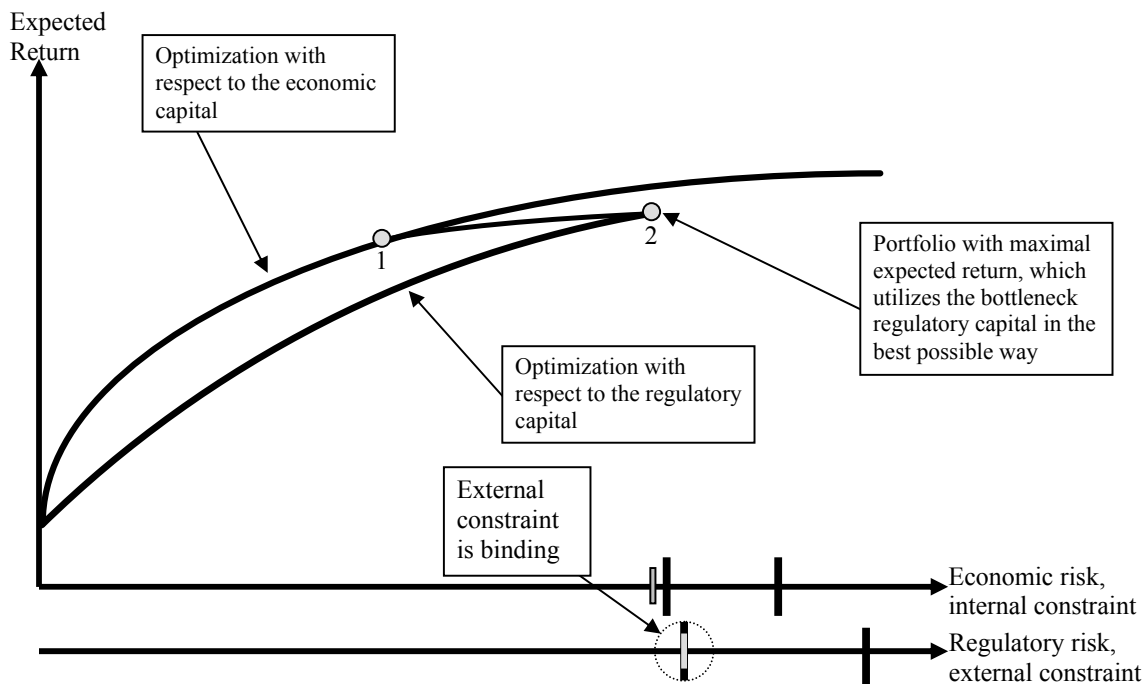

Fig. 3: Visualization of the optimization with the external constraint binding

The decision which of the two portfolios in Fig. 3 is preferable depends on the preferences of the management. Portfolio 1 is only optimal if the management has a specific risk attitude, i.e. if the risk and return integrating preference functional of the management is tangent to the efficiency line in exactly this point. Thus this portfolio is at best characterized by a very specific risk attitude or by the fact that the "internal RORAC" is maximal under the condition that the available capital basis is utilized in the best possible way.

However, if it is the goal of the management to maximize the bank return on the basis of the available economic and regulatory capital, then portfolio 2 is optimal. It is to be noted that the lower efficiency line ("external efficiency line") in Fig. 3 is not the result of an optimization based on the *Theiler* approach, but the result of taking transactions in a descending order of the "external RORAC", which is determined by regulatory approaches, into the portfolio. Since these regulatory approaches do not consider diversification effects, the "external RORACs" of the transactions taken into the portfolio remain – independent of the structure of the portfolio – always the same, which

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would – due to the consideration of diversification effects in internal procedures – not be the case if the "internal RORACs" were used. This is why for the upper efficiency line, which is based on the "internal RORAC", the complex approach of *Theiler* which fulfills different mathematical conditions (above all: convexity of the used risk measure and the set of portfolios) is necessary, whereas for the determination of the lower efficiency line such a procedure is not necessary and it can be determined as described. Is it furthermore assumed that the internal constraint is not binding at any time, i.e. is irrelevant for the optimization, then the optimal portfolio is reached either by an optimization with respect to the regulatory capital or by an optimization with respect to the economic capital and a subsequent reallocation. But the second remark holds only in a world without bearing (additional) transaction costs. Since a reallocation is not possible without transaction costs in reality, transaction costs are taken into account in the following scenarios.

4.2.4. *External constraint is binding, internal constraint irrelevant, transaction costs taken into account*

Transaction costs become relevant if we assume that we are not in a purely simulated world, but that the transactions contained in portfolio 1 in Fig. 3 are really concluded transactions and the management now decides to undertake a reallocation to increase the expected portfolio return.[6] In this case a worse return position would be realized at the same economic risk level than it would have been realized if the bank portfolio had been optimized with respect to the regulatory capital straight from the beginning, which is illustrated in Fig. 4.
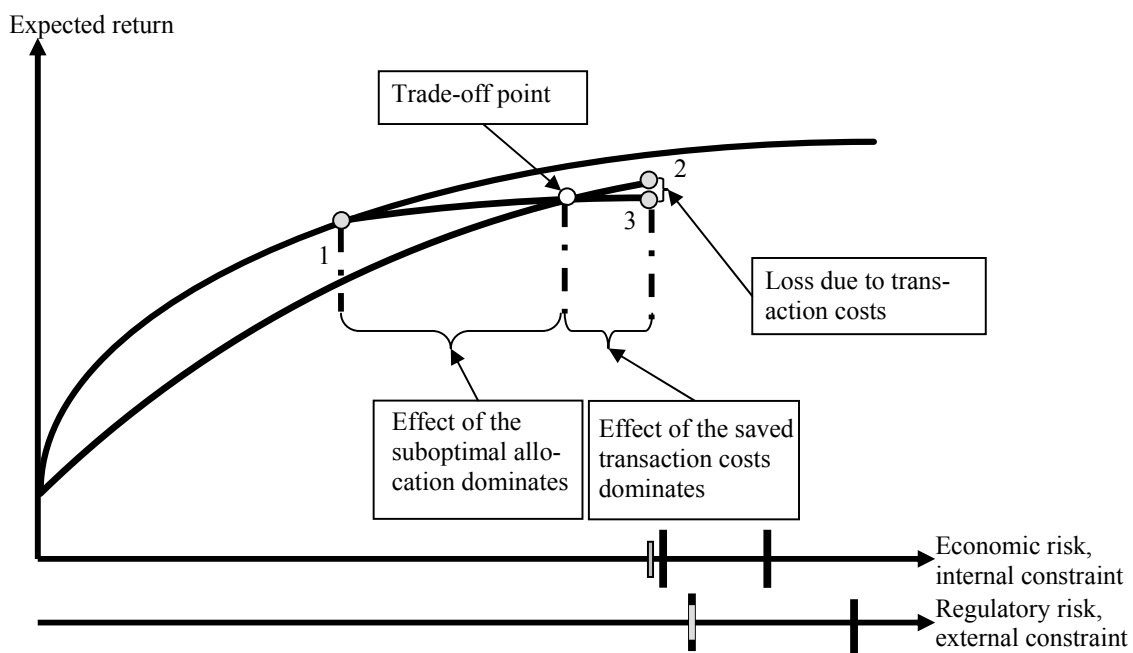

Fig. 4: Trade-off between suboptimal allocation and transaction costs

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[6] In addition to the transaction costs also negative effects on the image of the bank might possibly arise when a rather extensive reallocation is undertaken.

Instead of portfolio 2 in Fig. 2 which was reached through a reallocation in absence of transaction costs, now portfolio 3 is reached, which lies below portfolio 2 and therefore has less expected return, which is due to the flatter course of the efficiency line in presence of transaction costs, but the same economic risk. Portfolio 2 which now is the portfolio with the highest expected return only could have been reached by optimizing the portfolio with respect to the external constraint, i.e. Basel II-data, straight from the beginning.

4.2.5. *External constraint is binding, internal constraint relevant, transaction costs taken into account*

In the following the case is analyzed that the internal constraint becomes binding during the reallocation process before portfolio 3 is reached. It is decisive whether the internal constraint becomes binding before or after the intersection of the reallocation-line and the lower efficiency line, which is the result of an optimization of the bank portfolio with respect to the regulatory capital. This point of intersection is marked in Fig. 4 by the notation "trade-off point". This notation is due to the trade-off of two contrary effects, the already explained loss due to transaction costs arising in the case of a reallocation and the costs due to a suboptimal allocation. Depending on when the internal constraint becomes binding during the reallocation, one effect dominates the other as illustrated in Fig. 4.

If the bank portfolio is optimized with respect to the regulatory capital and if a portfolio can only be reached which is left to the "trade-off point" because the internal constraint preliminarily becomes binding, then a suboptimal allocation is realized. This is due to the insufficient suitability of Basel II for an economically reasonable bank management, which mainly becomes manifest in the lacking consideration of diversification effects and a subsequent systematic overestimation of risk (see Section 2.2). In this case a portfolio with less expected return is realized than it would have been realized if the bank portfolio first had been optimized with respect to the regulatory capital and then a reallocation had been undertaken because the transaction costs are lower than the costs of a suboptimal allocation. So it does not make any sense for the bank to optimize the portfolio with respect to the regulatory capital. If the internal constraint becomes binding to the right of the "trade-off point", then it is just vice versa. In this case, the transaction costs are higher than the costs of a suboptimal allocation, i.e. it is better to optimize with respect to the regulatory capital straight from the beginning.

4.2.6. *Outlook: possible fixed costs reduction*

So far it has been shown that an optimization with respect to the regulatory capital leads under specific conditions to equal or even better results than an optimization with respect to the economic capital. Even if internal procedures are nevertheless indispensable (see Section 2), it might be possible to accomplish them in a reduced form which might translate into reduced fixed costs. The effect of this potential fixed costs reduction is illustrated in Fig. 5:
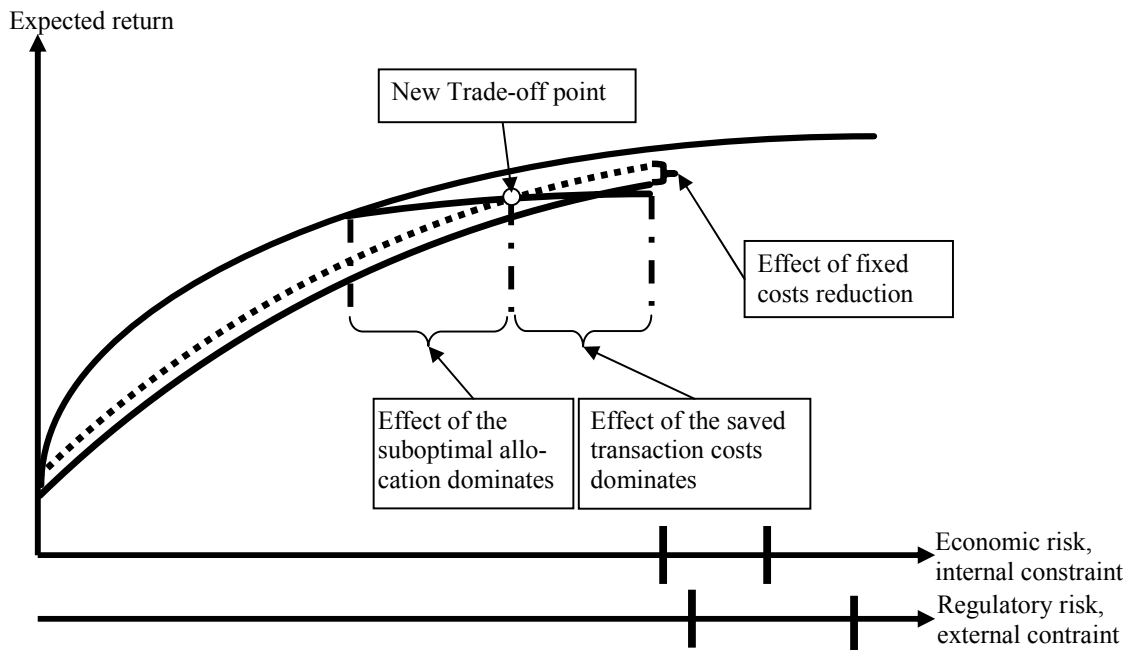
Fig. 5: Higher "external efficiency line" due to a reduction in fixed costs

The "external efficiency line" is parallelly shifted upwards (dotted line) which is the result of the fixed costs reduction. This shift leads to a movement of the "trade-off point" to the left which increases the area in which the effect of the transaction costs dominates. So if it is possible to accomplish internal procedures in a reduced form and thereby reduce fixed costs, the number of cases in which it is equal or even better for the bank to optimize due to Basel II-data will further expand. In case of substantial savings, the dotted line could be even shifted above the efficiency line of the internal management approach, leading to the case that regardless of the utilization of the constraints, optimizing using Basel II-data is always superior.

4.2.7.   Summary of the different scenarios

To sum up, based on the findings above, it can be stated that under the following conditions the collection, storage and evaluation of data calculated with internal approaches seems to be dispensable by the use of a bank management system based on regulatory capital using Basel II-data:

The objective of the management is to maximize the expected return without using a risk/return integrated preference relation.

The regulatory capital represents the bottleneck of the optimization.

In an ex-ante simulation without any transaction costs: Economic capital never represents the bottleneck of the optimization, i.e. the internal constraint can be neglected.

In case of relevance of transaction costs: The internal constraint does not bind before the effect of suboptimal allocation is dominated by those of saved transaction costs. If it is possible to reduce overall fixed costs due to a reduction in the complexity and width of the internal systems and procedures, this scenario becomes more likely. In case of substantial savings it can even turn out

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that an optimization using Basel II-data will be superior regardless of the utilization of the constraints.

The assumption that the management does not possess a preference relation does not imply that no safety goals can be considered within the optimization. They are taken into account by setting the internal limits for the economic and the regulatory capital. Under the above mentioned conditions a management concept based on the regulatory capital results in the same outcome (with irrelevance of transaction costs) or in an even better one (with relevance of transactions costs) than a management concept based on economic capital.

Internal methods for risk measurement and capital allocation are nevertheless not dispensable because they have an important monitoring function. Without them, it would be impossible to determine in which of the described scenarios the bank is, which could result in the realization of a suboptimal allocation. Thereby it is quite possible to accomplish internal procedures in a reduced form and not in their full width for the monitoring function, which holds potentials for savings. A further aspect is that internal procedures and risk management systems are mandatory as a consequence of pillar II of Basel II and thus a complete renouncement of these is not possible. However, it could be shown that scenarios exist, in which the bank can be recommended to control its portfolio based on the regulatory capital despite the unsatisfactory suitability of Basel II for an economically reasonable bank management.

The following case study may exemplify that a Basel II based management concept is not only of theoretical relevance.

5. Case Study

The regarded commercial bank is based in Northern Germany. It has total assets of EUR 192 billion and roughly 4.400 employees around the world. Being deeply rooted in its home market, the bank is market leader in the corporate customer segment and the world's largest provider of ship financing. Its customers are offered with an innovative range of products and services coupled with individual advice in all business areas, including private clients. The bank pursues the goal to run the advanced IRB-Approach to determine the regulatory capital requirement starting from January 1st, 2008. The expected result of this is a reduction of the necessary regulatory capital.

During the implementation of the regulatory requirements, the internal application of the investigated parameter was always in the minds of management in order to realize a Basel II-data based integrative bank management concept. Even today, Basel II-data is used for the internal bank management. One example therefore is that for regulatory purposes determined LGD-figures are also used for the calculation of the allocated economic capital. The first utilization of these figures for strategy and planning was in 2005. The management of credit risk is carried out on the basis of Basel II-data. Besides this, further risk management tools are used for the internal management, for instance for the management of economic capital or of risk concentration. Both are requirements of pillar II of the Basel Accord for Capital Adequacy.

Apart from expected cost reduction the major reasons for the application of Basel II-data are their (internal) acceptance and transparency. The regulatory requirements are clearly defined and documented. The gained experiences are positive. For this reason, the chosen approach is followed up and refined. Moreover, the utilization ratio of economic capital is with 67 % much lower than the utilization ratio of the regulatory capital which is 81 %. Hence, the conclusion might be drawn

that the regulatory capital and not the economic capital is the scarce resource of the optimization problem of the preceding section. Consequently the most important requirement for a management based on Basel II-data is fulfilled.[7]

6. Summary and outlook

Banks currently accomplish enormously expensive projects for the implementation of Basel II. In this contribution it has been examined up to what extent an economic bank management approach based on Basel II-data is possible or even superior. The starting point is the optimization problem within the risk/return management approach due to *Theiler* which is based on the maximization of the expected return of the bank subject to the economic and regulatory capital constraints (limits).

It has been shown that if the management pursues the goal to maximize the expected return, a management based on Basel II-data is economically reasonable if the regulatory capital represents the bottleneck of the optimization and the economic capital is at no time utilized to capacity. In this case, a management concept based on Basel II-data results at least in the same expected return of the bank as a management based on internal data. Additionally considering transaction costs in the analysis, it turns out that bank management based on Basel II-data is economically reasonable if economic capital is not utilized to capacity before the effect of suboptimal allocation is dominated by those of transaction costs. If transaction costs are considered, bank management with Basel II-data dominates the approach based on internal data.

However, this does not mean that banks can completely dispense with internal risk measurement techniques under the given conditions. On the one hand, the use of suitable internal procedures is contained in the requirements of Basel II, on the other hand, it has to be examined on a regular basis whether the constellation in which a Basel II-based management is reasonable still is present. Since there do not exist detailed regulations for the internal procedures within Basel II, those might be limited to the observation of the constellation as well as to constrain the effects of the deficits of Basel II, e. g. risk concentration. Therefore, there is the possibility to reduce the complexity of internal management procedures and save money by the implementation of a management system based on Basel II-data.

If the convergence of internal control procedures and external reporting requirements is further advanced in the future by the Basel committee, internal management concepts could be in a more considerable degree quitted in favor of management based on "Basel III"-data than it is possible already today. This is the reason why the relevance of the topic treated in this contribution is believed to still increase in the future.

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[7]   Another example for using Basel II-data for bank managing is given by the Rabobank. (*Bruggink/Buck* 2002, pp. 219-223)

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