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Productivity in banks: myths & truths of the Cost Income Ratio

Abstract

Understanding productivity is essential for banks when considering the fierce international competition. Yet, how do banks perform in terms of their productivity? And how can productivity be measured? A popular measure for productivity and efficiency in banking is the Cost Income Ratio (CIR). But this measure is misleading in both terms. This article discusses the difficulties in measuring productivity in banks and criticizes the inadequate usage of the CIR. In order to derive an approximation of a bank's productivity an adjusted CIR measure is proposed. The elimination of unwanted effects is conducted in a pragmatic way and is based on publicly available data. This approach is illustrated using large European stock exchange-listed banks as an example. Furthermore, new opportunities for measuring the banks' productivity are outlined on the basis of introducing efficiency measurements on a process level.

Keywords: Cost Income Ratio (CIR), efficiency measurement, productivity in banks, productivity measurement, Data Envelopment Analysis (DEA).
JEL Classification: G21, L25, M16.

Introduction

Competition in the banking industry has intensified enormously in recent years, a trend that can be observed particularly in the fragmented European banking market. Accordingly, the consolidation of market participants has proceeded at a steady rate and has crossed national borders and dimensions. In fact, the pace has even intensified as a result of the current financial market crises. After establishing large enterprises in several countries, the industry is witnessing the emergence of banks with a value and profitability exceeding any size known thus far. For example, the market capitalization of the five biggest European banks represented $ 193 Bn. for HSBC, $ 92 Bn. for Banco Santander, $ 84 Bn. for BNP Paribas, $ 64 Bn. for Intesa Sanpaolo and $ 48 Bn. for Unicredit (30.09.2008). In many countries the prices for banking products – in terms of interest rates, commissions and fees – are under pressure. A general decline of margins as well as a far reaching assimilation within Europe is expected for the future. This process is accelerated by the harmonization efforts of the European Commission for the financial services market.

The profitability of banks is particularly influenced by two factors: The respective market conditions regarding competition and price levels as well as service production capability (Varmaz, 2006). The main indicators for evaluating service capability are productivity and efficiency. Studies of efficiency show that there are large differences between different banks' service capabilities. The room for improvement in comparison to *best-practice banks* is usually estimated at 15% to 25% (Berger and Humphrey, 1997; Beccalli, Casu, and Giradone, 2006). These inefficiencies offer opportunities for increasing productivity and, consequently, for improving the banks´ profitability.

Thus, the question arises how banks perform in terms of their productivity and who will belong to the successful banks in the next years. The following sections deal with the current development in a European context and the measurement of productivity and efficiency. The analysis starts with the traditional *Cost Income Ratio* (CIR) – a popular and critical measure for a bank's productivity. In the course of this paper the adjustment of the CIR is explained and new approaches for measuring efficiency in banks on a process level are introduced.

1. Harmonization of the European banking market

The European Commission pursues a consequent policy to reduce inefficiencies in national markets and oligopolistic structures with the goal of establishing a harmonized market for financial services (European Commission, 2005). According to the European Commission, a "*Level Playing Field*" does not exist at this point in time. In its analysis of the retail banking sector, the European Commission ascertained a latent inelasticity of prices in local markets, which is caused by a lacking demand power. The reason is restricted competition resulting from market participants' efforts to close off their markets and to create market entry barriers. This in turn results in significant differences in prices for deposits and loans as well as prices for additional banking services (EU Commission, 2006). Consequently, significant differences in profitability among European banks can be observed.

The creation of an integrated, open and efficient European market for financial services is the central mission of the European Commission. An efficient banking system generates stability and is beneficial for the consumer. From an economic point of view, only highly productive, i.e. efficient suppliers will survive in conditions of fair and transparent competition, as the margins will continuously decrease and inefficient market participants will thus vanish from

the market. In such an environment it is almost impossible to set up oligopolistic structures to achieve excessive yields at the expense of the customers.

Considering the aforementioned harmonization efforts, a successive assimilation of margins and at the same time a decrease of margins are to be expected in the European financial services sector. This development also affects increasingly the East- and Southeast-European markets. The opportunity to achieve a high profitability by realizing high margins in local markets with low levels of competition will decrease step by step. This awareness plays a decisive role in the strategies of banks. Clearly, established banks which have benefited from the conditions until now are hesitant when it comes to abandoning their convenient source of income. Yet, it seems unavoidable that in the future the productivity of banks will gain increased importance for generating profitability (Vennet, 2002; Rose and Hudgins, 2004; Poddig and Varmaz, 2005).

2. Productivity and efficiency in banks

The aspects of measuring, analyzing and optimizing operational performance play a vital role when the decrease of margins is considered. Especially, the evaluation of productivity and efficiency of banks is critically important (Burger, 2008).

Productivity expresses the relation of output and input. The measurement is directly based on quantities. Productivity is an operational ratio which can be easily calculated and compared. Its strong relatedness to the production process and the consideration of specific input and output qualities allows for a measurement of the "success" of transforming input into output. Additionally, productivity can also be measured under consideration of price components. Thus, several factors with different dimensions can be aggregated. But monetary assessment of the factors represents only a "support calculation". Experience in banks shows that it is extremely difficult to compare productivity of different banks as distinct and accepted definitions for the main terms (e.g., order volume, card transaction) do not even exist.

Measurement of productivity is particularly crucial in process management in order to determine service capability and to identify improvement opportunities. A bank is more productive than its competitors if, for instance, a security transaction is settled and cleared with fewer resources, i.e. either fewer working hours or lower costs.

The term *efficiency* is often used as a synonym for productivity, but according to Cooper, Seiford and Zhu (2004), Coelli et al. (2005), and Sherman and Zhu (2006) this is not accurate. There are many discussions and public announcements of improvement programs in business journals and in the banking community. Yet, "efficiency" is neither precisely defined nor measured.

Efficiency can be understood as a comparative concept. The result of transforming input into output is compared to a benchmark which is basically represented by the best-practice case. The precise definition of the underlying elements, however, depends on the particular case at hand (Forsund and Hjalmarsson, 1974). An evaluation of efficiency is impossible if only a single measurement point or several measurement points without an according benchmark exist. A scientific definition of efficiency usually follows the Pareto-Koopmans concept. "Full (100%) efficiency is attained for an object […] if and only if none of its inputs or outputs can be improved without worsening some of its other inputs or outputs" (Cooper, Seiford and Zhu, 2004). A bank, a branch or a business process is efficient if and only if it utilizes – in comparison to other similar objects – the technical facilities and input factors in the optimal way (*technical efficiency*), uses the resources in the best possible way (*allocative efficiency*) and produces at an optimal scale (*scale efficiency*) (Coelli et al., 2005).

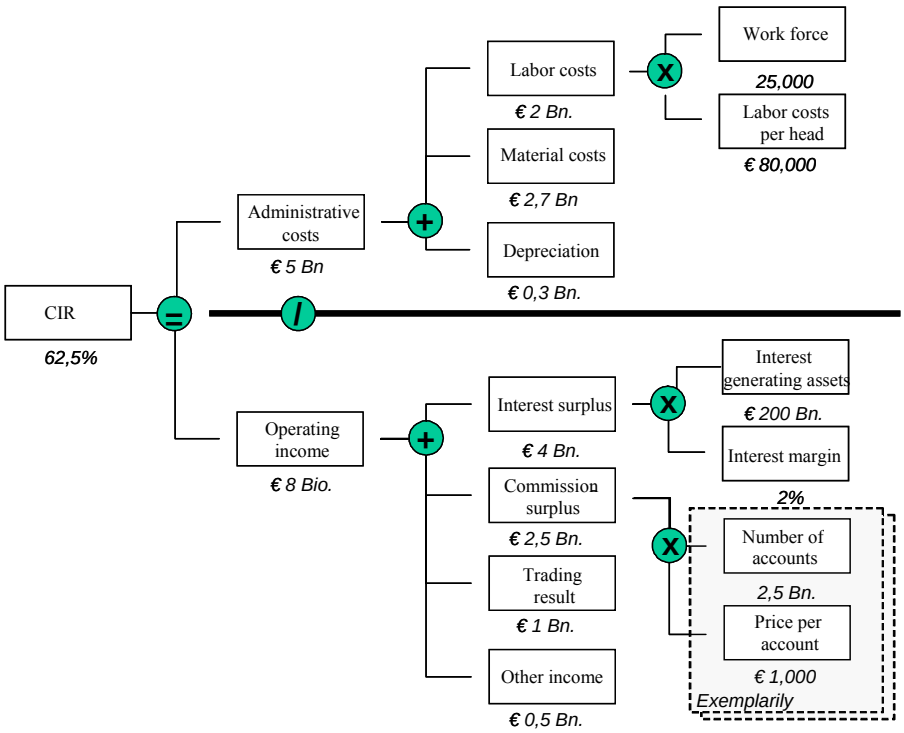
The measurement of efficiency represents an advancement of productivity analysis. The concept of efficiency is based – in simple terms – on the calculation of total productivity under consideration of different input and output factors. The position and functional form of the efficiency line, which is represented by the sum of all best-practice cases, are usually not known so that estimation is necessary.

3. CIR – the productivity ratio for banks?

In scholarly journals and business practice, including evaluations of rating companies, the discussion about productivity and efficiency in banks is mostly based on the *Cost Income Ratio* (CIR), which is also known as *efficiency ratio*. Even though the predication power of the CIR is not clear at all, this ratio is widely regarded as a yardstick when comparing productivity and efficiency of banks. The commonly held notion claims that a high CIR is equivalent to low productivity and low efficiency and vice versa. However, the limited predication power of the CIR becomes apparent in the next two subsections. Consequently, an adjusted CIR is suggested afterwards. The procedure allows for an indicative and pragmatic measurement of productivity in banks.

3.1. Structure of the cost income ratio. The cost income ratio puts expenses (administrative costs) and earnings (operating income) of a bank in relation to each other. The CIR shows how many Euros

(or dollars etc.) were needed in a given period of time to generate one Euro (or dollar etc.) in revenue. Consequently, the CIR measures the output of a bank in relation to its utilized input. Figure 1 shows the components needed to determine the CIR.



Source: ProcessLab

Fig. 1. Scheme of CIR calculation and quantitative example

The provision for risks, which decreases the earnings in the profit and loss calculation, is usually not included. Non-recurring earnings or expenses are handled differently: (1) Gross earnings (interest and commission surplus) are put in relation to administrative expenses. (2) All operative income components (gross earnings plus trading result and other income) are placed in relation to administration expenses. Some banks also disclose an adjusted CIR which eliminates non-recurring effects.

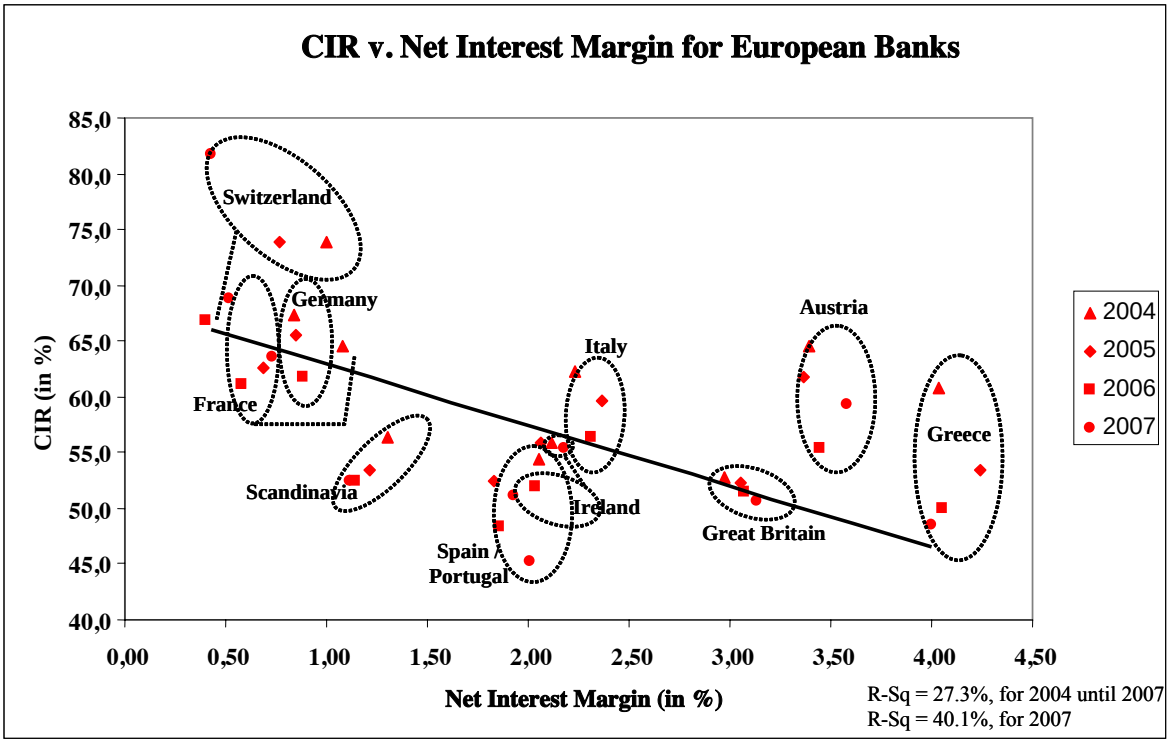
The comparison of banks based on the CIR is fast and easily feasible, and the result appears to be intuitive. The simplicity is certainly an advantage of the CIR, and this might be a reason for its popularity. The ratio is considered to be meaningful for investors. Practically every bank discloses the ratio in its company reports.

3.2. Factors influencing the CIR. A closer look at the CIR calculation reveals that price components (interest rates, commission fees and factor costs) influence the determination of earnings and expenses and consequently distort the predication power of the CIR. While the determination of earnings is based on sales quantities, which are assessed on the basis of prices, the determination of administrative costs requires costs of production factors (in particular, labor costs per head). Particularly the consideration of prices on the earnings side seems to be problematic for the measurement of productivity. The purpose of measuring productivity is to detect the level of a bank's production and settlement capability. Therefore, market conditions reflected in prices as well as sales revenues of a bank should not be included in the measurement of productivity. The ability to achieve higher prices by no means improves the productivity of a bank.

Comparisons of banks in different countries reveal significant differences in interest rates, commission fees and factor costs. As these elements are incorporated in the CIR calculation, banks situated in a country with comparatively high interest margins ceteris paribus appear to be more productive than others.

In order to perform a more detailed analysis, the CIR and interest margins of 62 stock exchange-listed European banks were compared. The data were extracted from a periodically published report (Deutsche Bank AG, 2008). Figure 2 shows the correlation between the interest margin and the CIR for banks in selected European countries. Because of the vital meaning of net interest income of European banks – which accounts for almost 50% of the earnings in 2007 – the interest margins have a significant impact on the CIR. Net interest margins

within the respective countries – with the exception of Switzerland (decline of the interest margin > 0.5%) – were relatively robust in the period of 2004-2007. When analyzing the impact of the interest margin on the CIR in 2006, there is a significant correlation (R^2 = 56.0%). The higher the interest margin in the local markets, the lower is the CIR. This correlation highlights the strong influence of this price component on the CIR.



Source: ProcessLab, Data: Deutsche Bank AG (2008).

Fig. 2. Correlation of national net interest margins and national cost income ratios in selected European countries in the period 2004 until 2007

The CIR is affected by additional factors which further decrease the predication power concerning productivity. These factors are not related to and therefore independent of the level of service production. However, they have a direct influence on the earnings and expenses of a bank and consequently influence the CIR:

- *Business model:* The specific business model of a bank has a direct effect on the CIR. Therefore, significant differences in the average CIR are the result (e.g., in 2007: private banks: 50.6%, multi-region-banks: 49.8%, universal banks: 60.1%, and corporate banks with focus on capital markets: 79.0% (Deutsche Bank, 2008)). Welch (2006) identifies drivers depending on business models to explain differences in CIR in British banks.
- *Regional focus*: As shown above via the example of interest margins, commission fees and factor costs differ markedly in individual countries as well.
- *Cyclic improvements of income*: The CIR seems to be more favorable in boom times because of over-proportionately high earnings. Times characterized by an economic downturn usually generate a decrease in earnings resulting in a less favorable CIR.
- *Non-recurring effects:* Non-recurring income, such as selling holdings or non-recurring costs caused by restructuring programs, is included in the CIR calculation. Banks rarely disclose adjusted CIR values.
- *Risk affinity*: The risk affinity of a bank concerning granting loans has an important impact on the CIR. A higher risk affinity leads to higher interest margins because of higher risk premiums. Thus, interest earnings increase and the CIR decreases. Deferred risk adjustments are not considered in the CIR calculation. Yet, they are reflected in the profitability of a bank. This means that a bank can disclose a favorable CIR even though it needs to write off billions of assets – for instance because of the subprime cri-

sis. A good example is UBS, which deteriorated its CIR of 69.7% (31.12.2006) to 110.3% (31.12.2007) within one year (Fourth Quarter 2007 Report of the UBS Group). The jump was not caused by a sudden decrease in productivity but it was due to the impairments on US mortgage loans with low or no collateral (subprime).

- *Balance sheet management*: The balance sheet policy of a bank affects the refinancing costs along the yield curve. These costs are considered in the interest earnings and thus have an impact on the CIR as well.

3.3. Adjustment of the CIR. To determine the productivity of a bank there is a demand for a ratio which represents the actual performance – namely a ratio that considers the production and settlement of bank services, i.e. transforming resources (inputs) such as human resources, IT systems etc. into products and services (outputs). If productivity is understood and viewed in this way, then the CIR is an unsuitable measure for productivity.

A direct calculation of quantity-based productivity is hardly possible due to the lack of publicly available information in the banking business. But if the price components on the earnings side and the expenses side can be eliminated, the focus can be placed on the quantity components of performance. This approach is also applied in the adjustment of profitability indices which are based on profitability ratios, e.g. the Total Factor Productivity (TFP)-index (Coelli et al., 2005).

However, such adjustments are difficult as a result of lacking price information. An extensive comparison of price structures in different countries has not been successfully performed yet, since transparency is low and product supply and consumer behavior are very different. Comparative studies are only available for selected business fields, e.g. performance of account-based services in worldwide retail banking (Capgemini, EFMA and ING, 2007). The following procedure of adjusting price components within the CIR is based on available data and includes most of the banks´ earnings and expenses. A complete adjustment is not possible because of incomplete or missing data related to income from commission business and due to lacking data to adjust for differences in the area of material costs. The adjustment can be carried out as follows:

- On the earnings side, the differences in interest margins of the observed banks have to be excluded. As the interest income of European banks represents almost 50% of the total earnings, about half of the earnings can be adjusted. The adjustment of interest margins is easy since the needed data can be calculated based on publicly available information.
- On the expenses side, the differences in national labor costs have to be eliminated. This entails adjusting a large expense position as labor costs account for more than 60% of the expenses of European banks.

The effects of adjusting the CIR are shown in the following by means of a comparison of European stock exchange-listed banks for the year 2007. Differences in business models etc. are neglected. The data of German banks are taken as reference data for the adjustment. Thus, the underlying mathematical assumption is that all European banks have the same interest margins and labor costs as German banks. The adjustment leads to interesting results (Figure 3).

The starting point for the analysis is the unadjusted CIR. Here, Iberian banks hold the leading position (unadjusted CIR of 45.3%). Greek banks with a CIR of 48.5% are ahead of the UK (50.6%) and of the European average (55.9%). Swiss banks trail with a CIR of 81.8%. If the CIR is considered as a productivity ratio, Swiss banks are the least productive in Europe. French and German banks show unfavorable values as well.

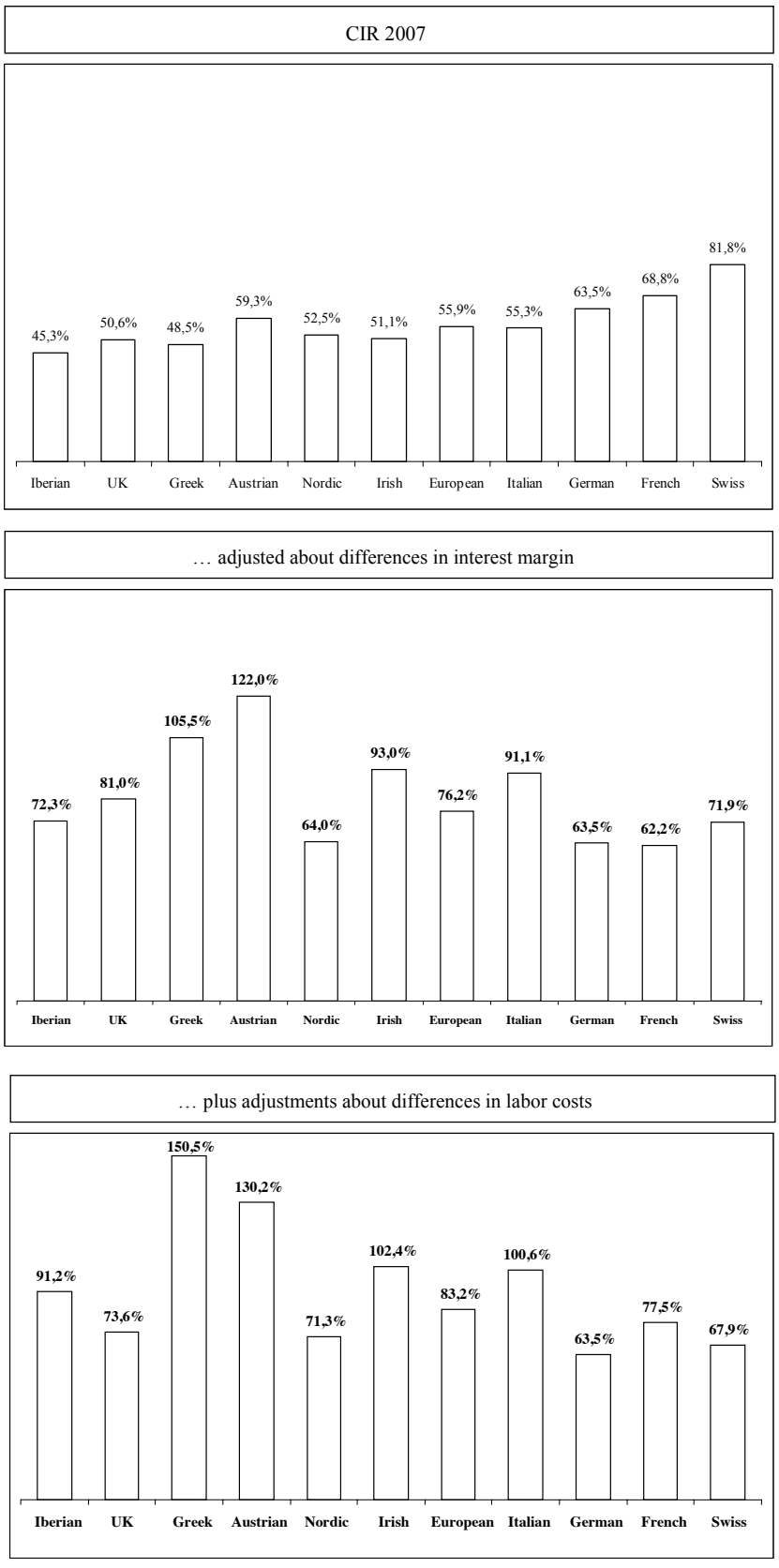
The adjustment of price effects involves two steps. Firstly, the discrepancies in market prices regarding interest are eliminated and adapted to the German level. For this purpose the average interest margin of German banks (0.73%) is used. Through this adjustment the CIR of each country changes noticeably. Now French banks are at the top with a CIR of 62.2%, followed by German banks (63.5%) and Nordic banks (64.0%), while the situation of Greek banks (105.5%) has worsened seriously. Austria holds the last position in the ranking of European banks with an adjusted CIR of 122.0%.

Secondly, the CIR is adjusted for national differences in labor costs. The ranking changes again. The labor cost level in Germany is slightly above the European average whereas Greek labor costs lie 40% behind the average (Eurostat, 2006).[1] As a result of the adjustment of labor costs to the German level, the CIR of Greek banks changes even more. The supposedly high productivity of Greek banks worsens to a CIR of 150.5%. In other words, it would cost 3 Euros to earn 2 Euros.

An adjustment of CIR for price components on the earnings and expenses side leads to a different perception of productivity in European banks. Based on the classic CIR, Iberian and Greek banks appeared to be the most productive. After the adjustment,

[1] The basis of the calculation are the medians of gross year income of banks and insurers in European regions, e.g. for the Iberian region the data of Spanish and Portuguese banks have been weighted according to the percentage of employees in both countries.

however, German and Swiss banks assume the top positions in the ranking. The high degree of automation in these countries may help explain this change in the ranking, in spite of the very low interest margin and the high labor costs.



Net interest margin, Deutsche Bank AG (2008)

Iberian	2.01%
UK	3.13%
Greek	4.00%
Austrian	3.58%
Nordic	1.12%
Irish	1.93%
European	1.60%
Italian	2.18%
German	0.73%
French	0.52%
Swiss	0.43%

Labor costs index, Eurostat (2006)

Iberian	0.71%
UK	1.20%
Greek	0.53%
Austrian	0.89%
Nordic	0.83%
Irish	0.83%
European	0.87%
Italian	0.84%
German	1.00%
French	0.77%
Swiss	1.09%

Source: ProcessLab

Fig. 3. CIR for European banks before and after the adjustment of differences in interest margins and labor costs

3.4. Summary concerning the CIR. This section has shown that the CIR is not adequate for measuring productivity and efficiency in banks. The CIR embodies the character of a *profit ratio*. Price components on the earnings side have an essential impact on the CIR. They distort the predication power of performance concerning the actual production and settlement of bank products and services (Fiorentino, Karmann and Koetter, 2006). Thus, banks operating in countries with high interest margins seem to be highly productive. Yet, a bank's ability to achieve high prices for its products does not increase its productivity. In order to arrive at an approximate determination of productivity, the CIR needs to be adjusted. Price components have to be eliminated and adjustments have to be made for the respective interest margin and costs of labor in different countries. The results always lead to the same information and exhibit robustness. The procedure shown here is pragmatic and based on publicly available data. However, the adjusted CIR is only suitable for a direct comparison of several banks, i.e. to determine a ranking in terms of *better than* or *worse than* another bank. However, an evaluation with respect to measuring and comparing efficiency to the best-practice case cannot be performed by simply comparing CIRs. The missing indicator function of the CIR for the efficiency of banks has already been shown in empirical studies (e.g., Bikker, 1999).

4. Process-based analysis of efficiency

An adjusted CIR provides an indication about value-based productivity, i.e. how much input was needed to achieve an adjusted income. Yet, even an adjusted CIR cannot replace a well-grounded analysis of efficiency in banks. Real progress can only be made if the efficiency of *business processes* represents the focus point of the analysis instead of the productivity of a bank as a whole.

4.1. Necessity for a process approach. Business processes are the basis of enterprises' productivity and efficiency (Hammer and Champy, 1993). They are relatively solid over time; furthermore, they can be compared between different enterprises. Analysis of processes is a key element for evaluating service capability or *performance* (Kueng, Meier, and Wettstein, 2001).

Although process orientation is widespread in banks, such a mindset is neither fully understood nor applied continuously. So far, only selected processes are measured and controlled. Yet, to assess productivity of banks on the level of processes, a thorough understanding of the banks' processes, e.g. in the form of a process architecture (Österle, 1995), is essential. Furthermore, a clear understanding of the relevant input and output factors to generate bank products and services is required. Moreover, standards for the definition and accounting of the measurement of quantities are needed. Obviously, banks face challenges and significant requirements for performance measurement on a process level, due to the characteristics of bank products and services and the complex IT architectures that contain a multitude of applications along the process chains.

Besides performing productivity analysis, banks should strive for measuring the efficiency on the level of business processes. Simple analyses of productivity are descriptive and should only serve as a starting point. However, empirical studies show that ratios based on a process level are still rarely conducted and only used in the field of business process management (Kueng, Meier, and Wettstein, 2001; Heckl, 2007).

In contrast to productivity analysis, the measurement of efficiency features a normative character (Ray, 2004). The goal is to determine a potential increase in performance compared to the best possible case. This comparison to other processes or to the same process of another bank – in terms of benchmarking – enables an assessment of the bank's own performance.

In efficiency measurement, it is essential to consider several factors simultaneously in the analysis. Only this approach ensures the accurate determination of the multi-dimensional character of performance within a business process. In the context of process management, the factors costs, quality, time, and operational risks have to be balanced. These factors must not be analyzed separately from one another, but need to be considered collectively.

4.2. Approaches for a process-based efficiency analysis. Three benchmarking approaches are available to analyze business process efficiency (Figure 4):

(1) Comparison of a bank's business process with similar processes within the same organization or with other banks.

(2) Comparison of bank processes with processes in another industry as far as they possess a comparable structure or comparable activities.

The objective of these two approaches is to analyze the one's own process performance with respect to *inefficiency*. The analysis reveals opportunities for improvement compared to the best possible execution of a comparable process. The approaches are related to the strategic level of business process management and allow for a comparison of performance in consideration of a different process design.

Starting points for the analysis are the input and output factors of a business process. This entails, on the one hand, considering the resources for process execution in terms of working hours or needed IT systems (inputs). On the other hand, the quality of the product or service as well as the adherence to delivery dates and the operational risks, which are involved in the process execution, need to be included (outputs).

(3) Comparison of single transactions within a particular business process.

This approach aims to identify opportunities for improvement while executing a certain process (e.g., securities transaction process). The "intrinsic" inefficiency of a process is caused by differences in the execution of single activities within a process chain (Burger and Moormann, 2008). To identify this type of inefficiency, transactions which are cleared and settled *within* a business process need to be compared to their output. This approach is related to the operational level of business process management. As is the case in the other approaches, this approach of measuring performance requires consideration of the factors of costs, time, quality, and operational risks.

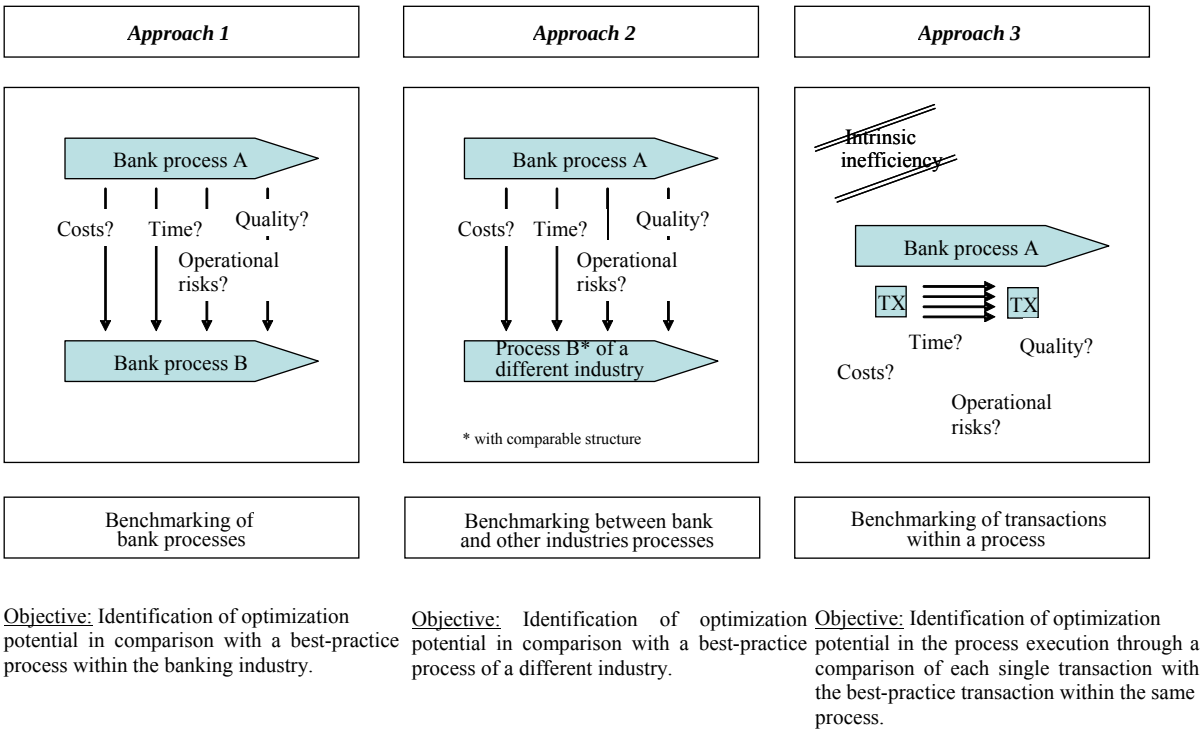


Fig. 4. Approaches for efficiency analysis of banks' business processes

4.3. Techniques for measuring efficiency. Methods and tools for the above described analyses of efficiency exist. Academic literature offers several measurement techniques which enable benchmarking with simultaneous consideration of different factors.

The key to efficiency analysis is the identification of a particular production function of the observed process. According to production theory, the production function represents all best possible input-output relations and therefore represents the benchmark for a process comparison. The divergence from the production function can be interpreted as *inefficiency*. The detected *inefficiency* thus illustrates the opportunity for improvement in comparison to the best possible case (Farrell, 1957).

Subject to the available data, the existing inefficiency can be separated into different components. A business process runs completely efficiently if it utilizes the technical possibilities and input factors optimally (technical efficiency), allocates the resources in a best possible manner (allocative efficiency) and produces at an optimal scale (scale efficiency).

The techniques to measure efficiency can be separated into two groups – parametric and non-parametric methods (Lovell, 1993). Yet, there is no best possible method to measure efficiency. The choice of the method has to correspond to the problem and the given conditions (Bauer et al., 1998). In order to perform a measurement, parametric methods require a-priori assumptions concerning the development of the production function. Here, the *Stochastic Frontier Analysis* (SFA) is the most widely applied method. For non-parametric methods, the development of the efficiency line is determined by empirical data. Here, *Data Envelopment*

Analysis (DEA) is commonly used (Cooper, Seiford, and Zhu, 2004).

Particularly the efficiency analysis of business processes through DEA seems promising, because the measurement can be conducted on the basis of only a few assumptions. The production function is determined by empirically measured data. The method enables "fair" benchmarking, as each observed object (e.g., a transaction) can present itself in the best possible way. DEA helps to identify realistic opportunities for improvement as this method compares each observed object to a similar peer-object or even to a combination of several peer-objects. Furthermore, DEA is very flexible in its application. Comprehensive business processes as well as single transactions can be examined regarding (in-) efficiency. Several discussions on the strengths and weaknesses of this method have been published (Coelli et al., 2005).

The approaches to efficiency analysis deliver important information which contributes to a better understanding of performance in banks. As a result of the on-going search for process improvements, methods such as DEA will gain further relevance for the analysis of process efficiency.

Conclusion

Measurement of productivity and efficiency in banks is still in its infancy. As illustrated in this article, the traditional cost income ratio is not a suitable ratio to determine productivity. Interest margins as well as labor costs of a country significantly influence the CIR, and therefore this measurement does not appear to be appropriate when analyzing performance in terms of service production and settlement. This article suggests a procedure based on publicly available data and which enables an approximate evaluation of productivity in banks. The procedure eliminates price components to focus the analysis on the performance. The adjustment of the CIR leads to remarkable changes in the assessment of the productivity in European banks. Supposed productivity advances in various countries disappear. In particular, those banks which currently operate in markets with high interest margins lose top positions in contrast to banks operating in highly competitive markets with low interest margins.

High "real" productivity rates of banks serve as an essential starting point for the expected consolidation in the European financial market and the harmonization of margins. Banks that are currently benefiting from high interest margins have to direct their attention to making the necessary improvements in their own service capabilities so that they are able to compensate for the decreasing income.

Measuring productivity of a bank at the meta-level, i.e. for the bank as a whole, is not precise enough to develop specific recommendations for process improvement. Instead, a modern analysis of productivity should rather focus on banking processes. For this purpose several requirements have to be met. Methods such as Data Envelopment Analysis deliver a good insight into banking productivity and efficiency. Modern IT tools like Workflow Management Systems generate detailed data and enable the application of new analysis methods. Hence, exciting opportunities emerge for a future-oriented and effective process management in banks.

References

1. Bauer P.W., A.N. Berger, G.D. Ferrier, D.B. Humphrey. Consistency Conditions for Regulatory Analysis of Financial Institutions: A Comparison of Frontier Efficiency Methods // Journal of Economics and Business, 1998. – №2. – pp. 85-114.
2. Beccalli E., B. Casu, C. Girardone. Efficiency and Stock Performance in European Banking // Journal of Business Finance & Accounting, 2006. – №1/2. – pp. 245-262.
3. Berger A.N., D.B. Humphrey. Efficiency of Financial Institutions: International Survey and Directions for Future Research // European Journal of Operational Research, 1997. – №2. – pp. 175-212.
4. Bikker J.A. Efficiency in the European Banking Industry: An exploratory Analysis to rank countries // De Nederlandsche Bank Working Paper, Amsterdam 1999. – №18. – 24 pp.
5. Burger A. Produktivität und Effizienz in Banken – Terminologie, Methoden und Status quo // Frankfurt School of Finance & Management Working Paper, 2008. – №92. – 96 pp.
6. Burger A., J. Moormann. Detecting Intrinsic Inefficiency on Process Level – Benchmarking of Transactions in Banking // 4th Workshop on Business Process Intelligence (BPI 08), Milano, 01.09.2008.
7. Capgemini, EFMA, ING. World Retail Banking Report 2007 // Capgemini, EFMA, ING Group, Paris 2007. – 64 pp.
8. Charnes A., W.W. Cooper, E. Rhodes. Measuring the efficiency of decision making units // European Journal of Operational Research, 1978. – №4. – pp. 429-444.
9. Coelli T.J., D.S.P. Rao, C.J. O'Donnell, G.E. Battese. An Introduction to Efficiency and Productivity Analysis // 2nd Edition, New York: Springer, 2005. – 366 pp.
10. Cooper, W.W., L.M. Seiford, J. Zhu. Data Envelopment Analysis: History, Models and Interpretations. In: W.W. Cooper, L.M. Seiford, J. Zhu (Eds.): Handbook on Data Envelopment Analysis // Boston: Kluwer Academic, 2004. – pp. 1-39.

11. Deutsche Bank AG. European Banks – Running the Numbers: Spring edition. // DB Global Markets Research, London 2008. – 180 pp.
12. European Commission. Financial Services Policy 2005-2010. // European Commission White Paper, Brussels 2005. – 15 pp.
13. European Commission. Interim Report II – Current Accounts and Related Services. // European Commission Competition DG, Brussels 2006. – 193 pp.
14. Eurostat. Verdienstunterschiede zwischen europäischen Ländern und Regionen. Statistik kurz gefasst // Eurostat, Luxembourg 2006. – 12 pp.
15. Farrell M.J. The Measurement of Productive Efficiency // Journal of the Royal Statistical Society, 1957. – №III. – pp. 253-281.
16. Fiorentino E., A. Karmann, M. Koetter. The cost efficiency of German banks: a comparison of SFA and DEA // Deutsche Bundesbank Discussion Paper, Series 2: Banking and Financial Studies 2006/10, Frankfurt 2006. – 40 pp.
17. Hammer M., J. Champy. Re-engineering the Corporation: A Manifesto for Business Revolution // London: Nicholas Brealey, 1993. – 257 pp.
18. Heckl D. Steuerung von Kreditprozessen. Studie // Frankfurt am Main: Bankakademie-Verlag, 2007. – 102 pp.
19. Kueng P., A. Meier, T. Wettstein. Performance Measurement Systems must be engineered // Communications of AIS, 2001. – №1. – pp. 1-27.
20. Lovell C.A.K. Production Frontiers and Productive Efficiency. In: H.O. Fried, C.A.K. Lovell, S.S. Schmidt (Eds.): The Measurement of Productive Efficiency: Techniques and Applications // Oxford: Oxford University Press, 1993. – pp. 3-67.
21. Österle H. Business Engineering. Prozeß- und Systementwicklung I. Entwurfstechniken // 2nd Edition, Berlin et al.: Springer, 1995. – 375 pp.
22. Ray S. Data Envelopment Analysis: Theory and Techniques for Economics and Operational Research // Cambridge: Cambridge University Press, 2004. – 376 pp.
23. Rose P.S., S.C. Hudgins. Bank Management & Financial Services // 6th Edition, Irwin: McGraw-Hill, 2004. – 782 pp.
24. Varmaz A. Rentabilität im Bankensektor // Wiesbaden: Deutscher Universitäts-Verlag, 2006. – 314 pp.
25. Welch P. Measuring efficiency in the finance factory: time for a rethink // Journal of Financial Transformation, 2006. – №2. – pp. 51-60.