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An international scorecard for measuring bank performance: The case of Dutch banks

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Abstract

Measuring bank performance solely on the basis of profitability conveys significant information about past performance, but may provide little information about expectations for future performance. Therefore, this paper relies on a much broader definition of performance and introduces a scorecard where performance is measured on the basis of four performance criteria: (i) profitability; (ii) risk; (iii) market power, and (iv) efficiency. We use this scorecard to compare the performance of major Dutch banks with similar banks in Germany, France, Italy, Switzerland, the United Kingdom and the u.s.

Key words: Bank performance, profitability, risk, market power, efficiency

JEL classification: G21, L11, L22

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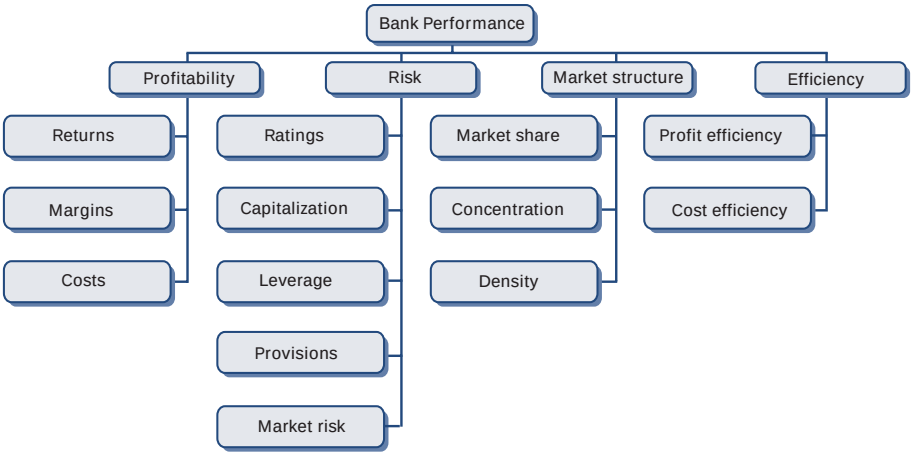
1 Introduction

1.1 Performance

When exactly does a bank show sound performance? What are the yardsticks against which banks' performance can be assessed? In an attempt to approximate the concept of performance, interested parties (banks, analysts, supervisors, media) all too often rely on comparatively simple ratios, such as the return on assets or the return on equity. In cases where the market transcends geographical frontiers and banks face international competition, it is important that the performance of domestic banks can be compared with that of competitors from other geographical areas. Through lower stock exchange valuations, banks showing relatively poor performance easily become potential take-over targets for institutions marked by better performance and, hence, higher stock exchange valuations. In addition, banks showing low levels of performance may endanger financial stability and trigger financial market unrest. It is evident that it is essential for prudential supervisors to monitor the performance of their supervised institutions in an international perspective.

Comparisons based solely on profitability do convey significant information

Chart 1 Bank performance scorecard



about past performance, but provide little information about expectations for future performance. Therefore, this paper relies on a much broader definition of performance. As illustrated in Chart 1, comparisons in this paper are based on a scorecard, with banks' performance being measured on the basis of four performance criteria: (i) profitability; (ii) risk; (iii) market power, and (iv) efficiency.

Due in part to data limitations, the comparisons below are restricted to (major banks in) the Netherlands, Germany, France, Italy, Switzerland, the United Kingdom and the United States.[1] The analysis presented here does not in any way claim to be comprehensive. Our principal aim is to underpin the notion that sound or poor performance of banks and markets is a matter of more than just profit or loss. In the analysis, we use mainly data from BankScope and DataStream for the year 2002 and focus on major banks. In section four we only use BankScope data for all active banks in the countries under consideration. We insist, therefore, that the results presented in this paper serve illustrative purposes.

For each performance category, a number of measures are applied. In all cases, the average scores for each country are compared, as well as the heterogeneity of the results for the major banks in each country. Hence, the analysis shows that, whereas some measures differ notably across countries, other measures do not recognise clear geographical boundaries.

The principal lesson that may be drawn from the analysis concerns the frequent lack of simple consistency between the measures presented by us. Just relying on a cost-income ratio or a profit ratio will seldom lead to the same insights as the scorecard presented by us.

For example, the purely financial performance of the Dutch banks as measured by these same ratios is roughly average. Especially non-interest income clearly falls below the levels recorded by comparable institutions in other countries. A positive exception is the price-to-book value, which is relatively high for the Dutch major banks. This can be explained by taking a broader look and allowing for risk measures as well: the Dutch major banks have comparatively low risk profiles. By contrast with other countries marked by a similar combination of a reasonable profitability level and a fairly low risk profile, the Dutch banking market is characterised by a comparatively high level of concentration. The low risk level might thus be explained in part by the so-termed Quiet Life hypothesis, which holds that banks may use a certain degree of market power in order to operate in their home markets at relatively low risk levels. However, when we conclude the analysis by taking a look at the efficiency of the Dutch major banks, it becomes clear that the relatively high profit efficiency would appear to be largely attributable to high cost efficiency.

1.2 **Theory**

Although this paper does not claim to present a theoretical contribution to the

literature, we start with a relatively simple model that represents the theoretical framework upon which we base our scorecard.

This section develops a basic model of a profit maximizing bank.[2] We assume all costs to be variable costs (in the long run), and all outputs to be perfect complements with zero cross-price elasticity. For now, banks are also assumed to be myopic (we will later relax this assumption). For a bank i, we define profit Π_i, the output vector Y_i, the input vector X_i, the output price vector p, and the input price vector w_i. Each bank i maximizes profit using transformation function T and pricing opportunity set H, which captures the bank's assessment of its competitive position and concomitant willingness of customers to pay the prices charged by the bank. Part of the pricing opportunity set is Z, the level of equity. For now we drop subscripts that denote different inputs, outputs, input prices or output prices, for ease of exposition. All variables used in this section are therefore vectors, and a subscript i always refers to individual banks, whereas a variable without a subscript denotes the aggregate vector for all banks in a market.[3]

Since we use duality (and thus do not have to estimate input-demand and output-supply functions), there is no need to further specify the transformation function T or the opportunity set H.[4] For each output in the output vector Y_i, bank i faces the price p based on the inverse demand function $f(Y)$. Bank i then maximizes:

$$\Pi_i = pY_i - w_i X_i, \textit{ subject to}$$
$$T(X_i, Y_i) = 0$$
$$H(p, Y_i, w_i Z_i) = 0$$
$$p = f\left(\sum_{i=1}^{N} Y_i\right) = f(Y)$$

where $f(Y)$ is inverse market demand and N the number of banks. The corresponding Lagrangian system can be written as:

$$L\Pi_i = pY_i - w_i X_i - \xi T(\bullet) - \theta H(\bullet) \qquad (1)$$

Solving for p and X simultaneously yields the optimal output prices and input quantities (denoted by asterisks):

$$p^* = p(Y_i, w_i, Z_i)$$
$$X_i^* = X_i(Y_i, w_i, Z_i)$$

Profits are maximized if:[5]

$$\frac{d\Pi_i}{dY_i} = p^* + Y_i f'(Y)\frac{dY}{dY_i} - w_i \frac{dX_i^*}{dY_i} = 0 \qquad (2)$$

Where the optimal number of inputs X_i^* depends on the demand for outputs Y_i. Multiplying by Y_i yields:

$$p^* Y_i - w_i \frac{dX_i^*}{dY_i} = -\left((Y_i)^2 f'(Y)\left(\frac{dY}{dY_i}\right)\right) \qquad (3)$$

where revenue is denoted by pY_i. Here, banks are assumed to face perfectly competitive input markets, but operate in output markets where price differentiation is potentially possible. Thus, banks may compete via their output pricing strategies, by adjusting prices and fees according to market conditions.[6] The extent to which

they can influence prices depends on output quantities, input prices and other factors, all of which are given at the time of price setting. In the empirical analysis, we can disregard output prices, which are subject to severe measurement problems according to Berger and Mester (1997) and Vander Vennet (1997), are not required for the empirical analysis.

We further rewrite and rearrange equation 3, in order to arrive at an equation that is more closely in line with what is found in the empirical literature on bank performance. We start by defining λ_i as:

$$\frac{dY}{dY_i} = 1 + \frac{d\sum_{j \neq i} Y_j}{dY_i} = 1 + \lambda_i \qquad (4)$$

where λ_i is known as the conjectural variation of firm i's output.[7] Substitution of λ_i in equation 3 gives:

$$p^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i = -(Y_i)^2 f'(Y)(1 + \lambda_i) \qquad (5)$$

Dividing both sides by pY_i and rearranging gives:

$$\frac{p^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i}{p^* Y_i} = -\frac{Y_i}{Y} \frac{f'(Y) Y}{p^*} (1 + \lambda_i) \qquad (6)$$

The left-hand side of equation 6 is the bank's mark-up over its total costs. This mark-up can be decomposed into three parts, equivalent to the right-hand side of equation 6:

1) (Y_i/Y) is firm i's market share MS_i, with $0 < MS_i \leq 1$.

2) $f'(Y)Y / P$ is the inverse of the price elasticity of demand, $1/\eta$. Since the main prices for banks in the context of this analysis are interest rates, η is referred to as the interest elasticity of demand. It is equal to the market elasticity *iff* all firms are price takers in the output market and $p = p_i$, $\forall i$.

3) $1+\lambda_i$ measures firm i's expectations about the reactions of its rivals dY/dY_i, with $-1 \leq \lambda_i \leq 1$.

We can now write equation 6 as:

$$\frac{p^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i}{p^* Y_i} = (MS_i)\left(-\frac{1}{\eta}\right)(1 + \lambda_i) \qquad (7)$$

After multiplying p^*Y_i by we have:

$$\Pi_i^* = p^* Y_i - w_i \frac{dX_i^*}{dY_i} Y_i = \left((MS_i)\left(-\frac{1}{\eta}\right)(1 + \lambda_i)\right) p^* Y_i \qquad (8)$$

Therefore optimal profits Π_i^* go up with an increase in the market share MS_i, with a decrease in the price elasticity of demand η, with an increase of the conjectural variation λ_i, an increase in the price of outputs p^*, and an increase in demand for Y_i. As we shall see in the remainder of this section, many models that study competition and efficiency can be classified according to this basic framework. All models

contain a partial analysis, and focus on a single right-hand variable in equation 8, or a combination of two of these variables.
As a final step, we can make our model stochastic:[8]

$$\Pi^* = \left(p^* Y - w \frac{dX_i^*}{dY_i} Y \right) \times \exp(\varepsilon) \qquad (9)$$

And we assume that ε_i can be decomposed into a noise component v_i, and an efficiency component u_i, where $\varepsilon_i = v_i - u_i$. Here, v_i is normally distributed, i.i.d. with $v_i \sim N(0, \sigma_v^2)$. It represents white noise, the uncertainty about Π_i^*. The second component, u_i is assumed to be drawn from a non-negative half-normal distribution truncated μ at and i.i.d. with $u_i \sim |N(\mu, \sigma_u^2)|$. It represents inefficiency and carries a negative sign because all inefficient firms will operate *below* the efficient profit frontier.

Summing up, we have shown that differences in banks' performance can be compared in more than one way. Specifically, with the above simple framework in mind, we can start comparing: (i) financial performance ($p^* Y_i - w_i dX^*_i / dY_i Y_i$); (ii) risk $v_i \sim N(0, \sigma_v^2)$; (iii) market structure $((MS_i)(-1/\eta)(1+\lambda_i))$; and efficiency $u_i \sim |N(\mu, \sigma_u^2)|$. Unfortunately, estimating our simple framework is far from simple, because of data issues, identification problems and econometric challenges.[9] Therefore, in this paper we limit ourselves to presenting an overview of different performance measures.

First, we review a number of financial performance measures, followed by a range of risk measures. Subsequently, a number of measures for market structure are analyzed, after which we conclude by discussing two efficiency measures.

2 Financial performance indicators

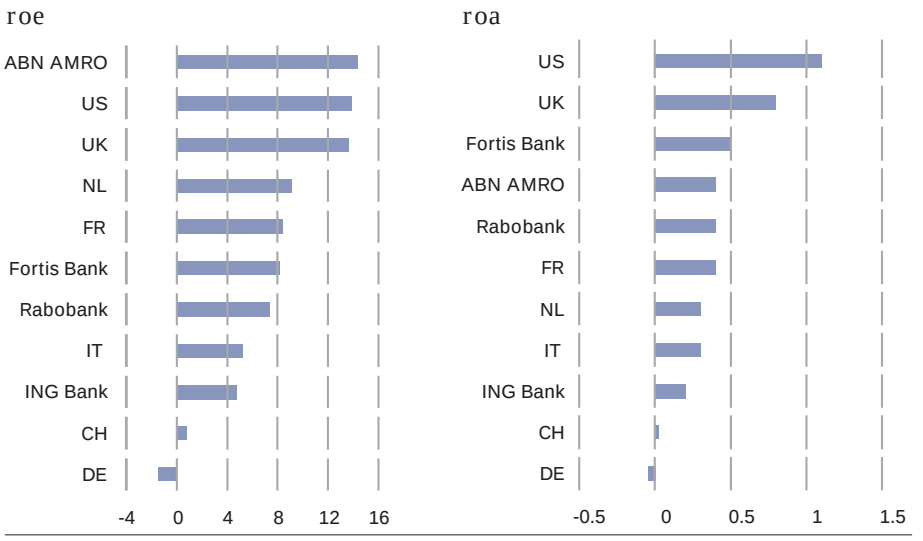
In this paragraph, the performance of Dutch banks is compared with that of some of their foreign counterparts on the basis of six financial performance indicators covering four different areas, namely profitability, income, efficiency and valuation. These indicators are generally used to represent banks' financial performance.[10] The list of the individual banks included in the sample and their scores for the various indicators are shown in the appendix. In the analysis below, averages per country have been computed in those cases where, in a certain country, banks' scores differ only slightly so that the average closely reflects the individual positions. In those cases where banks' scores differ materially from the 'national average', averages have also been computed excluding the outlier(s).

The four largest Dutch banks[11] are compared with major banks from the United States, the United Kingdom, Germany, France, Switzerland and Italy (the four to five largest banks in each country, totalling 31 banks).[12] The analysis is based on 2002 data and concerns, in principle, a static comparison. In a number of cases, a dynamic comparison is also made. Data for profitability, income and efficiency have been derived from BankScope. Data for valuation have been derived from DataStream. Both sets concern data that are in the public domain.

2.1 **Profitability**

For the purposes of analysing banks' profitability, the return on equity (roe) and the return on assets (roa) have been selected.[13] The data show that the banks in the United States and the United Kingdom record high profitability levels, with a weighted average roe far in excess of 10%. Banks in other countries usually remain far below 10%. Among the banks in these other countries, the major banks in the Netherlands record, on average, the highest roe value. Of the twelve most profitable banks in the sample, nine are from the United States and the United Kingdom. JP Morgan is the only Anglo-Saxon bank that is not in the top echelon, owing to the poor performance of its investment banking operations. The high position of abn amro is noteworthy; after Uncredito Italiano, it is the best-performing non-Anglo-Saxon bank, holding eighth position in the list. The other Dutch banks are all found in the lower half of the profitability range, with ing Bank recording the lowest profitability level. Three of the five German banks even record negative roe levels (see also Chart 2.1).

Chart 2.1 Average roe and roa, 2002



Source: Bankscope and own calculations.

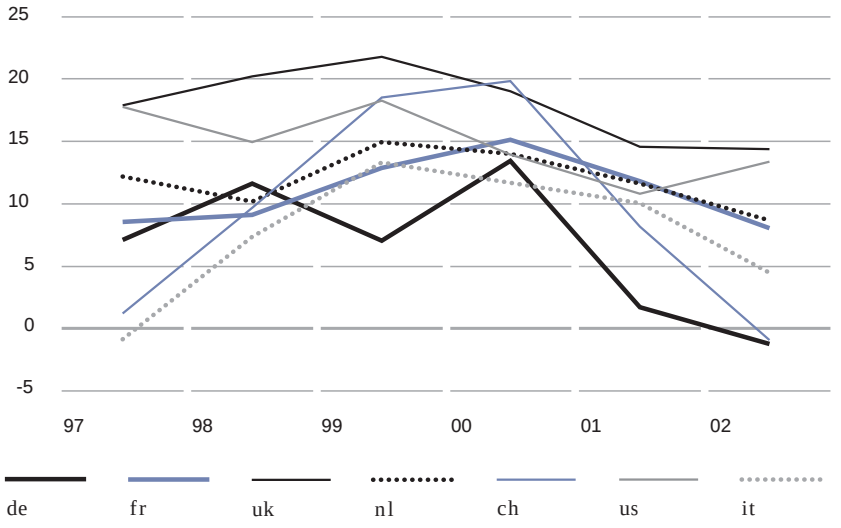
The results of a comparison on the basis of roa do not differ materially from those based on roe.[14] Again, the us and uk banks show best average performance. The differences from the other countries are considerable. Except for ing Bank, the Dutch banks are in the upper half of the list. On the basis of roa, abn Amro is no longer among the best-performing non-Anglo-Saxon banks (see also Chart 2.1).

If profitability is reviewed not just for the year 2002, but over a more prolonged period – spanning the years from 1997 to 2002[15] – it becomes evident that the relatively high profitability (roe) of the us and uk banks is not a coincidence. Their profitability is structurally higher. The poor position of the German banks is not a coincidence either, since in three of the six years reviewed here the German banks show the lowest average performance levels. The Dutch banks consistently hold third or fourth position in this group of seven countries and are thus somewhere in the middle. It is important to note that, although profitability may fluctuate sharply from one year to the next, the relative country positions remain fairly stable. The averages for the Swiss and Italian banks show higher levels of fluctuation (see also Chart 2.2).

2.2 Earnings

The interest income margin has been computed by dividing interest earnings by potentially interest-earning assets and is, hence, not the same as an interest rate spread.[16] Where the weighted average net interest margins for the various countries

Chart 2.2 Average roe, 1997-2002



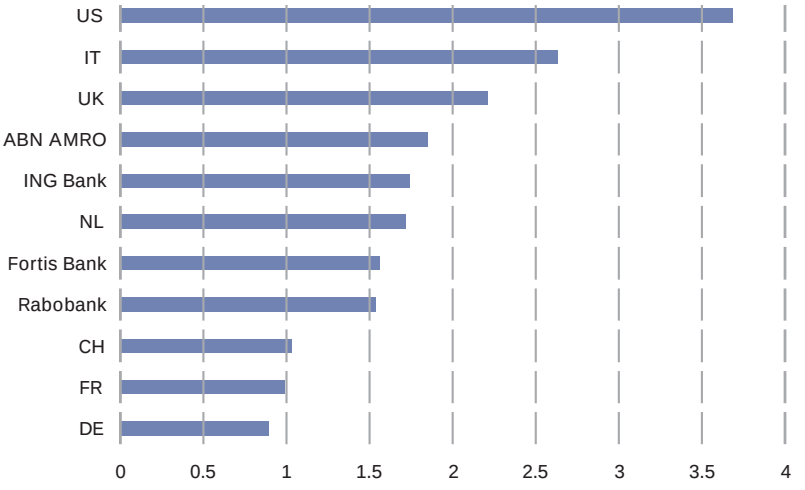
Source: Bankscope and own calculations

are concerned, the us banks' performance is impressive. The four banks recording the highest margins are all from the United States. Three of these four banks record margins in excess of 4% and one even in excess of 5%. Also noteworthy are the Italian banks, all of which are to be found in the upper half of the list. The Italian banks apart, abn amro , recording a margin of 1.9%, is the only non-Anglo-Saxon bank in the upper half. The other Dutch banks are to be found in the lower half of the list, at positions 16, 18 and 19 of the total of 31 banks. It might be noted that, among the Dutch banks, performance differs only slightly. In general, differences among banks in one and the same country are smaller than in the preceding two analyses (see also Chart 2.3).

It is striking that the average interest income margin realised by the us and uk banks is twice the average achieved by banks from the other countries (see also Table 2.1). If the four Dutch banks had realised interest income margins on a par with those of the us and uk banks, their net income would have increased by an estimated eur 18 billion.

One possible explanation for the large differences in interest income margins might be found in the existence of price-bundling. There are three forms of price-bundling, namely cost efficiency bundling, cross-selling bundling and loyalty bundling. Price bundling means that two or more products are offered at a single price. For instance, banks may be able to charge low interest rate spreads for loans if their lending is coupled with the sale of credit cards. Higher levels of cross-selling could thus explain lower interest income margins. Mankila (2001) has attempted to

Chart 2.3 Average interest income margin



Source: Bankscope and own calculations.

examine the degree of price-bundling within the European retail market. Although his research results do not unequivocally show in which countries price-bundling is common or not, he does note that, responding to increasing competitive pressures, Southern European banks engage to a larger extent in price-bundling. This would seem to be at odds with our rankings for interest and non-interest income margins, where Italian banks perform relatively well. Perhaps other factors, such as a lack of market transparency, play a major role.

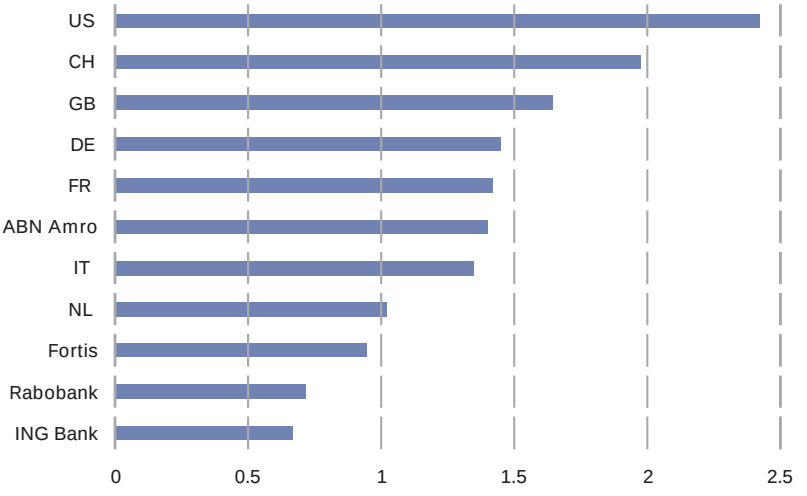
The pattern produced by the other (i.e. non-interest) income margin differs slightly from the results of the preceding analyses.[17] A striking feature is the high position held by Switzerland. One explanation for this high ranking could be the large proportion of corporate finance and investment banking in the two Swiss banks' operations. This might also explain the low ranking of the Swiss banks on the basis of the interest income margin. It is probable that – large – corporate loans are marked by lower interest income margins than retail loans. The fact is that large corporate customers are better placed to negotiate favourable conditions, have in-

Table 2.1 Average interest income margin

Group of countries	Average interest income margin, 2002
us, uk	3.0
nl, de, fr, ch, it	1.5

Source: Bankscope and own calculations.

Chart 2.4 Average commission & fee and other income margin, 2002

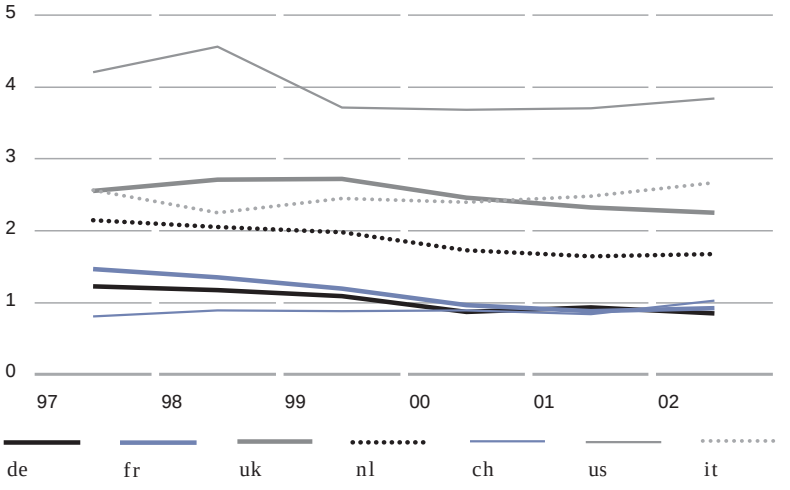


Source: Bankscope and own calculations.

depth market knowledge making for a more transparent and, hence, competitive market and, considering their larger loan volumes, are eligible for relatively lower prices. The Netherlands is at the bottom of the list, with significantly lower margins. Although abn amro does not qualify for a position in the upper half of the list, at 1.4 it does realise the highest margin among the Dutch banks. Recording margins below 1.0, the other Dutch banks are among the last on the list (positions 25, 28 and 29 for Fortis, Rabobank and ing Bank, respectively). The arithmetic average of the non-interest income margin for 2002 for all 27 foreign banks included in the sample was 1.6. If the Dutch banks had achieved this average margin, their net income would have gone up by an estimated eur 9 billion (see also Chart 2.4).

In line with the situation for the average roe, the relative positions held by the various countries on the basis of average interest income margins have changed little over the past five years. Apparently, there is a strong correlation between country and net interest margin. The us banks consistently record by far the highest margins, followed by the uk and Italian banks. The Dutch banks hold a middle position. The non-interest income margins have shown a significant decrease over the past five years. Whereas in 1997 some countries had still achieved margins in excess of 3 and two countries even in excess of 4, in 2002 most countries did not manage to exceed a level of 2 (see also Chart 2.5).

Chart 2.5 Average interest income margin, 1997-2002

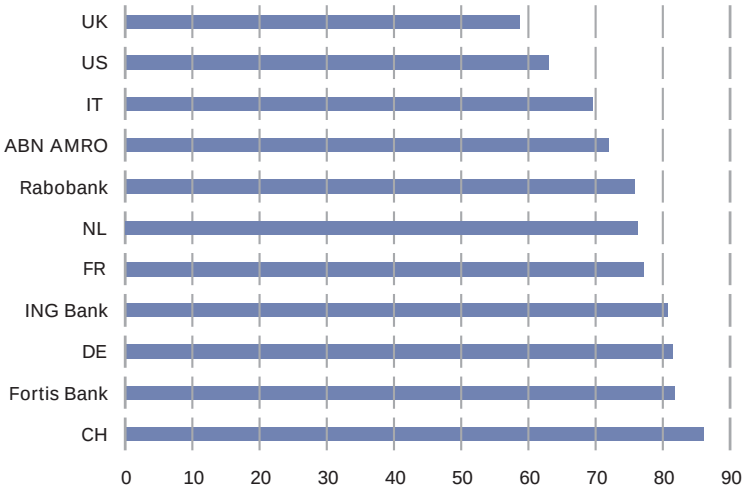


Source: Bankscope and own calculations.

2.3 Efficacy

By contrast with the ratios analysed before, the degree of efficacy (cost to income ratio[18]) is subject to a much less pronounced country effect. Or, more in detail, in the preceding analyses the scores of different banks from one and the same country fairly matched the country average. Where the efficiency ratio is concerned, this is not the case, with considerable differences between the efficiency ratios of banks in the same country. Still, it is again the United Kingdom and the United States that perform well in this respect. In addition, two Italian banks record favourable (i.e. low) ratios, pushing the country's average in the positive direction.[19] On the basis of its average, the Netherlands holds a middle position. It is mainly corporate finance and investment banking operations that give rise to high (i.e. unfavourable) cost to income ratios. If allowance is made for the fact that those foreign banks whose scores are more unfavourable than those of the Dutch banks focus on such operations (such as Credit Suisse, Deutsche Bank, JP Morgan Chase, CapItalia and ubs), it must be concluded that the Dutch banks' position is by no means good. However, in the second quarter of 2003, abn amro reaped the fruits of severe retrenchment operations in the form of an improvement of the cost to income ratio to 68%. Other Dutch banks, too, have undertaken action in recent years to improve their ratios. Since banks in other countries have undertaken similar action, it remains

Chart 2.6 Average cost to income ratio, 2002

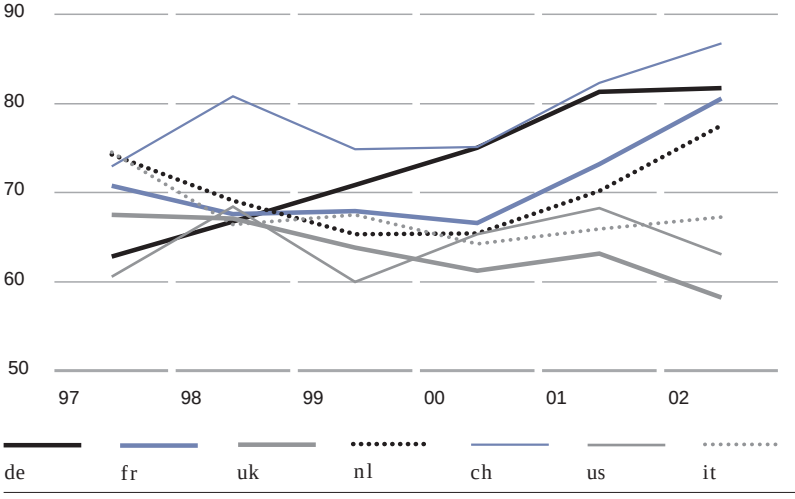


Source: Bankscope and own calculations.

to be seen whether the Dutch banks' relative position in this respect will show an improvement in the future (see also Chart 2.6).

Historical analysis of the cost to income ratio shows that, on average, the uk banks have consistently achieved favourable efficiency ratios over the past five years (see also Chart 2.7). On average, the us and Italian banks also perform well in this

Chart 2.7 Average cost to income ratio, 1997-2002



Source: Bankscope and own calculations.

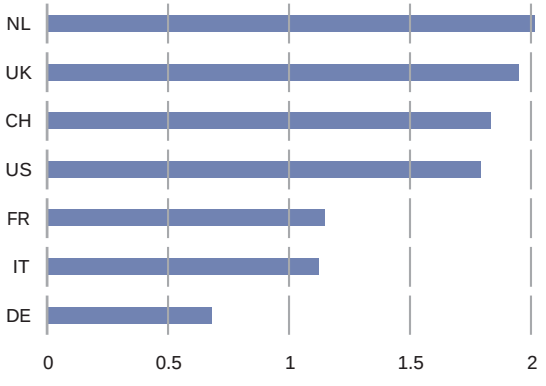
respect. The Dutch banks are clearly lagging behind. One explanation could be found in the relatively low margins achieved on commission and fees and the relatively low interest rate spreads. This does not necessarily mean that the production process at the Dutch banks is ineffective; the cause would rather appear to be a lack of income opportunities.

2.4 Valuation

For the valuation of banks, reliance has been placed on the price to book value (i.e. market capitalisation/equity).[20] Banks themselves also use this ratio for assessing their performance, since it provides an indication as to whether an institution is 'cheap' and, hence, a potential target for a take-over, or 'expensive' and, hence, able to take over other market participants at relatively low cost (acquisitions are usually financed by new share issues; a higher price to book value results in higher capital proceeds per euro of market capitalisation). In this respect, the Dutch banks perform well.

Although the preceding analyses showed that, measured by various financial performance indicators, the Dutch banks were often in the lower half of the rankings, the Netherlands now heads the list. This is due notably to the high valuations of abn amro and ing, which hold fourth and eighth position, respectively. Fortis has one of the lowest scores but, considering the relative weight of this bank within the Dutch group, this does not materially affect the average. The high Swiss position can be ascribed to the high score achieved by ubs. Since the sample includes just two Swiss banks, this has a strong effect on the average. The uk and we banks again dominate the upper half of the ranking. In the light of the previous analyses on the basis of financial performance indicators, this is scarcely surprising (see also Chart 2.8).

Chart 2.8 Average price to book value, 2002



Source: Datastream and own calculations

Table 2.2 Ranking based on each financial performance indicator

Financial performance indicator	Position						
	1	2	3	4	5	6	7
1 Return on equity	us	uk	nl	fr	it	ch	de
2 Return on assets	us	uk	fr	nl	it	ch	de
3 Interest income margin	us	it	uk	nl	ch	fr	de
4 Non-interest income margin	us	ch	uk	de	fr	it	nl
5 Cost to income ratio	uk	us	it	nl	fr	de	ch
6 Price to book value	nl	uk	ch	us	fr	it	de

2.5 Conclusion

On the basis of six indicators, the financial performance of 31 banks from seven countries has been compared. Table 2.2 provides an overview of the scores for each of the countries for each indicator. The us and uk banks score best for most of the indicators. The Dutch banks generally hold fourth position, so that their overall financial performance is average.

The us and uk banks achieve considerably higher levels of profitability than the banks from the other countries. Among the Dutch banks, abn amro scores best, while the other Dutch banks remain below the average for the entire sample. The high profitability of the us and uk banks is due to high income (both interest and non-interest income) and relatively low cost levels. The us and uk banks charge 'higher prices' for their products. Not only is borrowing from us and uk banks 'more expensive' than borrowing from many of their European counterparts, but customers are also more often required to pay for all sorts of services. The latter costs are often higher than those charged by Dutch and other banks. Many of the services rendered by Dutch banks are either free of charge or subject to relatively low charges (such as credit transfers, charges on overdrafts, charges for counter transactions), whereas banks' customers in the United States and the United Kingdom have to pay much higher fees and commissions. Based on this non-interest income margin, the Dutch banks show poor performance, ranking last in the sample. For a number of Dutch banks, the home market is not particularly profitable. In this context, it might be noted that the relatively high level of profitability achieved by abn amro is mainly due to profits generated in foreign markets (mainly the United States). Opportunities for charging high prices (interest on lending as well as fees and commissions) may be a result of structures that restrain competition. Recently, for instance, uk banks were penalized by the uk competition authorities for restraining competition in some market segments by reducing market transparency, seeking

market segmentation by creating high change-over barriers between segments and applying price discrimination within segments, creating access barriers for new entrants and making price arrangements. The results of the analysis on the basis of the price to book value show a different pattern. Here, share prices play an important role and, apparently, the share price level depends on more than just the financial indicators discussed above. The results show that, of all the countries considered, the Netherlands has the highest average price to book value. Except for its score in respect of the return on assets, abn amro invariably performs best among the Dutch banks. As regards the return on equity, the non-interest income margin and the cost to income ratio, the difference between abn amro and the other Dutch banks is considerable, possibly due to the high proportion of foreign operations. Whereas abn amro ranks in the upper half of the list in four of the six analyses, the other Dutch banks' scores are by no means as good. In all the analyses, the other Dutch banks end up in the lower half of the list. The Dutch banking system clearly faces a challenge for the years ahead.

3 Risk

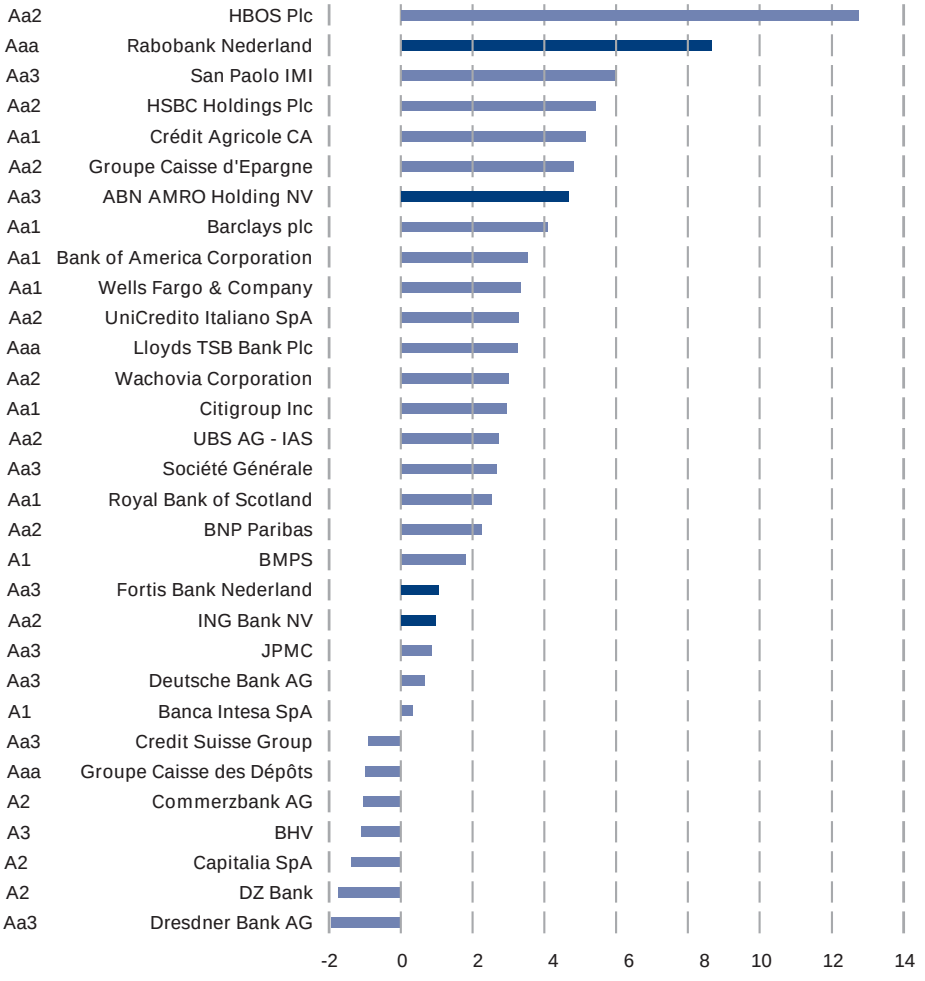
Banks' performance is often compared on the basis of profits. Such a comparison is subject to a limitation in that profit, while providing information about past performance, does not contain much information about expectations for future performance. An obvious forward-looking indicator of profitability (future performance) would be the price of equity listed on the stock exchange. It contains the estimated future cash flows of a firm, corrected for risk, and the value of growth options embedded in a firm. If we want to measure banks' expected future profitability, the valuation of its shares seems a natural place to start.

In order to place the comparison of the international banking sector on the basis of profit performance in a better perspective, we have included an analysis of context variables. Risk is one such variable. The fact is that differences in banks' performance also depend on the degree to which banks incur risk. In this chapter we will deal successively with risk measures derived from accounting data (balance sheet and profit and loss account) and market information (share prices) in an attempt to clarify the interaction between profit and risk and the manner in which banks seek to strike a balance between the two.

3.1 Risk analysis based on accounting data

In their operations, banks must make due allowance for the risks incurred. The degree to which banks do so can be derived from their public disclosure. Banks are, for instance, required to disclose their provisioning for loan losses. Thus, a risk analysis may be performed on the basis of accounting data. The risk-adjusted operating income is a measure of the level of profit per unit of risk.[21] Chart 3.1 shows that, compared with the international peer group, two of the four Dutch major banks perform well, with relatively stable levels of operating income. All four Dutch banks are rated Aa or higher and, like Lloyds tsb Bank (United Kingdom) and Groupe Caisse des Dépôts (France) in the peer group, Rabobank even has an Aaa rating for excellent credit quality. Banks from the United States and the United Kingdom generally achieve high levels of operating income per unit of risk. In 2002, only JP Morgan Chase (jpmc) had a ratio below 2.0 as a result of increased loan losses, dried-up trading income owing to persistently weak markets and sharply increased costs of litigation. None the less, jpmc still has a rating of Aa3. The German banks

Chart 3.1 Risk-adjusted operating income after provisioning[22]

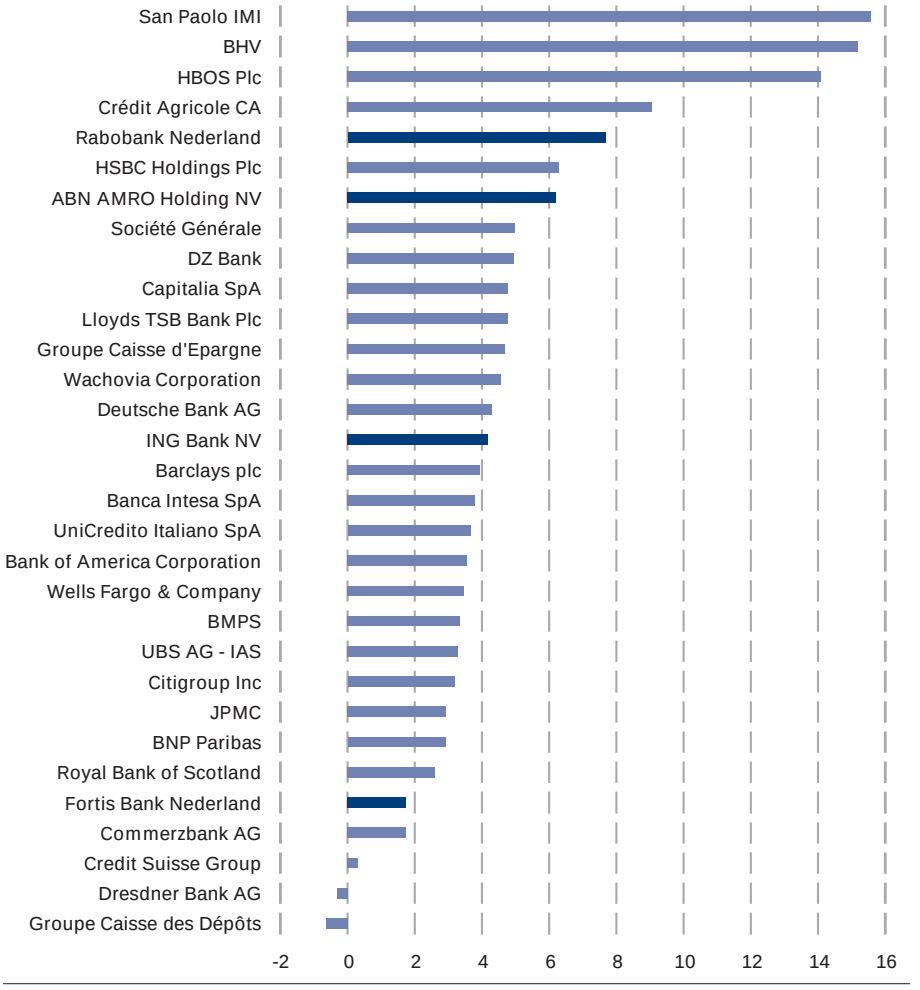


Sources: BankScope and Moody's (April 2003).

perform comparatively poorly. Among the German banks, Deutsche Bank was the only one to achieve a positive operating income per unit of risk, recording a ratio of 0.68 in 2002. The French, Italian and Swiss banks show varying performance.

An alternative measure is the risk-adjusted operating income before provisioning. Here, too, profit is adjusted for volatility, but fluctuations in provisioning do not influence the ratio. Chart 3.2 shows that, on the basis of this measure, too, two of the four Dutch major banks perform relatively well. It might be noted that in this case Rabobank achieves a lower ratio, which could mean that provisioning has smoothed profit volatility. ing achieves a comparatively higher ratio whereas Fortis performs slightly less well than the other banks in the peer group. Over the

Chart 3.2 Risk-adjusted operating income before provisioning



Source: BankScope.

past few years, ing has sought to limit credit risks. Nevertheless, the comparatively lower quality of ing's loans portfolio makes itself felt here. For the German Bayerische Hypo- und Vereinsbank (bhv) and dz Bank and the Italian Capitalia, the low-quality loans portfolios even cause relatively high levels of risk-adjusted operating income *before* provisioning to turn into negative risk-adjusted operating income *after* provisioning.

Credit and liquidity risks are actively managed by banks. Ratios regarding capital adequacy, leverage and provisioning are all indicators of credit risk. The ratio of liquid assets to demand deposits (deposit run off ratio) is a measure of the degree of liquidity. Table 3.1 shows that the average capital adequacy ratio per country for

Table 3.1 Risk measures (averages per country as percentages, 2002)[23]

Country	Capital adequacy ratio	Leverage ratio	Deposit run off ratio	Provisions relative to gross loans	Provisions relative to net interest income	Net interest margin
ch	13.80	0.97	33.50	2.40	25.70	1.04
de	11.10	0.97	27.30	3.28	59.10	0.90
fr	11.30	0.96	24.50	3.07	13.30	0.99
it	10.60	0.94	22.60	5.01	28.10	2.64
nl	11.20	0.96	37.90	1.28	15.50	1.72
uk	12.20	0.94	16.30	1.68	16.50	2.22
us	11.80	0.92	43.80	2.15	23.80	3.70
Averages	10.60	0.95	29.60	2.46	26.50	1.95

Source: Bankscope

the group of major banks for 2002 is around 10.6%. Only the German bhv and the Italian Capitalia and Banca Monte dei Paschi di Siena (bmps) record ratios below 10%. The uk banks are least liquid, with a deposit run off ratio of 16.3. For 2002 the deposit run off ratio is highest for the us banks. For the uk, Italian and us banks, the average leverage ratio is below the overall average of 95%. Compared to the other banks from the peer group, the us banks even have the highest level of equity funding (8%). This makes for a better ability to absorb asset defaults, so that these banks are able to borrow funds at lower prices. This relationship is further accentuated by the inverse relationship between leverage and the net interest margin.

With sound management, banks may increase or decrease their loan loss provisions in line with a deterioration or improvement, respectively, of the quality of their loans portfolios. If a bank makes comparatively large provisions per loan unit, it may consequently be assumed that the quality of its loans portfolio is less good than that of other banks in the peer group. On average, the Italian and German banks record the highest ratios of loan loss provisions to gross loans. In addition, for the German major banks, the 2002 transfers to provisions are high compared to the levels for the other banks in the peer group. It is worthy of note that, against this higher credit risk, the German banks charge lower spreads, whereas the us and uk banks with their lower credit risk charge higher spreads. The Dutch major banks (particularly Rabobank) provision comparatively least for loan losses, although the differences with the us and uk banks are no more than marginal.

3.2 Risk analysis based on market information

In order to gain an overview of banks' risk profiles, the analysis based on accounting data may be supplemented with an analysis based on market information. Whereas the preceding analysis focused mainly on credit risk and operational risk, market information permits an assessment of the risks run by an investor in a specific institution. To this end, we will use a single-index model for equity returns.[24] In the model, a distinction is made between systemic risk – risk attributable to sensitivity to macro-economic factors – and firm-specific risk.[25] We adopt the standard assumption that the return on the market index is a fair approximation of the macro-economic factor. The model is defined as follows:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

where

R_i excess return over and above the risk-free return (3 month Treasury bill or interbank rate) on share i,

R_m excess return over and above the risk-free return on market portfolio m (e.g. excess return on the Dow Jones euro stoxx index for the emu countries, the Swiss Market Index for Switzerland, the ftse 100 for the uk, and the Dow Jones Industrial Average for the us),

α_i average firm-specific return on share i (intercept of regression line),

β_i measure of the degree to which the returns on share i (r_i) and on the market index (r_i) move in parallel.

$$\beta_i = \frac{Cov(r_i, r_m)}{\sigma_m^2}$$

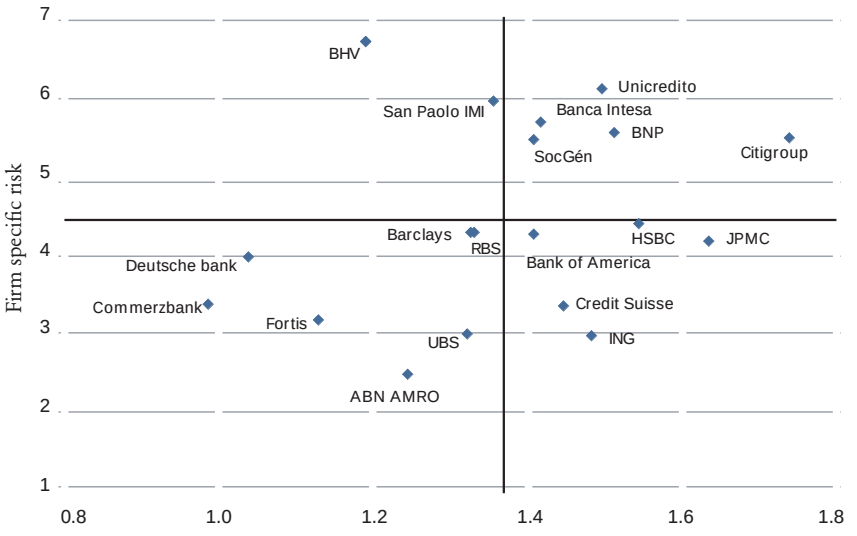
e_i unexpected component resulting from unanticipated firm-specific events (deviation from certain observations on the regression line).

The daily returns have been compared using daily share prices (derived from Datastream) of the three largest listed banks for each country (the largest two in the case of Switzerland).

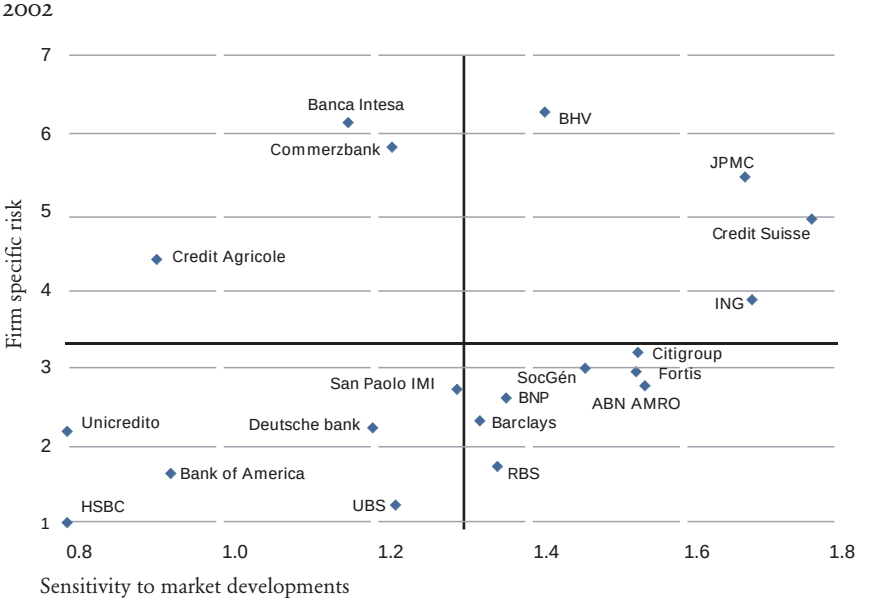
As noted above, the risk in respect of shares (variance of the return on shares) may be broken down into firm-specific risk and systemic risk. Since firm-specific risks move independently of market conditions, the total risk (variance of the return) of share i consists of: $\sigma_i^2 = \beta_i \sigma_m^2 + \sigma_{e_i}^2$, where the firm-specific element is $\sigma_{e_i}^2$ and the systemic risk $\beta_i \sigma_m^2$. Chart 3.3 reveals that in 2002 the Dutch major banks showed about average performance where firm-specific risk was concerned, whereas in 1998 they had still been subject to distinctly less firm-specific risk than the other major banks in the peer group. In addition to a high level of volatility of the market index σ_m^2 in Europe (Dow Jones euro stoxx in 2002: 3.84), market sensitivity (β_i) was also relatively high for the Dutch major banks in 2002. The French banks showed a distinct improvement in 2002 where firm-specific risk was concerned while market sensitivity remained roughly unchanged. With the exception of Deutsche

Chart 3.3 Firm-specific risk $\sigma^2(e_i)$ and sensitivity to market developments β_i of the three largest listed banks in each country

1998



2002



Bank, the German banks were subject to a relatively high level of firm-specific risk in 2002. It might be noted that generally the us and uk banks are marked by low levels of firm-specific risk, but that this does not hold for the investment bank jpmc within this group, which shows a high level of risk. As in the Netherlands, the banks' market sensitivity in both countries is high, but in the United States and the United Kingdom a lower volatility of the market index σ_m^2 (2.5 and 2.9, respectively) results in a lower systemic risk for 2002. The Swiss bank ubs shows a comparatively sound and stable risk profile, while Credit Suisse was subject to a relatively high degree of risk in 2002.

The Sharpe ratio and the Treynor ratio both measure risk-adjusted equity return.[26] In the case of the Sharpe ratio, the excess return earned on a share is divided by its standard deviation. Below, banks are compared on the basis of the risk-adjusted excess return on the market value of their shares. Using the Treynor ratio, we express excess return earned on a share in units of systematic risk per country instead of total risk. In fact, this concerns a repetition of the preceding analysis of risk-adjusted earnings, but this time on the basis of market information. The results are different. For 2002, the correlation between the Sharpe and Treynor ratios and the risk-adjusted earnings on the basis of accounting data is less than one-quarter. This is due to differences in the determination of earnings of individual firms on the basis of market principles (economic results), on the one hand, and on the basis of accounting principles (accounting results), on the other.

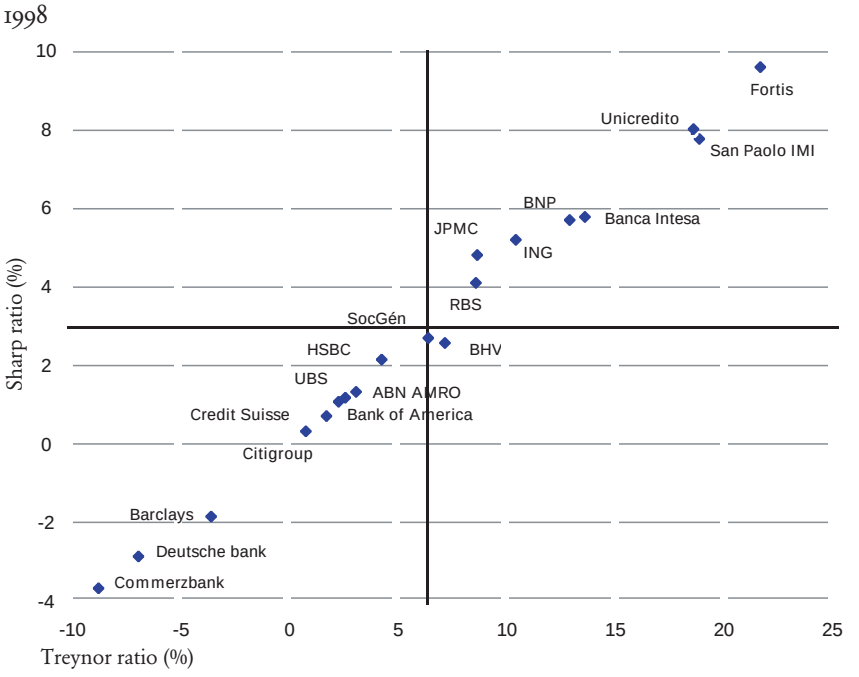
Chart 3.4 shows that in 2002 the Dutch banks ing and Fortis performed less well relative to the average than in 1998. abn amro performed much better in 2002. In general, the banks from the other countries show performance around or just above the average. The German banks show considerably below-average performance.

3.3 Conclusion

Whereas generated profits reflect banks' current performance, context variables contain more information about expected performance. In this chapter, the context variable 'risk' was included in the international comparison of Dutch banks' performance.

The international banks included in the peer group all enjoy a good Moody's bank deposit rating. However, the risk-adjusted results of the individual banks differ within the various countries (see Table 3.2). In 2002 only the uk banks generally performed better, while the German banks performed distinctly worse. One important factor underlying the differences in performance is the quality of the loans portfolio. Notably in the case of the German banks, transfers to provisions depress profit. The risk-adjusted equity returns for the German banks in particular show a corresponding pattern, but for the other banks these economic results differ from the accounting results. The Dutch banks' scores range generally from

Chart 3.4 Sharpe ratio and Treynor ratio for the three largest listed banks



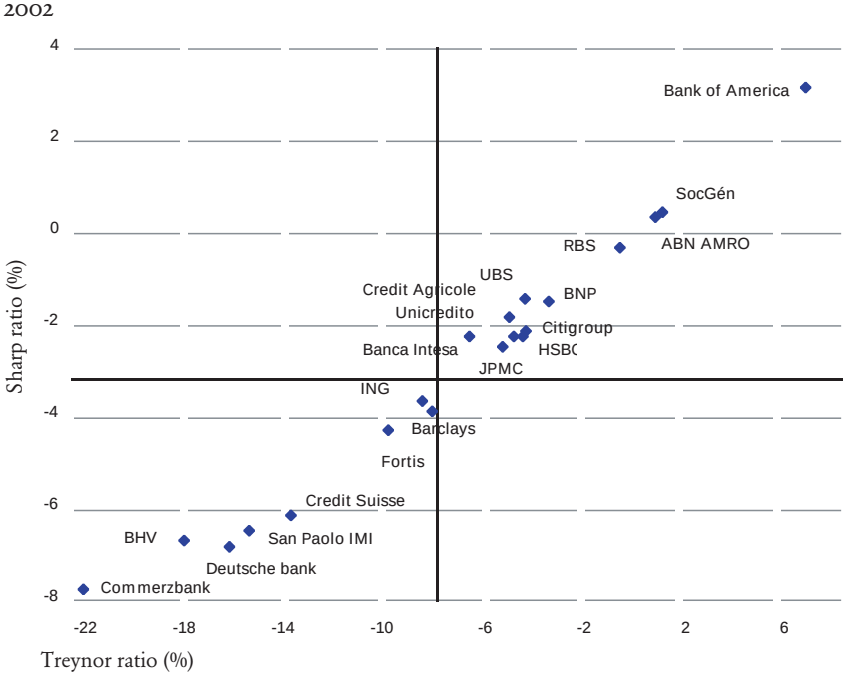


Table 3.2 Rankings based on various risk performance indicators

Risk indicator	Position						
	1	2	3	4	5	6	7
1 Capital adequacy ratio	ch	uk	us	nl	fr	de	it
2 Leverage ratio	us	uk	it	nl	fr	ch	de
3 Deposit run off ratio	us	ch	nl	de	it	fr	uk
4 Provisions relative to gross loans	nl	uk	us	ch	fr	de	it
5 Transfers to provisions/net interest income	fr	nl	uk	us	it	ch	de
6 Risk-adjusted operating income	uk	nl	it	fr	us	ch	de
7 Specific risk	uk	ch	nl	fr	us	it	de
8 Market sensitivity	it	uk	fr	de	us	ch	nl
9 Sharpe ratio	ch	nl	us	de	fr	uk	it
10 Treynor ratio	ch	nl	us	de	fr	uk	it

mediocre to good. In 2002 the Dutch major banks were, however, marked by relatively high levels of market sensitivity; on the other hand, their specific risk was low.

4 Market structure

In economic theory, the market where firms operate is among the principal factors governing their performance. First, we might ask what exactly a market is. A market is an environment where supply and demand are matched and, at the same time, prices and sales quantities are determined.[27] A market is characterised by the product on offer, the number of sellers, the number of buyers and price setting. On the basis of these features, a market may be classified as fully competitive, oligopolistic or monopolistic. In the present section, the market structures are described in which banks operate in various countries, focusing on the number of banks and bank branches in each country and the concentration ratios. Subsequently, a brief description is given of recent empirical research about the degree of competition in the various banking systems.

The structure of the banking market may be viewed in various ways (see Table 4.1). In fact, any measure of the structure of a market is concerned with the degree of aggregation and the weighting of the firms operating in the market. In this overview, we will start at the highest level of aggregation, and will then successively review the number of banks in the various countries and the banking density. Subsequently, we will turn to a lower level of aggregation, but still with equal weights for each firm. To this end, we will compare standard concentration ratios. We will then present a market structure index which, though constructed at the highest level of aggregation, has unequal weighting factors. Finally, we will present a measure of market structure constructed at the lowest level but with equal weighting factors.

Table 4.1 Measures of market structure

	Aggregation level	Weighting
Total number of banks	high	equal
Banking density	high	equal
Concentration ratio	less high	equal
Herfindahl-Hirschmann ratio	high	unequal
Lorenz curve	low	equal

Table 4.2 Number of banks, 1998 and 2001

	1998	2001	Change (%)
Canada	59	49	-16.9
France	337	332	-1.5
Germany	2,087	1,673	-19.8
Italy	627	582	-7.2
Netherlands	61	50	-18.0
United Kingdom	319	267	-16.3
United States	819	700	-14.5

Source: BankScope.

The number of banks differs enormously among the seven countries considered (see Table 4.2). In 2001, there were 1,673 banks in Germany, whereas the numbers of active banks in Canada and the Netherlands were 49 and 50, respectively. In all countries, the number of banks has decreased between 1998 and 2001. This development is not surprising, given the fact that this decrease, especially in Europe, had already set in in the early 1990s and was notably caused by the restructuring of the banking system during that decade. In percentage terms, the decrease was largest in Germany, and only slightly less in the Netherlands. Relative to the other six countries, the number of banks has remained fairly stable in France.

The average number of branches per 1,000 inhabitants in the seven countries is summarised in Table 4.3. For the period 1998-2001, a decrease in the average number of branches is observed in both Germany and the Netherlands, with the decrease in the Netherlands being more than twice observed in Germany. In France, on the other hand, the average number of branches shows a slight increase, while Italy even records a sharp increase. The latter observation is strange. When the number of banks declines, one would rather expect a decrease in the average number of branches.[28] Table 4.3 also shows that the average numbers of branches in France, Italy and the Netherlands were approximately equal in 1998, but different in 2001.

The degree of market concentration is another indicator of market structure. In the event of a high concentration ratio, one would tend to expect less competition and more market power than in the event of a low concentration ratio. Yet, there is also an alternative view, which argues that this need not necessarily be so. Below, we will come back to this issue. There are various indicators for the degree of concentration of the banking system (for an overview, the reader is referred to Bikker and Haaf, 2002a). Indicators that are frequently used in the literature are the *k* banks concentration ratio (CR*k*) and the Herfindahl-Hirschmann index (hhi).

Which concentration measure is the best depends on the features of each individual situation.[29] Any concentration ratio can be reduced to the general form of:

Table 4.3 Average number of branches per 1,000 inhabitants, 1998 and 2001

	1998	2001	Change (%)
Canada	n.a.	n.a.	–
France	0.43	0.44	2.3
Germany	0.73	0.66	-9.6
Italy	0.46	0.51	10.9
Netherlands	0.43	0.33	-23.3
United Kingdom	0.27	n.a.	–
United States	n.a.	n.a.	–

Sources: National central banks and ecb.
Explanatory note: n.a. = not available.

$CR=\sum_{i=1}^{n} w_i s_i$. Phrased differently, the concentration ratio is equal to the sum of the product of weight w and market share s of bank i. The way in which the weight is defined ultimately determines the specific form of the concentration ratio and also determines whether the ratio focuses on the entire market or on a specific market segment.

In the CRk, the top k banks are assigned a weight of one, and all other banks a weight of zero, i.e. $CR=\sum_{i=1}^{k} s_i$. This ratio focuses solely on the role played by a number k of banks and ignores the rest of the market. Since the choice of k is arbitrary, this constitutes a considerable disadvantage. In the hhi, each bank is assigned a weight on the basis of its market share, i.e. $CR=\sum_{i=1}^{n} s_i^2$. Thus, larger banks are assigned higher weights than smaller banks. The hhi also has a disadvantage in that it becomes less sensitive to the number of banks as the number of banks active in the market goes up. Both the hhi and the CRk have been criticised for focusing on the largest banks and ignoring the rest of the market.

As noted earlier, there is a relationship between concentration and market structure. In a market characterised by full competition, the degree of concentration will tend to be lower than in the case of an oligopoly or a monopoly. In the case of a monopoly, the hhi and the CRk are equal to 1, since a single firm serves the entire market. Hence, a high concentration ratio is an indicator of more market power for the large firms. This does not necessarily mean that there is no competition. After all, competition may be oligopolistic, with a small number of large market players competing with each other. For instance, in the Bertrand model of price competition the obtained Nash equilibrium replicates the equilibrium of perfect competition where price equals marginal cost.

Chart 4.1 shows the CR3, the CR5 and the hhi, measured on the basis of total assets, total loans and total deposits. It should be noted that these totals apply to the consolidated operations and that, consequently, the market environment is not defined by geographical frontiers.[30] Instead, it is defined as the environment of all cus-

tomers served by the bank. This slightly distorted picture may cause the concentration ratio for a country to be over- or underestimated. Another drawback of the limited data availability within BankScope lies in the fact that, apart of geographical frontiers, a market is also defined by all suppliers. For the United Kingdom, for instance, the 'City effect' makes itself felt, with the large international investment banks, through their effect on the denominators, depressing the concentration ratios.

Chart 4.1 shows that, on the basis of the consolidated data from BankScope and measured by the CR3, the CR5 and the hhi, the Netherlands is marked by a highly concentrated banking system. Canada has a concentrated banking sector compared to the other countries as well. In contrast with the situation for Canada, the CR5 in the Netherlands is dominated by the CR3. Except for the United States, all other countries had a CR5 in 2001 of between 30 and 40%. This would suggest that in Germany, France, the United Kingdom and Italy, competition is weaker than in the United States. However, the us market is very large and fragmented, so that the degree of concentration at the state level might well be higher than at the national level.

As already noted, the CR3 and the CR5 have a drawback in that the choice of 3 or 5 for *k* is arbitrary. As a result, a CR*k* cannot provide a complete indication of the market structure or the market distribution. Lorenz curves are more suitable for representing market distributions (see Bikker and Haaf, 2002a). Chart 4.2 shows the Lorenz curves for Canada, Germany, the Netherlands and the United Kingdom. It is evident from Chart 4.2 that the curves show similar patterns up to 80% of the total number of banks. Apparently, the number of major banks differs among countries, which explains the divergence at the tail of the cumulative distribution.

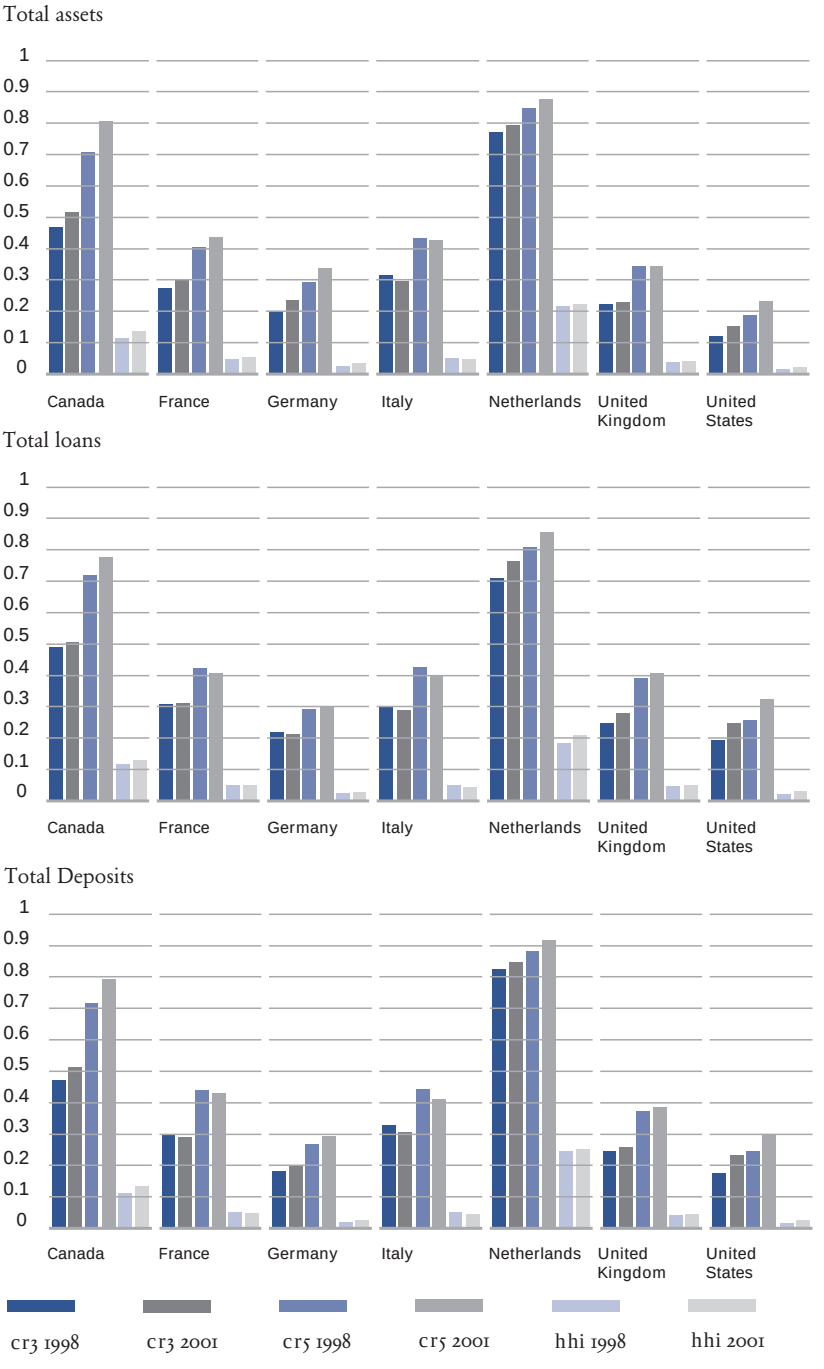
Germany proves to be furthest removed from the 45° line, which indicates a relatively more unequal distribution. This means that the skewness of the distribution of total assets is more pronounced in Germany than in the other countries.

As has been shown by the comparison made in this section, defining a market structure is neither simple nor does it lead to unambiguous results. In cases where one wishes to measure potential market power at market level, it may be recommendable for the larger banks to be assigned a higher weight, as in the Hirschmann-Herfindahl index. However, if one wishes to gain an impression of the service level within a market, the banking density might be more suitable. And if one is interested in the size inequality of the banking sector, a Lorenz curve may be more appropriate.

From the brief description above we find at the one extreme the Netherlands with a highly concentrated and relative equal distributed banking sector and a low number of active banks and low branche density. At the other extreme we find Germany with a low concentration and relative unequal distributed banking sector and a high number of active banks and branche density. Does this imply that competition is more fierce in Germany than in the Netherlands?

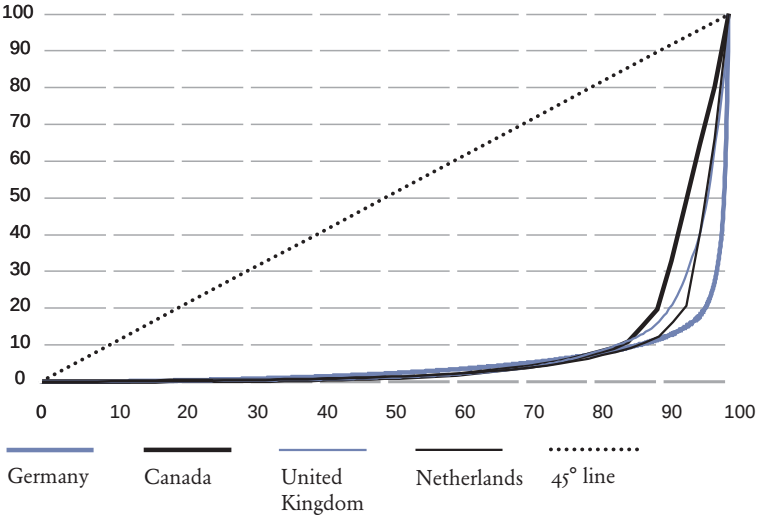
To measure competition the literature distinguishes two approaches: the structural and non-structural approach. See Bikker and Haaf (2002a) for an excellent overview. In the structural approach market structure indicators such as concentration indi-

Chart 4.1 Concentration ratios, 1998 and 2001



Source: Bankscope and own calculations.

Chart 4.2 Lorenz curves of total assets, 2001



Source: Bankscope and own calculations.

ces and total number of active firms take a central position to analyse the impact of market structure on the firm's profitibality. The structural-conduct-performance (scp) hypothesis and the efficiency hypothesis are the most common structural hypotheses used in empirical work.

The scp hypothesis explains a firm's performance through the exogenous market structure. A concentrated market results in more collusion among larger firms which subsequently leads to a superior performance. The application of this hypothesis to the banking sector has been subject to much criticism. A first critique from the Industrial Organisation approach is that the scp paradigm lacks micro foundations (Bos, 2002). Another critique is the causality that runs from market structure to performance.

The efficiency hypothesis challenges the scp hypothesis and offers an alternative view on the relation between market structure and performance. According to this view differences in performance can explained by differences in efficiency. A firm with a higher efficiency can reduce prices, therefore, gain market share and the market becomes more concentrated. Hence, market structure is endogenously determined by efficiency.

The non-structural approach analyses competition among firms without using explicitly information about the market structure. The measures of competition of Iwata (1974), Bresnahan (1982), and Lau (1982) are based on the conjectural variation measure presented in section 2. The Iwata model derives a conjectural variation measure for *individual* banks supplying homogenous product in an oligopolistic market. The Bresnahan and Lau model derives a conjectural variation measure for

the market power of an average bank. A conjectural variation of zero implies that firms do not affect the profit maximisation problem of competitors, hence, the market is characterised by perfect competition. A high conjectural variation implies that firms are aware of their impact on the competitors' profit maximisation problem and collusion among firms may exist.

The Panzar and Ross (1987) model derives a competition measure that is based on the reduced form revenue equations of individual banks. A recent study by Bikker and Haaf (2002b) used this model to examine the competitive conditions in the banking markets of 23 oecd countries. Their results indicate monopolistic competition for all the 23 banking markets. However, since the Panzar and Ross measure is a continuous measure, the extent of monopolistic competition in the various banking systems is continuous as well.

According to their estimates competition in Europe seems to be a bit stronger than in the us. Within Europe the competition in the Dutch and the Italian banking sector seems to be less than the competition in the French, the German and the British banking sector. Another interesting empirical result is that Bikker and Haaf (2002b) found a significant relationship for the impact of market structure measured by concentration and the number of banks on competition. In order to gain a better insight into the differences between individual banks' behaviour, the next section centres on banks' relative performance and on a comparison of efficiency.

5 Efficiency[31]

In an attempt to improve the measurement of banks' performance, there is an increasing tendency to seek to measure not only actual performance but also potential performance. One underlying notion is that in a situation of full competition – ideal from the consumer's viewpoint – banks will be forced to minimise cost in order not to be pushed out of the market. This also makes clear once more that banks' performance in a certain market may be explained in part from internal factors but definitely also in part from the market conditions in which banks operate. It is also clear that these two forces are often hard to disentangle in an unambiguous manner.

The research into the manner in which banks, given their own (whether or not optimal) choices, are able to minimise cost and/or maximise profit to the extent possible, increasingly relies on measures of efficiency. In this chapter, an example will be discussed. To that end, we will first deal briefly with the relationship between performance and efficiency. Subsequently, we will review the relevant literature before introducing a new method for comparing banks' efficiency. The method will then be applied to the European banking market, after which conclusions will be drawn.

5.1 Performance and efficiency

Standard micro-economic theory holds that, if a market is characterised by full competition, no single bank will be able to generate excessive profit. More in general, a bank will – in the absence of market power – only be able to generate above-average profit if it also has above-average ability to control cost.

If a bank does have a degree of market power, it is no longer a price-taker and can, by raising its prices, increase its profit without having to lower cost. Such market power may be due to economies of scale, permitting large banks to produce more at the same average cost level than small banks. Product differentiation, too, may lower cross-price elasticity and thus afford scope for raising prices. In summary, a banking market may be characterised by studying banks' performance in that market. More precisely, we focus on banks' *relative* ability to minimise cost and/or maximise profit. The question arises, however, whether in such benchmarking exercises we should centre solely on the production possibilities of banks that actually operate in this market. First, doing so, we would ignore differences in these

banks' product ranges and size. Second, we would identify – unintentionally – one or more banks as best-practice firms, even if their performance would be below par in an absolute sense.

That brings us automatically to the next question: what exactly is *par*? That question can be answered by studying the efficiency literature.[32] In this literature, the degree to which banks minimise cost and/or maximise profit is compared with an optimal frontier. Banks operating on this frontier are 100% efficient, while banks operating below (where profit is concerned) or above (where cost is concerned) the frontier are to a greater or lesser extent inefficient. One important feature of these optimal frontiers is that they consist of all optimal production possibilities *that are considered feasible*. To that end, they are estimated on the basis of the actually observable production possibilities.

5.2 Literature

As far as we know, no research has been conducted thus far in which the method used here has been applied to the banking system. In this section, we present a brief, non-exhaustive overview of related work comparing banks' efficiency.

For the us banking sector, a comprehensive literature has sprung up over the past fifty years (for surveys, see Berger and Humphrey (1997), and Berger, Demsetz and Strahan (1999)). More recently, research has also focused on European banks (see, for instance, Molyneux, Altunbas and Gardener (1997), Sheldon (1999), and Altunbas, Gardener, Molyneux and Moore (2001)). Initially, research centred mainly on measuring economies of scale, which were thought to underlie part of the observed differences in performance. Overall, until the early 1980s, attention centred on the existence of so-termed U-shaped cost curves, where economies of scale were maximal at total asset levels of usd 100 – usd 500 million. For economies of scope (the degree of synergism), the evidence is much less convincing.

The work of Berger and Humphrey (1991) represented an important step forward. They showed that X-efficiency – the relative distance to the cost or profit efficiency frontier – is much more substantial for banks than economies of scope and scale. Later studies elaborated on their work, for instance by allowing for the degree of risk incurred by banks (see Berg, Førsund and Jansen (1992), McAllister and McManus (1993), Mester (1996), and Berger and DeYoung (1997)).

Although, after these and other breakthroughs, efficiency studies found their proper place in the banking literature, the number of studies in which banks are compared across countries is still comparatively limited. Examples are Berg *et al.* (1993), Fecher and Pestieau (1993), Vander Vennet (1994), Bergendahl (1995), Berg *et al.* (1995), Ruthenberg and Elias (1996), Pastor *et al.* (1997), and Vander Vennet (1999). Most of these studies focus on the European banking system. In Allen and Rai (1996), Saunders and Walters (1994), and Bos and Kolari (2004), large European and us banks are compared.

The results of the research conducted thus far suggest that the average cost efficiency of European banks ranges between 70 and 80%. As is usual, average profit efficiency is considerably lower, between 50 and 60%. Pastor et al. (1997) conclude that French and Spanish banks are more efficient than banks in Germany, the United Kingdom and Austria. Sheldon (1999) concludes, on the basis of non-consolidated data for 1,783 banks in the eu, Norway and Switzerland for the period 1993-1997, that large banks, specialised banks and retail banks are more efficient in terms of both cost and profit than smaller banks, diversified banks and wholesale banks.

In an attempt to make better allowance for the differences between the banking markets in the various European countries, a number of recent studies integrates country-specific variables. For example, Dietsch and Lozano-Vivas (2000) emphasise that the assumption of one common efficiency frontier may give rise to misleading results in the event of large and exogenous legal, demographic and economic differences. Consequently, they show that, measured under one common frontier, banks which operate in countries marked by a relatively unfavourable economic climate are comparatively inefficient. It should be noted in this context that, since this climate is beyond the control of bank management, a foreign bank which would decide to start operations in such a country should not automatically expect to be able to shift the efficiency frontier. In other words, part of efficiency and of efficiency differences is country-specific. This is confirmed by Lozano-Vivas et al. (2001) in a simulation in which a bank showing average performance in its home country decides to start operations in another country. Only in a few cases does such a decision work out favourably for the bank concerned.

Overall, the impression remains that comparisons of banks in different countries insufficiently allow for differences in access to resources and technologies (see also Dietsch and Lozano-Vivas (2000), Chaffai et al. (2001), Lozano-Vivas et al. (2001), and Bikker (2002)). In the sections below, we will attempt to make up for this insufficiency by presenting a new model permitting a common efficiency frontier to be measured, while making allowance for underlying differences in production technologies (resulting from, for instance, differences in the legal, demographic and economic environment).

5.3 **Meta-efficiency**[33]

A bank maximises profit by selling, at a given risk level, as many products as possible at the highest possible prices, while using the smallest possible amount of inputs at the lowest possible cost. The standard approximation in the literature (Bos and Schmiedel (2003)) thus shows that:

$$\max \pi = f(\mathrm{p}, \mathrm{y}, \mathrm{w}, \mathrm{x}, \mathrm{z}) + u - v \qquad (1)$$

where profit π is a function of a vector output prices p, a vector outputs y, a vec-

tor input prices w and a vector inputs x, with equity/assets z as the risk measure. Normally distributed measurement errors u are permitted. The degree to which a bank operates below the maximum profit frontier v determines its profit efficiency: $(\pi - v)/\pi$. A bank operating on the efficiency frontier thus has an efficiency of 1 (i.e. $v = 0$); a bank operating below the efficiency frontier has an efficiency below 1 (but above 0).

In the same vein, a bank is considered to minimise its cost c:

$$\min c = f(p, y, w, x, z) + u + v \qquad (2)$$

An inefficient bank operates above the minimum cost frontier, so that cost efficiency is measured as: $c/(c+v)$. Again, an efficient bank has a value of 1 and an inefficient bank a cost efficiency of less than 1.

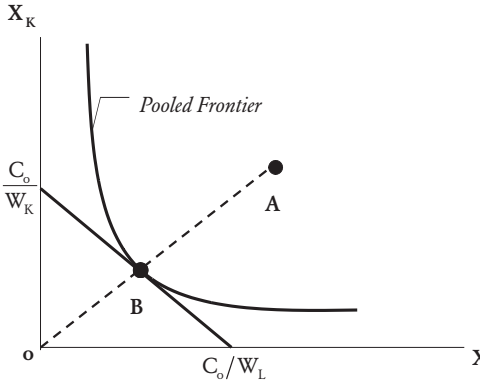
Using this method, profit and cost frontiers can be estimated both for individual countries and for, for instance, Europe. If a frontier is estimated for each individual country, the resulting efficiency values can be compared *within* but not *across* countries, since efficiency is the distance from the optimum frontier, which in that case is country-specific. If the same optimum frontier is estimated jointly for a group of banks in various countries, the resulting efficiency values can be compared. Yet, in this case there also is a problem in that the values may be distorted because it is difficult or impossible to allow for country-specific factors. Including control variables provides no more than a partial solution to the problem, because this merely shifts the *entire* optimum frontier (for each country), whereas country-specific factors may just affect the direction or shape of the optimum frontier. This problem could be resolved by constructing an envelope around a range of country-specific frontiers, thus retaining their specific nature but yet permitting comparable efficiency values to be measured. The construction of this envelope, a *meta-frontier*, is explained in Table 5.1.

5.4 Results

In order to gain an impression of the Dutch banks' performance in an international perspective, the method introduced above has been used to estimate the profit and cost efficiency of large commercial banks in eight European countries in the period 1993-2000. The data have been derived from BankScope, and all commercial banks have been selected with assets in excess of USD 100 million (1993 dollars, adjusted for inflation).

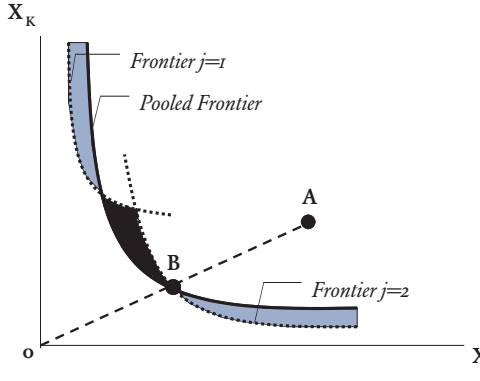
A cost minimisation model and a profit maximisation model are used. For both models, we estimate (a) a pooled efficiency frontier, (b) a country-specific efficiency frontier, and (c) a meta-efficiency frontier.[35] When discussing the results, we will concentrate on the differences between the pooled frontiers and the meta-frontiers. First, a brief overview is given of the pooled and the meta-efficiency values as they

Table 5.1 Constructing a meta-cost frontier[34]



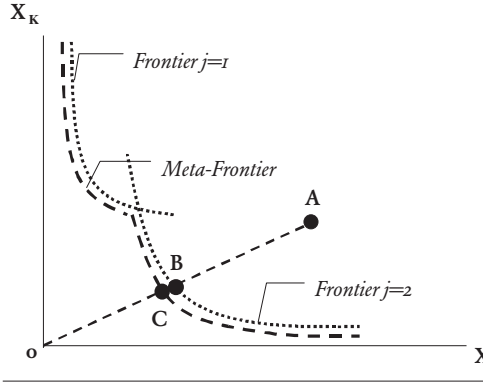
Step 1: Banks minimise cost on a joint iso-cost curve. A bank operating at a certain ratio of relative prices (W_K/W_L) for capital and labour operates at the lowest possible cost if it is located at point B on this minimum cost frontier ('Pooled Frontier').

Hence, a bank located at point A has a cost efficiency (CE) of $(A0/B0)^{-1}$. For the most efficient bank this cost efficiency is 1, for the least efficient bank it is (nearly) 0.



Step 2: The minimum cost frontier of one banking market (j=1) may differ from that of another banking market (j=2). Hence, when estimating country-specific cost frontiers, some banks may – relative to a pooled cost frontier – be considered efficient (in the shaded areas) whereas other banks may be considered inefficient (in the dark area).

To the extent that the country-specific cost frontiers result from local, external factors, the use of a pooled cost frontier would thus be incorrect.



Step 3: Now an envelope is constructed ('meta-frontier') which closely fits the country-specific minimum cost frontiers. In this way, allowance is made for local, external factors constraining banks' behaviour. For a bank located at point A, cost efficiency is now decomposed into a country-specific proportion $(A0/B0)^{-1}$ and a 'Technological Gap Ratio' (tgr) of $(B0/C0)^{-1}$. The product of the two constitutes the meta-cost efficiency.

The procedure for profit efficiency (assuming profit maximisation) is identical. For details, see Bos and Schmiedel (2003).

have been obtained from the estimations. Subsequently, we review the differences in meta-efficiency among the eight countries considered here, followed by a discussion of the significance of the results for a new explanation of the differences in performance between banks in the Netherlands and the United Kingdom.

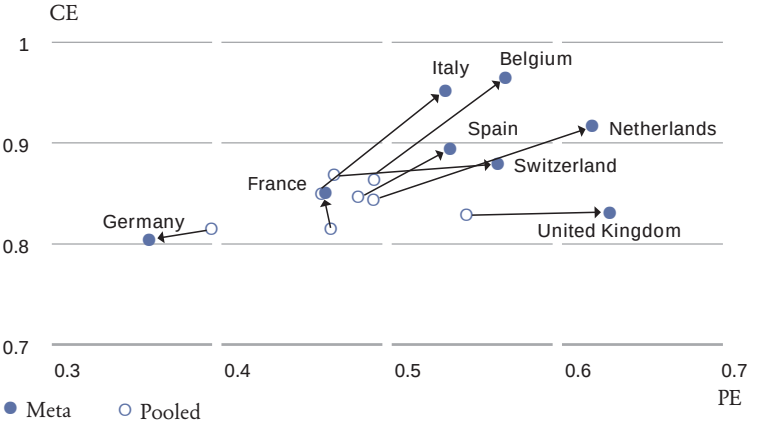
5.5 From pooled frontier to meta-frontier

In Tables a.1 and a.2, we present the estimated cost and profit efficiency values, as well as the Technological Gap Ratio (tgr) – the relative distance between the country-specific frontier and the meta-frontier. As is usual in the stochastic frontier models used here, cost efficiency (and its standard deviation) is, on average, significantly higher than profit efficiency. It may be noted that, in the models for cost efficiency, the tgr is, on average, very small.[36] This suggests that there is relatively little overlap between the country-specific frontiers. Furthermore, on average, the banks' performance in the various countries differs little. Minimum cost efficiency, however, does differ, and especially France, Germany and the United Kingdom (the three largest banking markets) feature a number of highly inefficient banks. In the Netherlands, banks still have an average scope of almost 16% for cost reductions (or, phrased differently, they are 84.38% efficient, measured by the pooled frontier).

On average, the profit efficiency scores show much larger differences. German banks, for instance, may raise profit by slightly more than 60% (in other words, they are 39.68% efficient, measured by the pooled frontier). Banks in Belgium, on the other hand, can raise profit by 'no more than' 51%. At the same time, it should be noted that these differences mostly disappear if we concentrate on the most efficient banks in each country.

Chart 5.1 makes clear how the pattern of relative cost efficiency (*ce*) and profit efficiency (*pe*) changes when, instead of a pooled frontier, a meta-frontier is estimated. First, we see that in each country the average cost and/or profit efficiency increases when we move to the meta-frontier. This result may be interpreted to mean that the country-specific frontiers have little overlap. In other words, by estimating a

Chart 5.1 From pooled frontier to meta-frontier[37]

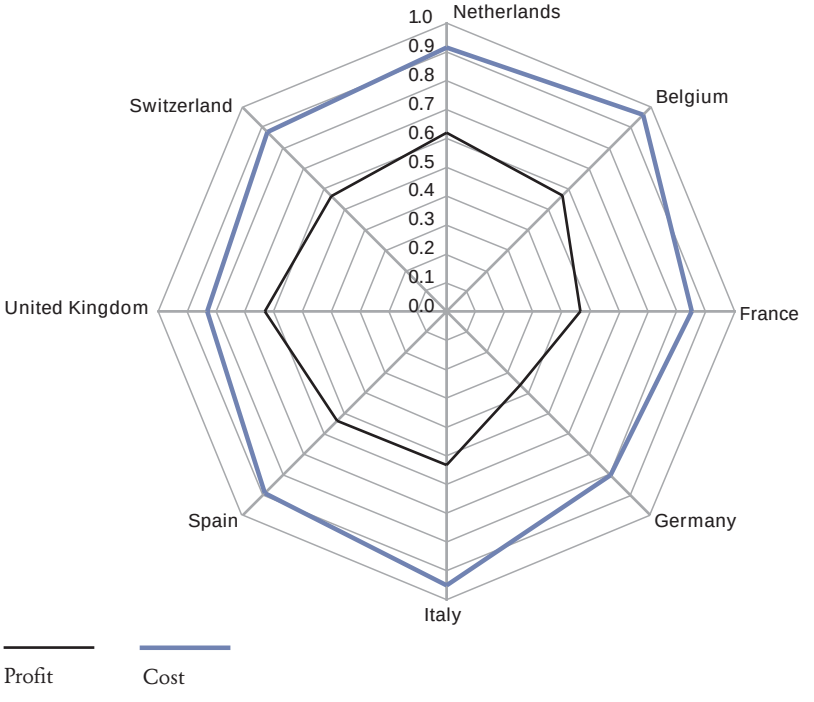


pooled frontier, we lose much of the country-specific information. Things are conspicuously different for Germany, where both cost efficiency and profit efficiency *decrease*. This is all the more striking as the profit efficiency in particular was already very low before we constructed the meta-frontier. Perhaps this may explain the recent problems encountered in the German banking system, as well as, for that matter, the lack of cross-border mergers, since the results show that it may be very difficult to repeat domestic successes abroad. Another striking phenomenon is the particularly sharp increase in both cost and profit efficiency of the Dutch banking system. Given the fact that profit efficiency rises even more sharply than cost efficiency, this result must be interpreted with due caution. It might be noted, incidentally, that in the United Kingdom profit efficiency also goes up signifantly when we move to the meta-frontier.

5.6 Comparison of meta-efficiency values

The results of the meta-efficiency exercise present a varied picture for the European banking system. Chart 5.2 shows that especially large differences are in evidence in respect of the degree to which banks are able, given their production choices

Chart 5.2 Comparison of meta-efficiency[38]



and their home market environment, to maximise profit. Notably in Germany and France, banks find it relatively hard to do so.

It should also be noted that successful cost control does not automatically lead to higher profit efficiency (and, hence, to higher profits). Thus, on average, the Belgian banks are marked by the highest cost efficiency, but they are less efficient in maximising their profit than their Dutch or uk counterparts. Further interpretation of these results is difficult in the absence of in-depth knowledge of the local markets and banks' behaviour in these markets.

5.7 The Netherlands and the United Kingdom

In order to answer the question how we should adjust our traditional ways of analysing and assessing banks' performance in the light of the results presented here, we will – again – take a comparative look at banks in the Netherlands and the United Kingdom.

First, the analysis has shown that, measured against a pooled frontier, the differences in cost efficiency are small. Thus measured, there is, however, a significant difference in profit efficiency between banks in the two countries. Given their production choices, uk banks are, on average, 11% more profit efficient than their Dutch counterparts.[39] Even for the most efficient banks, this difference does not disappear. These results are confirmed by the 'hard' data: for the period 1993-2000 the average roa for Dutch banks was 0.53, whereas uk banks scored an average roa of 0.88.[40]

However, comparison of the meta-efficiency values for the Dutch and the uk banks yields a more balanced picture. The differences in profit efficiency have virtually disappeared, while the differences in cost efficiency have increased in favour of the Dutch banks.[41] This does not necessarily mean that, on average, the Dutch banks are faced with lower cost levels. It does mean, however, that, within the prevailing market environment, they would appear to be more strongly focused on cost reduction than their uk counterparts. In addition, the substantial differences between the results underlain by a pooled frontier and those underlain by a meta-frontier provide a sound indication of the extent to which the absolute performance measures (i.e. the roa) may be compared. In other words, it would seem realistic to assume that an efficient uk bank would, in the Dutch environment, achieve a similar roa as an efficient Dutch bank (and conversely).

5.8 Conclusion

In this chapter, we have presented an overview of the use of benchmarking techniques for analysing banks' performance. After an outline of the relationship between performance and efficiency, the results described thus far in the literature have been

discussed. Subsequently, we introduced the concept of 'meta-efficiency'. Using data for the European banking system, we have attempted to make clear to what extent banks' performance depends on their ability – which is partially determined exogenously – to minimise costs and maximise profit as efficiently as possible.

Differences in efficiency within Europe, notably those in respect of profit maximisation, still prove to be significant. Especially German banks are hard put to it to maximise profit. Dutch and uk banks, on the other hand, are leading the pack in this regard. Closer examination of the differences between the pooled efficiency frontiers and the meta-frontiers shows that, although the efficiency values presented here are *comparable*, they are not directly transposable.

6 Conclusion

The banking market is becoming ever more international in scope, marked as it is by banks in one country serving customers in a variety of other countries, becoming ever more reliant on income from other countries beyond their home market and providing products that are becoming ever more similar across countries. In view of these developments, banks' performance, too, will have to be increasingly assessed in an international context. The future position of the Dutch banks depends to an ever greater extent on their relative performance, that is, their performance relative to their peers on the international playing field. That is why, in the preceding chapters, we have compared the performance of the Dutch banks with that of their foreign counterparts.

Since performance is a complex concept, going beyond such measures as profitability alone, the relative performance has been charted on the basis of four performance categories, to wit (i) financial indicators, (ii) risk, (iii) market power, and (iv) efficiency.

Based solely on measures on financial performance, the Dutch major banks show below-average performance. Especially non-interest income distinctly falls short of that generated by comparable institutions in other countries. One might wonder whether the Dutch banks offset this moderate performance by incurring less risk. A comparison based on a number of risk measures confirms that this is indeed the case. For instance, the risk-adjusted operating income of Dutch banks is excellent, also when viewed internationally. For investors, too, Dutch banks are prime investment objects, as is evident from the relatively high Sharpe and Treynor ratios. The high degree of market concentration in the Dutch banking system may have contributed to a high degree of banks' market power. Thus far, considering the low levels of non-interest income, this has apparently not given rise to high costs for Dutch consumers. Furthermore, Dutch banks prove to be marked by sound profit and cost efficiency levels, which provide an insight into the extent to which Dutch banks are able, within their exogenously determined environment, to maximise profit and control costs.

The ever keener competition within the international banking system causes banks to be increasingly subject to pressures to achieve high performance levels. Considering the progressing globalisation within banking, chances are that consolidation will continue and increase and that cross-border mergers should be expected. In such an environment, it is important that the Dutch banks' performance

should remain in line with that of their principal foreign competitors in order to ensure a competitive position on the international playing field.

In the present study, as in other studies on the subject, we sorely missed information about the prices (such as interest rates, etc.) which banks charge for their products. This makes it difficult to trace the causes of banks' relative levels of performance in more detail. On the other hand, bank borrowers may benefit from the fact that banks are reluctant to share price information. Especially high quality borrowers without a reputation are much more likely to borrow at attractive rates if a bank can prevent free-riding on the strong signal this rate gives to other participants. Therefore, banks' reluctance to share price information may sometimes come at an advantage to their customers.

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7 Appendix

Table a.1 Sample used for the analysis of banks' financial performance and risk, and country of establishment

Country	Bank
Germany	Bayerische Hypo-und Vereinsbank ag – ias
Germany	Commerzbank ag – ias
Germany	Deutsche Bank ag – us gaap
Germany	Dresdner Bank ag – ias
Germany	dz Bank ag-Deutsche Zentral-Genossenschaftsbank
France	bnp Paribas
France	Caisse des Dépôts et Consignations-Groupe Caisse des Dépôts
France	Crédit Agricole ca
France	Groupe Caisse d'Epargne
France	Société Générale
United Kingdom	Barclays plc
United Kingdom	hbos Plc
United Kingdom	hsbc Holdings Plc
United Kingdom	Lloyds tsb Bank Plc
United Kingdom	Royal Bank of Scotland Group Plc (The)
Italy	Banca Intesa
Italy	Banca Monte
Italy	Capitalia
Italy	San Paolo imi
Italy	UniCredito Italiano
Netherlands	abn amro Holding nv
Netherlands	Fortis Bank Nederland (Holding) n.v.
Netherlands	ing Bank nv
Netherlands	Rabobank Groep-Rabobank Nederland
Switzerland	Credit Suisse Group
Switzerland	ubs ag – ias
United States	Bank of America Corporation
United States	Citigroup Inc
United States	J.P. Morgan Chase and Co.
United States	Wachovia Corporation
United States	Wells Fargo and Company

Chart a.1 Return on Average Equity (roae), 2002

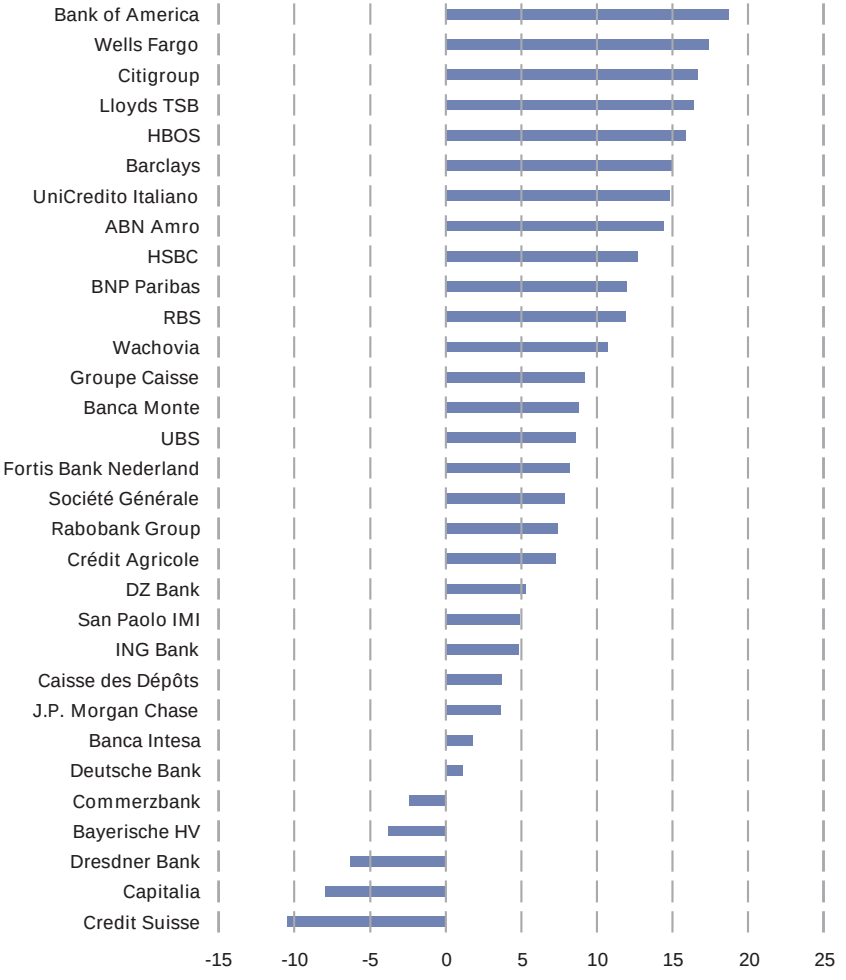

Chart a.2 Return on Average Assets (roaa), 2002

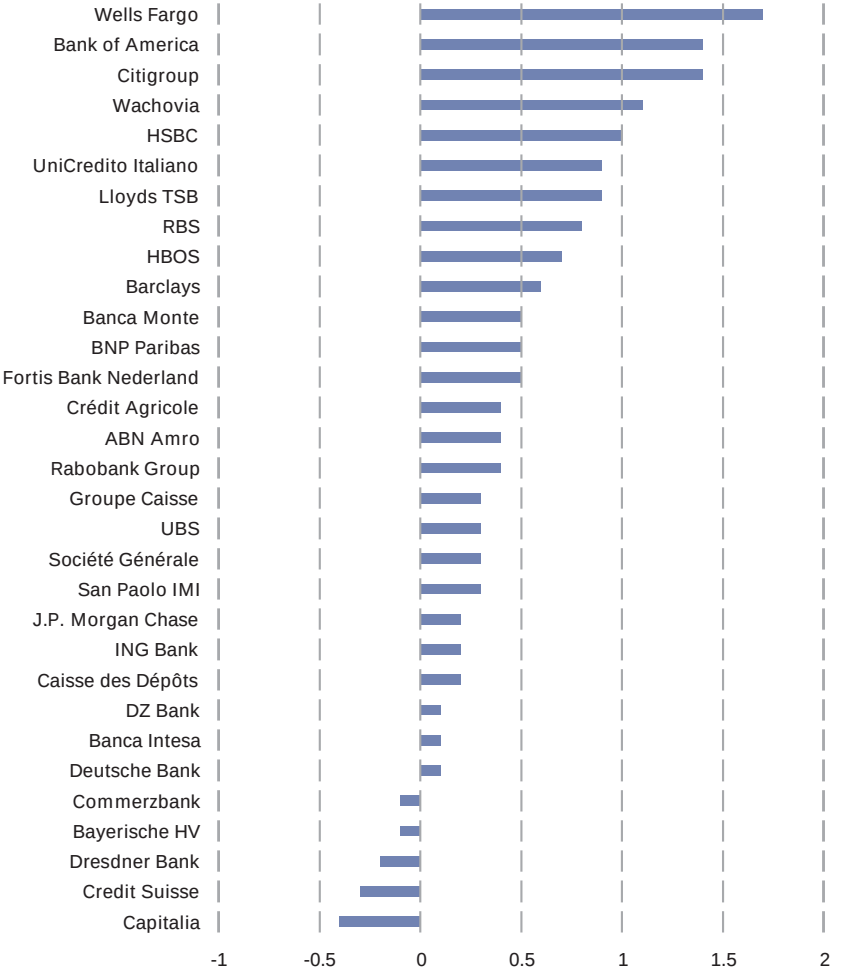

Chart a.3 Net interest margin, 2002

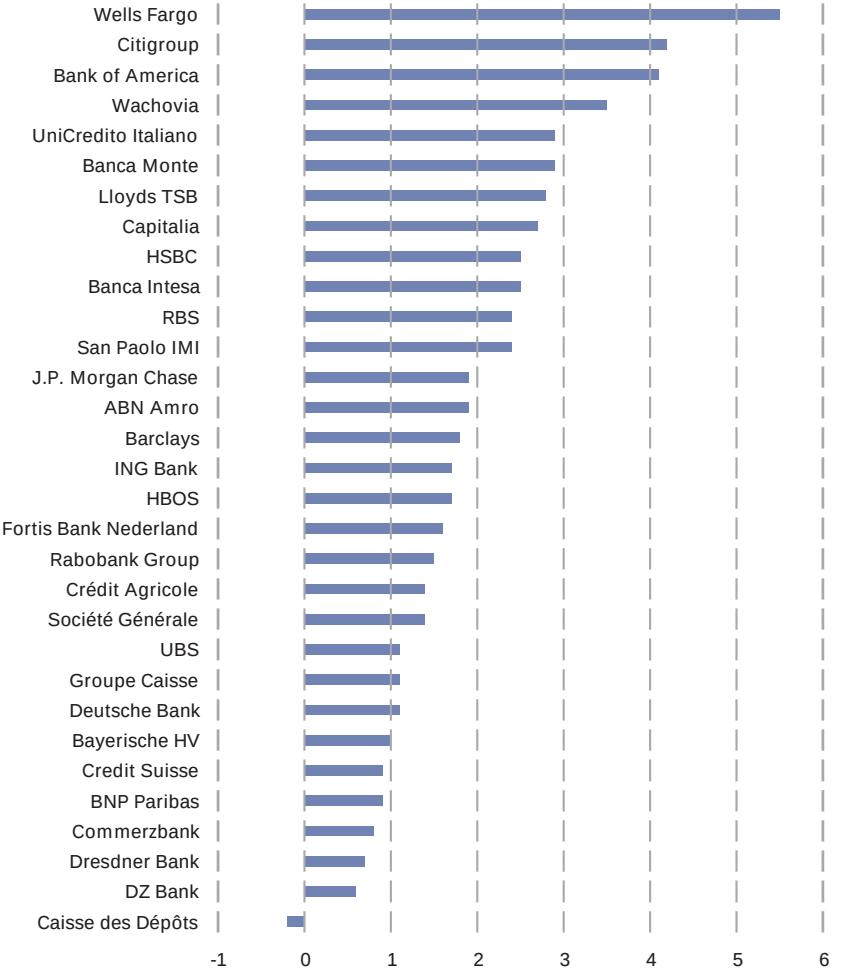

Chart a.4 Net other (all non-interest) income margin, 2002

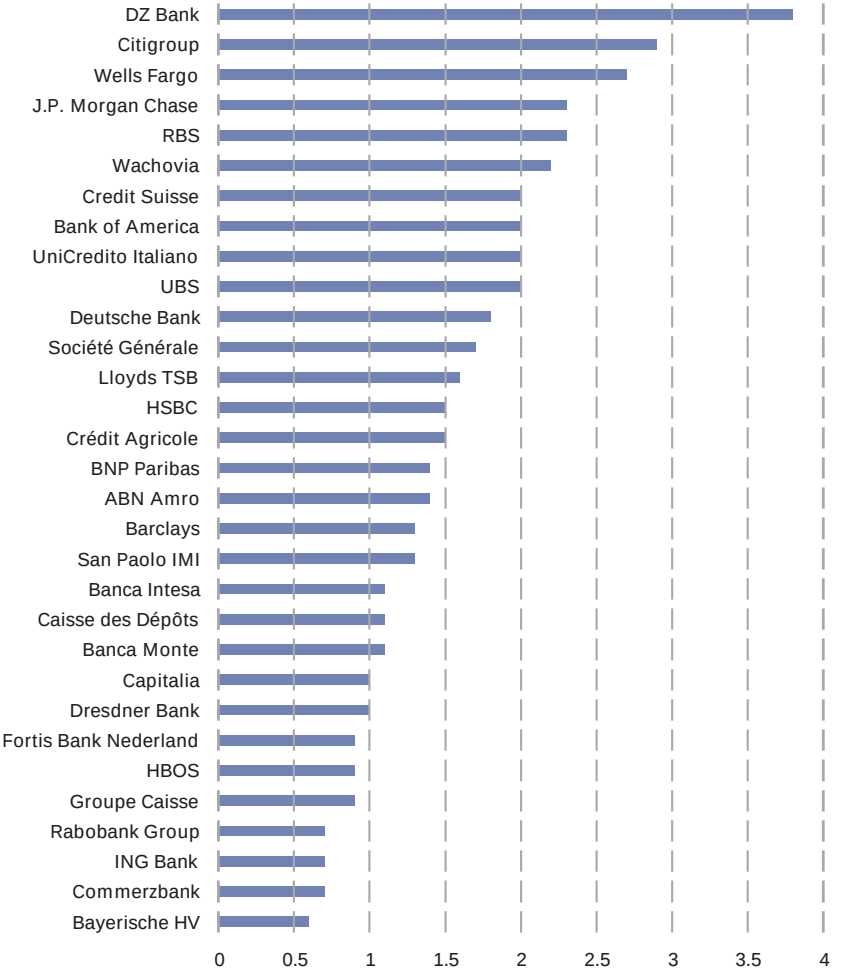

Chart a.5 Cost to income ratio, 2002

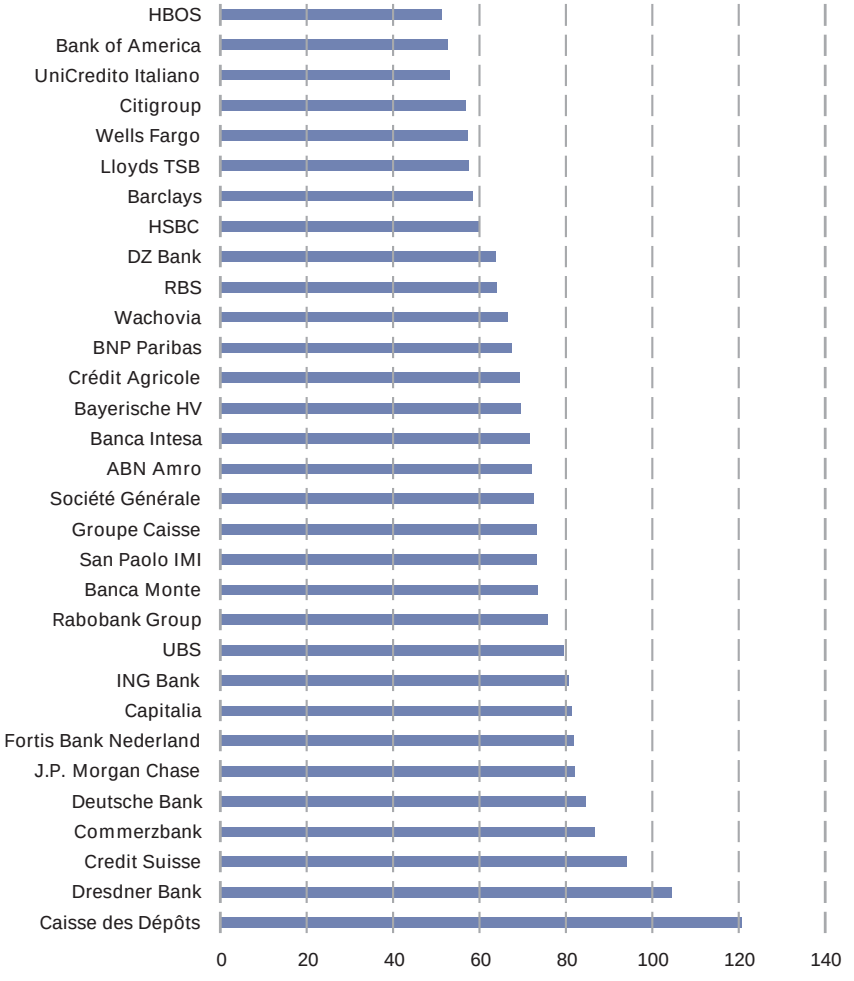

Chart a.6 Price to book value, 2002

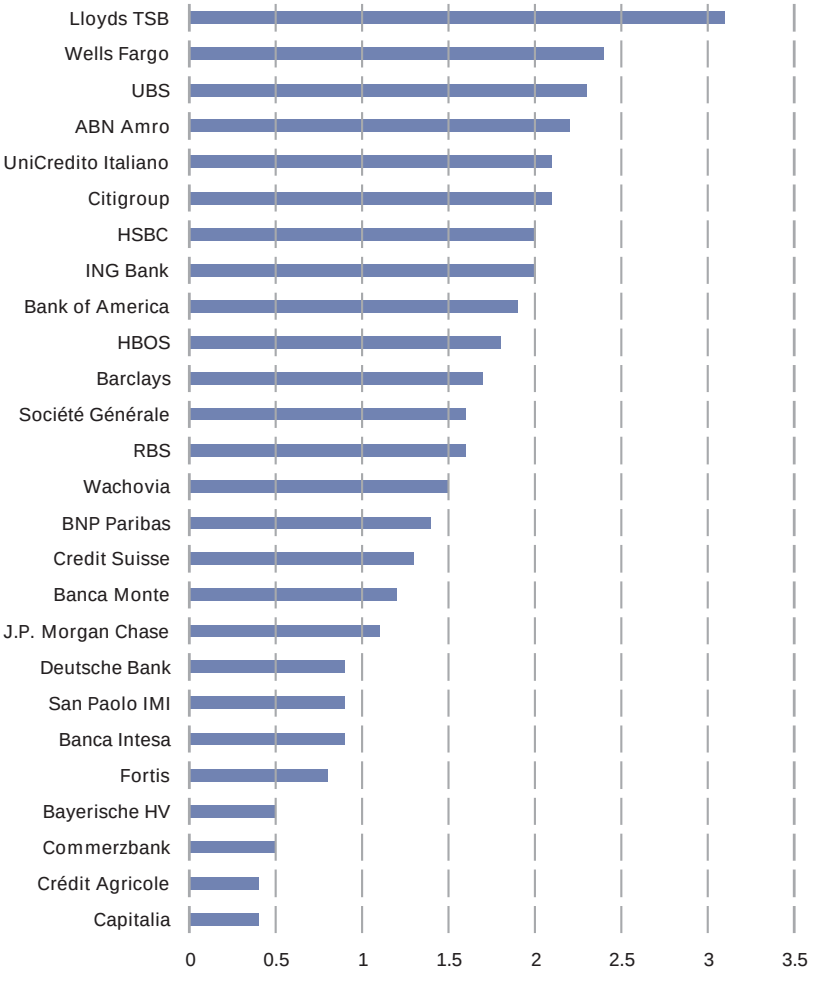

Table a.1 Cost efficiency scores of European banks

Country/Statistic	n	Mean	Std. Dev.	Mini-mum	Maxi-mum
Belgium					
Pooled cost efficiency	231	0.86386	0.06006	0.53519	0.94784
Country cost efficiency	231	0.96591	0.02657	0.75074	0.98742
Technological Gap Ratio	231	0.99921	0.00162	0.98664	1.00000
Meta-frontier cost efficiency*	231	0.96514	0.02655	0.74993	0.98671
France					
Pooled cost efficiency	1115	0.81446	0.12135	0.04947	0.98267
Country cost efficiency	1115	0.85069	0.10786	0.12847	0.98293
Technological Gap Ratio	1115	0.99914	0.00326	0.93254	1.00000
Meta-frontier cost efficiency*	1115	0.85008	0.10815	0.12824	0.98293
Germany					
Pooled cost efficiency	1148	0.81476	0.13408	0.16810	0.98668
Country cost efficiency	1148	0.80494	0.11985	0.16373	0.98175
Technological Gap Ratio	1148	0.99890	0.00396	0.92382	1.00000
Meta-frontier cost efficiency*	1148	0.80408	0.11989	0.16371	0.98146
Italy					
Pooled cost efficiency	660	0.84976	0.07934	0.33968	0.96757
Country cost efficiency	660	0.95241	0.04872	0.54148	0.99169
Technological Gap Ratio	660	0.99940	0.00193	0.96280	1.00000
Meta-frontier cost efficiency*	660	0.95185	0.04894	0.53926	0.99169
Netherlands					
Pooled cost efficiency	244	0.84380	0.11620	0.23129	0.97642
Country cost efficiency	244	0.91871	0.02984	0.71860	0.97397
Technological Gap Ratio	244	0.99768	0.00753	0.89452	1.00000
Meta-frontier cost efficiency*	244	0.91660	0.03099	0.71736	0.97392
Spain					
Pooled cost efficiency	406	0.84628	0.08255	0.16911	0.96922
Country cost efficiency	406	0.89441	0.08880	0.35681	0.98891
Technological Gap Ratio	406	0.99929	0.00241	0.95861	1.00000
Meta-frontier cost efficiency*	406	0.89384	0.08902	0.34204	0.98736
United Kingdom					
Pooled cost efficiency	603	0.82884	0.13074	0.08767	0.98283
Country cost efficiency	603	0.83141	0.12298	0.07346	0.97754
Technological Gap Ratio	603	0.99889	0.00272	0.95954	1.00000
Meta-frontier cost efficiency*	603	0.83051	0.12299	0.07346	0.97754
Switzerland					
Pooled cost efficiency	786	0.86865	0.06797	0.43024	0.94676
Country cost efficiency	786	0.88043	0.10250	0.34897	0.99321
Technological Gap Ratio	786	0.99890	0.00543	0.88841	1.00000
Meta-frontier cost efficiency*	786	0.87947	0.10250	0.34883	0.99288

Table a.2 Profit efficiency scores for European banks[43]

Country/Statistic	n	Mean	Std. Dev.	Mini-mum	Maxi-mum
Belgium					
Pooled profit efficiency	231	0.49250	0.19920	0.01542	0.86720
Country profit efficiency	231	0.58643	0.26381	0.01280	0.94952
Technological Gap Ratio	231	0.96286	0.06643	0.49791	1.00000
Meta-frontier profit efficiency*	231	0.56955	0.26010	0.01268	0.93581
France					
Pooled profit efficiency	1115	0.46697	0.20498	0.00924	0.92043
Country profit efficiency	1115	0.47549	0.21124	0.00769	0.92464
Technological Gap Ratio	1115	0.97411	0.03812	0.69325	1.00000
Meta-frontier profit efficiency*	1115	0.46375	0.20771	0.00680	0.87600
Germany					
Pooled profit efficiency	1148	0.39682	0.23884	0.00026	0.88464
Country profit efficiency	1148	0.37716	0.23815	0.00010	0.87364
Technological Gap Ratio	1148	0.95454	0.05730	0.49791	1.00000
Meta-frontier profit efficiency*	1148	0.36018	0.22865	0.00010	0.86153
Italy					
Pooled profit efficiency	660	0.46138	0.18140	0.00691	0.89695
Country profit efficiency	660	0.54411	0.21058	0.00924	0.93071
Technological Gap Ratio	660	0.98025	0.03451	0.61676	1.00000
Meta-frontier profit efficiency*	660	0.53434	0.20850	0.00895	0.91098
Netherlands					
Pooled profit efficiency	244	0.49204	0.16136	0.01955	0.79122
Country profit efficiency	244	0.63864	0.19644	0.01910	0.91519
Technological Gap Ratio	244	0.97205	0.03436	0.82681	0.99999
Meta-frontier profit efficiency*	244	0.62063	0.19212	0.01841	0.90620
Spain					
Pooled profit efficiency	406	0.48301	0.19083	0.01685	0.88787
Country profit efficiency	406	0.55258	0.25894	0.00628	0.95217
Technological Gap Ratio	406	0.97022	0.04888	0.62493	1.00000
Meta-frontier profit efficiency*	406	0.53705	0.25315	0.00549	0.94647
United Kingdom					
Pooled profit efficiency	603	0.54657	0.15778	0.04152	0.91899
Country profit efficiency	603	0.66715	0.16386	0.04911	0.93707
Technological Gap Ratio	603	0.94586	0.04671	0.66312	0.99998
Meta-frontier profit efficiency*	603	0.63090	0.15730	0.04749	0.89326
Switzerland					
Pooled profit efficiency	786	0.46902	0.17467	0.01296	0.92072
Country profit efficiency	786	0.58252	0.16052	0.03629	0.91971
Technological Gap Ratio	786	0.97008	0.04120	0.67715	1.00000
Meta-frontier profit efficiency*	786	0.56508	0.15668	0.03612	0.89374

Table a.3 Performance compared internationally

Type (std. dev.) *[ranking]*	Financial performance						Risk					
	ROA	ROE	IIM	NIIM	C/I	P/B	Bank deposit rating	Capital adequacy ratio	Leverage ratio	Deposit run off ratio	Provisions relative to gross loans	Transfers to provisions relative to net interest income
Netherlands	0.34	9.24	1.72	1.02	76.21	1.66	Aa2	11.58	95.55	35.46	1.25	14.27
	(0.12)	(1.58)	(0.15)	(0.20)	(4.59)	(0.74)		(1.22)	(0.01)	(3.00)	(0.44)	(4.69)
	[4]	*[3]*	*[4]*	*[7]*	*[4]*	*[4]*	*[1]*	*[4]*	*[4]*	*[3]*	*[1]*	*[2]*
Germany	-0.05	-1.35	0.90	1.45	81.43	0.64	Aa3	11.04	97.01	29.86	3.42	66.17
	(0.12)	0.70)	(0.18)	(1.00)	(16.08)	(0.24)		(1.43)	(0.01)	(14.19)	(0.70)	(34.47)
	[7]	*[7]*	*[7]*	*[4]*	*[6]*	*[7]*	*[4]*	*[6]*	*[7]*	*[4]*	*[6]*	*[7]*
France	0.36	8.48	0.99	1.42	77.10	1.13	Aa2	11.29	95.65	21.92	2.74	10.27
	(0.12)	(1.14)	(0.63)	(0.34)	(22.52)	(0.64)		(0.35)	(0.01)	(11.83)	(1.50)	(16.87)
	[3]	*[4]*	*[6]*	*[5]*	*[5]*	*[5]*	*[1]*	*[5]*	*[5]*	*[6]*	*[5]*	*[1]*
Italy	0.29	5.27	2.64	1.35	69.52	1.09	A1	10.40	94.49	22.98	4.89	28.19
	(0.49)	(1.73)	(0.22)	(0.40)	(10.48)	(0.64)		(1.13)	(0.01)	(2.25)	(2.14)	(16.11)
	[5]	*[5]*	*[2]*	*[6]*	*[3]*	*[6]*	*[7]*	*[7]*	*[3]*	*[5]*	*[7]*	*[5]*
Switzerland	0.02	0.84	1.04	1.97	85.98	1.78	Aa2	13.80	96.67	36.30	2.42	28.54
	(0.47)	(6.60)	(0.85)	(0.07)	(10.24)	(0.74)		(-)	(0.00)	(37.45)	(0.28)	(37.60)
	[6]	*[6]*	*[5]*	*[2]*	*[7]*	*[1]*	*[1]*	*[1]*	*[6]*	*[2]*	*[4]*	*[6]*
uk	0.82	13.67	2.22	1.65	58.70	1.77	Aa2	12.05	94.41	15.71	1.58	17.18
	(0.16)	(1.11)	(0.48)	(0.49)	(4.65)	(0.22)		(1.29)	(0.02)	(6.68)	(0.61)	(5.72)
	[2]	*[2]*	*[3]*	*[3]*	*[1]*	*[2]*	*[1]*	*[2]*	*[2]*	*[7]*	*[2]*	*[3]*
usa	1.14	13.94	3.70	2.42	63.02	1.69	Aa3	11.81	91.48	37.43	2.00	21.11
	(0.57)	(2.11)	(1.30)	(0.35)	(11.82)	(0.50)		(0.49)	(0.02)	(24.51)	(0.42)	(9.53)
	[1]	*[1]*	*[1]*	*[1]*	*[2]*	*[3]*	*[7]*	*[3]*	*[1]*	*[1]*	*[3]*	*[4]*

Table a.3 Performance compared internationally (continued)

Type (std. dev.) *[ranking]*	Risk (continued)						Market structure						Efficiency	
	Risk-adjusted operating income	σ^2 (ei)	βi	Sharpe ratio	Treynor ratio	C3	C5	HHI	Branch density	Branch density per km2	Average market share	Share of largest bank	Profit efficiency	Cost efficiency
Netherlands	3.89	3.21	1.59	-0.67	-1.31	78.2	85.4	0.288	0.33	0.13	1.96	44.9	62.06	91.66
	(2.76)	(0.59)	(0.08)	(2.51)	(5.68)						(7.33)		(19.21)	(3.10)
	[2]	*[3]*	*[7]*	*[2]*	*[2]*	*[1]*	*[1]*	*[1]*	*[4]*	*[2]*	*[1]*	*[1]*	*[2]*	*[2]*
Germany	0.39	4.78	1.28	-3.41	-7.50	20.4	27.7	0.021	0.66	0.15	0.06	8.2	36.02	80.41
	(0.77)	(2.21)	(0.12)	(0.58)	(2.92)						(0.35)		(22.87)	(11.99)
	[7]	*[7]*	*[4]*	*[4]*	*[4]*	*[5]*	*[3]*	*[5]*	*[1]*	*[1]*	*[6]*	*[5]*	*[6]*	*[6]*
France	2.45	3.34	1.25	-3.51	-8.34	30.5	44.0	0.051	0.44	0.05	0.31	13.2	46.38	85.01
	(1.43)	(0.94)	(0.30)	(1.11)	(2.87)						(1.23)		(20.77)	(10.82)
	[4]	*[4]*	*[3]*	*[5]*	*[5]*	*[4]*	*[4]*	*[3]*	*[3]*	*[5]*	*[3]*	*[4]*	*[5]*	*[4]*
Italy	2.58	3.69	1.09	-5.04	-12.56	32.5	43.5	0.048	0.51	0.10	0.18	13.8	53.43	95.19
	(2.53)	(2.14)	(0.26)	(2.57)	(5.47)						(0.92)		(20.85)	(4.89)
	[3]	*[6]*	*[1]*	*[7]*	*[7]*	*[3]*	*[5]*	*[4]*	*[2]*	*[3]*	*[4]*	*[3]*	*[4]*	*[1]*
Switzerland	1.69	3.08	1.50	-0.37	-0.68								56.51	87.95
	(1.31)	(2.59)	(0.38)	(2.84)	(6.50)								(15.67)	(10.25)
	[6]	*[2]*	*[6]*	*[1]*	*[1]*								*[3]*	*[3]*
uk	5.24	1.70	1.17	-4.03	-10.59	36.8	47.7	0.069	0.26	0.06	0.48	19.2	63.09	83.05
	(4.19)	(0.65)	(0.32)	(1.78)	(3.67)						(1.81)		(15.73)	(12.30)
	[1]	*[1]*	*[2]*	*[6]*	*[6]*	*[2]*	*[2]*	*[2]*	*[5]*	*[4]*	*[2]*	*[2]*	*[1]*	*[5]*
usa	2.36	3.43	1.39	-2.55	-5.93	14.3	21.1	0.017			0.09	5.4		
	(0.40)	(1.90)	(0.39)	(3.19)	(6.61)						(0.34)			
	[5]	*[5]*	*[5]*	*[3]*	*[3]*	*[6]*	*[6]*	*[6]*			*[5]*	*[5]*		

Notes to Table a.4

[1] Financial performance: all indicators are averages for 2002, derived from BankScope and weighted by average total assets (five largest banks, except for Switzerland (2) and the Netherlands (4)); roa = return on total assets; roe = return on equity; iim = interest income margin; niim = non-interest (other) income margin; c/i = cost to income ratio; p/b = price to book value (market capitalisation/ equity), measured as average weighted by market capitalisation (derived from Datastream); [2] Risk: unless noted otherwise, data for 2002, derived from BankScope and averaged, weighted by average total assets (five largest banks, except for Switzerland (2) and the Netherlands (4)), share prices derived from Datastream and averaged, weighted by market capitalisation; bank deposit rating = Moody's average bank deposit rating; capital adequacy ratio = bis ratio (for Switzerland one bank has been taken, for France, the Netherlands and the United Kingdom four major banks have been taken, and for Germany, Italy and the United States the five largest banks); leverage ratio = borrowed funds as percentage of total equity; deposit run off ratio = liquid assets as percentage of deposit liabilities; loan loss provisions; transfers to provisions relative to net interest income (for Germany only three banks); average risk-adjusted operating income after provisioning; $\sigma^2(ei)$ = averages, weighted by total assets (BankScope), have been computed for the three largest banks in each country, except for Switzerland (2); βi = averages, weighted by total assets (BankScope), have been computed for the three largest banks in each country, except for Switzerland (2); Sharpe ratio = excess equity return divided by its standard deviation; Treynor ratio = excess equity return expressed in units of systematic risk per share; [3] Market structure: data derived from BankScope, 2001, total assets; C3 = concentration ratio, sum of market shares of three largest banks; C5 = concentration ratio, sum of market shares (total assets) of five largest banks; hhi = concentration ratio, sum of squares of market shares of all banks; branch density = number of bank branches per 1,000 inhabitants, ecb and national central banks, 2001, except for the United Kingdom (1999); branch density per km^2 = number of branches per 1,000 inhabitants divided by surface area, ecb and national central banks, 2001, except for the United Kingdom (1999); average market share in total assets; market share of largest bank, in total assets; [4] efficiency (data derived from us Call Reports and BankScope) : cost efficiency = meta-cost efficiency, see dnb Research Series Supervision, no. 57, averages, weighted by total assets, for the period 1995-1999; profit efficiency = meta-profit efficiency, see dnb Research Series Supervision, no 57, averages, weighted by total assets, for the period 1995-1999.

Notes

1 The sample used in this paper consists of the four or five largest banks in each country (for Switzerland the two largest banks). The data relate to the year 2002, unless stated otherwise. The Dutch banks included in the sample are abn amro, ing Bank, Rabobank and Fortis Bank.

2 This paragraph is based on Bikker and Bos (2005). The basics of the model described can be find in Cowling (1976), Cowling and Waterson (1976), and Stigler (1964). The model by Cowling describes a relationship between industry performance and market concentration, both over time (intra-industry) and between industries (inter-industry).

3 See Hughes and Mester (1993), and Mester (1996).

4 See Coelli et al. (Chapter 3, 1998).

5 Here f' denotes the first derivative of f.

6 Note that on the markets for inputs, banks are assumed to be price-takers. Therefore, they face exogenously determined market input prices (cf. Berger and Mester (2003)). In many studies based on (a derivation of) this basic framework, input prices are essentially misspecified since they are calculated for each individual bank instead of at the market level.

7 A high λ_i means a firm has a high awareness of its interdependence with other firms. If firms are indeed myopic, their λ_i is zero.

8 For a description of the functional form and empirical specification used to estimate this model see section 5.

9 For a discussion, see Bikker and Bos (2005).

10 See, among other publications, Brealy and Meyers (2000), and Greenboum and Thakor (1995).

11 The four Dutch banks are abn amro , ing (ing Bank), Rabobank and Fortis (Fortis Bank).

12 For Switzerland the sample comprises the two largest banks.

13 Return on equity has been calculated by dividing ebit minus taxes minus interest by total equity. Total equity is an average for 2001 and 2002. The weighted averages for each country have been computed on the basis of total equity.

14 Return on assets has been calculated by dividing ebit minus taxes by total assets. Total assets are an average for 2001 and 2002. The weighted averages for each country have been computed on the basis of total assets.

15 These figures have not been computed in the same way as those used in the static comparison. Owing to mergers and acquisitions, a number of banks included in the dataset did not yet exist in 1997. The available data are insufficient to permit computation of *weighted* averages per year for the period 1997-2001; consequently, in the dynamic comparison, arithmetic averages have been computed.

16 Total interest income divided by that proportion of average assets (for 2001 and 2002) which is potentially interest-earning. In the computation of the interest income margin for each individual bank, net interest income has been divided by 'interest-earning assets'. In the computation of the weighted average interest income margin for each country, these margins have been weighted by each bank's amount of interest-earning assets.

17 All non-interest income divided by average total assets (for 2001 and 2002). The commission/fee/other income margin has been computed by dividing all non-interest income (i.e. commission, fee, trading and other income) by total assets. The average margin for each country has been weighted by each bank's amount of total assets.

18 The cost to income ratio has been computed by dividing overheads by total operating income. The country averages have been computed as weighted averages based on each bank's amount of assets.

19 Banks that are able to charge higher spreads, for instance because of low levels of competition in their markets, will more easily achieve a favourable (i.e. low) cost to income ratio. In that case, they seem more efficient. Yet, a low cost to income ratio does not necessarily mean that the use of productive resources is marked by a high degree of efficiency. The favourable position of the Italian banks can be explained by their high interest income margins. uk banks have recently been accused of creating structures that hamper competition, a potential cause of high margins resulting in favourable cost to income ratios.

20 Price to book value has been computed by dividing the price of all shares (i.e. market capitalisation) by total shareholders' equity. The price to book value provides an indication as to whether a large or a small sum must be paid for a firm in the event of immediate winding-up. By contrast with the ratios analysed previously, the price to book value is computed at holding company level. A number of financial institutions engage in both banking and insurance, complicating comparisons on the basis of price to book value. For five of the institutions included in the sample, no data are available to perform this analysis. The weighted country averages have been computed on the basis of assets.

21 Risk-adjusted operating income: $\frac{Operating\_income_i}{\sigma\, Operating\_income_i}$. In the computation, the operating income of bank i is adjusted for bank i's operating income volatility over time.

22 Banks' operating income for 2002 has been divided by the standard deviation of banks' profits for the period 1997-2002, where available. Replacement of operating income for 2002 by averages does not lead to major differences in this computation. Moody's Bank Deposit Rating: banks are rated in terms of credit quality. Banks included in the sample have been assigned ratings varying from Aaa (exceptional credit quality) to A3 (good credit quality).

23 Averages of the five largest banks per country, except for Switzerland and the Netherlands (two and four, respectively). The leverage ratio per country has been computed as the average of aggregate borrowed funds divided by total assets. The deposit run off ratio represents the ratio of liquid assets to deposit liabilities. Provisions concern loan loss provisions.
24 See also Bodie, Kane & Marcus, 1999, chapter 10.
25 The Capital Asset Pricing Model (capm) is nested in the single-index specification we use. If α_i does not differ significantly from zero, the capm is obtained.

26 Sharpe ratio: $\frac{\bar{r}_i - \bar{r}_f}{\sigma_i}$; Treynor ratio: $\frac{\bar{r}_i - \bar{r}_f}{\beta_i}$ (Bodie, Kane & Marcus, 1999, pp. 754-755).
27 The environment may be defined by geographical frontiers. On the other hand, a market may also be international, depending on the range of a firm's operations and its product(s).
28 The individual data do not provide any clear clues suggesting that this increase might be due to a redefinition by the ecb.
29 Bikker & Haaf (2002a, p. 72) rightly note: 'Policy makers should choose CIs depending on the features of their banking market and their perceptions regarding the relative impact larger and smaller banks have on competition and regarding the relative impact of size distribution.'
30 BankScope offers no data for domestic operations.
31 The analysis presented here is largely based on Bos & Schmiedel (2003). For an overview of the concepts and methods introduced here, the reader is referred to the original article. For an excellent overview of efficiency within the European banking system, see Bikker (2004).
32 See Bos & Kool (2001), and Bos (2003).
33 For a more formal derivation of the models used here, the reader is referred to Bos & Schmiedel (2003).
34 For the sake of convenience, the analysis presented here relies on a deterministic cost frontier instead of the stochastic cost frontier used elsewhere. However, for the concepts presented here, the difference is not relevant. See also Coelli *et al.* (1998).
35 Denoted in the tables as (a) 'pooled frontier', (b) 'country frontier' and (c) 'meta-frontier'.
36 This may in part be due to the method used by us (see Bos & Schmiedel (2003)).
37 Shown here are the average cost efficiency (*ce*) and profit efficiency (*pe*).
38 Shown here are the average cost efficiency (*ce*) and profit efficiency (*pe*).
39 For the Netherlands the pooled profit efficiency is 49.20%, for the United Kingdom it is 54.66%. Hence, Dutch banks should raise profit efficiency by 5.46% (= 11% of 49.20%) in order to achieve the same profit efficiency as their uk counterparts.
40 Data from BankScope, for all commercial banks, weighted by total assets.
41 This also holds for the most efficient banks.
42 Taken from Bos & Schmiedel (2003).
43 Taken from Bos & Schmiedel (2003).

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