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THE IMPACT OF BANKING EFFICIENCY ON STOCK RETURNS

Evidence from the Nordic Countries

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LIST OF EQUATIONS

$$(1) \text{ Net asset value} = \frac{\text{market value of assets} - \text{liabilities}}{\text{stocks outstanding}}$$

$$(2) \text{ PV(stock)} = \text{PV(expected future dividends)}$$

$$(3) \text{ Price } (P_0) = \frac{DIV_1 + P_1}{1 + r}$$

$$(4) \text{ Expected return } E(r) = \frac{DIV_1 + P_1 - P_0}{P_0}$$

$$(5) \sigma^2 = \sum_s p(s) [r(s) - E(r)]^2$$

$$(6) \text{ ROA} = \frac{\text{net profit after taxes}}{\text{assets}}$$

$$(7) \text{ ROE} = \frac{\text{net profit after taxes}}{\text{equity capital}}$$

$$(8) \text{ EM} = \frac{\text{assets}}{\text{equity capital}}$$

$$(9) \sigma^2 = \sum_s p(s) [r(s) - E(r)]^2$$

$$(10) E_p = \sum u_j Y_{jp} / \sum v_i X_{ip}$$

$$(11) \text{ price of labor} = \frac{\text{staff expenses}}{\text{number of full-time equivalent employees}}$$

(12)

$$\text{price of physical capital} = \frac{\text{expenses associated with property, plant and equipment}}{\text{book value of property, plant and equipment at yearend}}$$

$$(13) \text{ price of interest-bearing liabilities} = \frac{\text{interest expense}}{\text{average interest-bearing liabilities}}$$

$$(14) R_{it} = \beta_i E_{it} + \varepsilon_{it}$$

$$(15) R_{it} = \frac{\text{stock return}}{\text{market value of the stock}}$$

$$(16) R_{it} = \beta_0 + \beta_1 \text{BSE} + \beta_2 \text{PE} + \varepsilon$$

$$(17) R_{it} = \beta_0 + \beta_1 \text{BSE} + \varepsilon$$

$$(18) R_{it} = \beta_0 + \beta_1 \text{PE} + \varepsilon$$

$$(19) \text{EBIT} = \beta_0 + \beta_1 \text{BSE} + \beta_2 \text{PE} + \varepsilon$$

LIST OF ABBREVIATIONS

BIS	The Bank for International Settlements
BSE	Banking Service Efficiency
CAC	Cotation Assistée en Continu (Continuous Assisted Quotation)
DAX	Deutsche Aktien Xchange
DEA	Data Envelopment Analysis
DMU	Decision-Making Unit
EBIT	Earnings Before Interest and Taxes
ECB	European Central Bank
ECU	European Currency Unit
EM	Equity Multiplier
EMU	European Monetary Union
EU	European Union
FTSE	The Financial Times and London Stock Exchange
GDP	Gross Domestic Product
HC	Human Co-operation
HR	Human Resources
M&A	Mergers and Acquisitions
NAV	Net Asset Value
OECD	Organisation for Economic Co-operation and Development
OMX	The Nordic Exchange
PE	Profit Efficiency
P/E	Price / Earnings
PV	Present Value
ROA	Return on Assets
ROE	Return on Equity
SD	Standard Deviation
SFA	Stochastic Frontier Approach
S&P	Standard & Poor's
VIF	Variance Inflation Factor
VRS	Variable Returns to Scale

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ABSTRACT

The Nordic banking sector has gone through major changes during the past two decades. The most significant changes have been internalization, technological development, and changes in the legislation. The objective of this thesis is to investigate how banks' efficiency has developed during and after the changes in the market, and whether changes efficiency figures have an impact on stock returns or not.

The data used are gathered from ten-year period including years 1996–2005, and covering the Nordic countries Denmark, Finland, Norway and Sweden. Data Envelopment Analysis method is used in this study. Two efficiency figures are calculated for each bank, one measuring banking service efficiency (BSE), i.e. it measures producing banking services, and the other measuring profit efficiency (PE), i.e. the ability to make profit.

Efficiency figures are compared country-specifically, but no statistically significant differences are found between the Nordic Countries. BSE figures are found to be high in all the countries during the sample period. PE figures have remained on a low level. Both BSE and PE levels have remained quite stable during the period investigated.

The correlations between efficiency figures and the stock returns are tested by using Pearson correlation coefficients, and both BSE and PE are found to correlate positively with stock returns at 0.01 level. The results are confirmed by using a regression model, which also shows that positive changes in efficiency figures lead to positive changes in stock returns and vice versa. Similar results are found also in previous studies concerning various other countries (see e.g. Kirkwood & Nahm 2006). The effects of the BSE and PE are also tested separately, and both are found to have a significant impact on stock returns, but the two efficiency measures together explain more of the changes in the stock returns than either of them alone.

KEYWORDS: Banking efficiency, Data Envelopment Analysis (DEA), the Nordic countries, stock returns

1. INTRODUCTION

The first banks emerged through “goldsmith banking” and they have been a part of the economies ever since. The main tasks of banks in contemporary times are transaction service, origination, which involves connecting the parties with financial surplus with those facing a financial deficit, and financial advice. The provision of deposit and loan usually distinguishes banks from other types of financial firms. Deposit products pay out money on demand or after some notice. They are liabilities for banks, which need to be managed if the bank is to maximize profit. Likewise, they also manage the assets created by lending. Thus, the core activity is to act as intermediaries between depositors and borrowers. (Kjellman, Björkroth, Lindholm & Ranki 2004: 65, 70; Heffernan 2005: 2.)

The banks around the world have been facing new challenges over the last few decades. Just taking care of the traditional main tasks is not enough to make a bank successful. The banking market has gone from being a regulated national issue to a liberalized global market environment. Also the European Monetary Union (EMU) has brought its own reforms and challenges into the European banking market. The banking firms have gone from bank dependence to a state of self-reliance concerning financial operations. At the same time the non-bank credit institutions have stepped up their activities and are so further increasing the competition. The technological development has led to an emergence of new products like Internet and telephone banking. Change seems to be a constant phenomenon in banking and therefore the banks are preparing their activities according to their expectations about the banking market in the future. (Mullineux & Murinde 2003: 283–284.)

Because the banking has become more and more competitive, just being profit-making is not enough anymore. There are many parties interested in a banking company’s success, and they might have different priorities and goals. For this reason managing a successful bank in today’s market has become extremely challenging.

There are many factors shown to affect a company's success. Finding all those things and defining the success itself are not easy tasks to accomplish and there are always new factors to be surveyed in this field. A complete pattern for a successful company will probably never be found, but some new factors effect on success can be detected.

1.1. Background

Banking sector in the Nordic countries just like banking around the world has gone through major structural changes during the past decades. It has transformed from strictly regulated and closed sector into an international and competitive one. Nordic banks now offer in addition to basic banking services also e.g. insurances and investment counseling. Because the banks at present work in an international environment, they have found co-operation with foreign banks advantageous. As in many other business branches as well, in banking the small companies are normally not able to compete with international corporations and are therefore forced to form alliances of their own to be able to survive. The competitive pressures in the banking market have produced a wave of mergers and consolidation in recent years. The same kind of development can also be seen in banking sectors outside the Nordic countries. For example in the US there were 8,000 bank mergers between 1980 and 1998 (Mullineux et al. 2003: 284). In the Nordic countries the banking sector is significantly smaller than the one in the US, and therefore the merger figures are also much lower, but all the same the development has been similar.

Many countries have been reforming their financial systems over the past twenty years. These reforms have involved a removal of limitations on the activities of financial institutions. The development has led to an emergence of the so-called financial conglomerates, which combine several financial services in one organization. The supporters of financial conglomeration have claimed that such arrangements will generate significant benefits on both sides of the markets. The economies of scale and scope are estimated to result for example to cost-efficiency gains and to a higher profitability. The market is

also believed to become more efficient and therefore less vulnerable to costly failures as the conglomeration progresses. (Mälkönen 2004: 7.)

One incentive for the banks to expand their product lines is the ability to serve new customers and sell additional products to the existing ones. So an institution combining several services under one roof can improve its cost efficiency by using the same distribution channels and customer databases for several services. These cost-efficiency gains will be, at least partially, passed on to the customers. Therefore financial conglomeration will probably lead to more efficient financial markets with more affordable financial services. The consequences of the financial conglomeration depend however on the market environment which provides the incentives for prudential and competitive behavior. (Mullineux et al. 2003: 3–4; Mälkönen 2004: 7.)

It has been predicted that financial globalization is broadly beneficial to the world economy. International financial markets can facilitate access by borrowers to a larger pool of global savings and enhance investment opportunities for savers worldwide. An international operating environment brings, however, new challenges for all participants. For example the company's management has to be competent enough to be able to create successful businesses and the supervision authorities must be able to form a functioning supervision system for international businesses. (Mullineux et al. 2003: 3–4; Mälkönen 2004: 7.)

Traditionally, banking efficiency has been evaluated on the basis of financial ratios. In recent years, the emphasis has moved to the estimation of operating efficiency, which denotes if a firm is cost-minimizer or profit-maximizer. Such concept of efficiency is estimated by a frontier index known as X-efficiency, which is a measure of managerial best practice. Also in this thesis the banking efficiency is measured by estimating operating efficiencies instead of calculating financial ratios for the banks, because it is believed to give a more reliable and comprehensive picture of the efficiency than separate financial ratios would. (Beccalli, Casu & Girardone 2006: 246.)

1.2. Problem Statement

Recent competitive pressures have driven banks to strategically focus on generating returns to stockholders. Therefore, the investigation of the determinants of bank performance and their relationship with stock prices has become increasingly important. (Becalli et al. 2006: 245.)

The objective of this thesis is to find out whether the efficiency performance in banking sector has an impact on the stock returns. In other words, the question is that if the bank performs well can it be seen as rising stock returns. Certainly being efficient causes savings and other benefits for the bank, but the goal is to find out if the level of efficiency has a linkage to stock returns. The changes in efficiency levels naturally increase the profits of the banks, but it is investigated if the market reacts on the efficiency changes or not.

This study concentrates on investigating the performance in the Nordic banking sector by studying banks publicly listed in Denmark, Finland, Norway and Sweden. From here onwards when talking about the Nordic countries only these four countries are being referred to.

The Swedish, Danish and Finnish banks in the sample are all listed in the Nordic Exchange (OMX) and the Norwegian banks in Oslo Bourse (Nordic Exchange 2006; Oslo Børs 2006). The sample of 68 banks consists of all publicly traded banks in the Nordic countries, which were listed during the ten-year sample period from 1996 to 2005 used in the study.

The banking performance is measured by efficiency, which is divided into two categories: banking service efficiency and profit efficiency. It is reasonable to use two measures for determining the efficiency, because the same banks that are considered to be efficient when using one measure are not necessarily efficient when another one is being used. Therefore using two different measures of efficiency gives more reliable results.

Both models used for measuring efficiency use the same input combinations, but the outputs differ from each other. One model measures how efficient a bank is when producing banking services is considered, and the other shows a bank's efficiency, when the ability to make profit is being considered. Both of the models are introduced in Chapter 6.4.

The objective of this thesis is to find out whether the efficient banks' stocks outperform their less efficient competitors' stocks. The efficiency is determined by using the two models described above, and the stock performance is measured by stock returns.

1.3. The Structure of the Thesis

This paper consists of a theoretical and an empirical part. The objective of the theoretical part is to introduce the research done in this field so far and to explain the process of stock valuation and the main factors affecting a company's performance.

The first chapter gives background information about the topic and introduces the research problem in brief. The previous study done concerning banking performance and its main findings are shortly explained in chapter two. A lot of research concerning banking has been published, but in this study the concentration is on the research of the factors affecting the performance and the risks in banking.

The following two chapters, three and four, explain the theory behind stock valuation and performance measurement. Understanding the underlying theoretical assumptions and practices is important in order to be able to make reliable conclusions about their values and development.

The banking sector in the Nordic countries is being described in chapter five. It differs in some aspects from the banking sectors in other countries, and there are also differences between the Nordic countries, which have been taken into consideration. The

macroeconomic factors are always affecting the performance of a company, and therefore they should also be taken into consideration when doing research in this field.

Chapters six and seven form the empirical part of the paper. The sample and models used are presented in chapter six and the results are described in chapter seven. The efficiencies are presented both country-specifically and as an average for the Nordic countries. The efficiency figures are then linked to stock returns and correlations between them are calculated to reveal the linkages. No multicollinearity problem is detected in the data used. The results are confirmed by employing a linear regression model. Also the effects BSE and PE have on stock returns are tested separately. Chapter eight summarizes the results and gives suggestions for the future research.

2. PREVIOUS RESEARCH

Lately there has been a lot of research published about banking in general and about how different factors affect the performance of a bank. For example, risks are a typical research topic when talking about financial markets. There are always many kinds of risks present and preventing all of them can never be possible. It is even not the aim, because for being able to operate a bank needs to take some risks. In banking, for example, loaning out money to customers is normally the main source of income and there are always risks included in such operations. The goal is to recognize the risks that are present and try to prevent them when possible and profitable.

The research concerning the banking branch has lately concentrated on the performance and efficiency of the banks. Investors and the management are naturally interested in the factors affecting the performance and a lot of research has been published concerning such possible factors. The main trends of the research in banking field are presented next briefly.

2.1. Risks under Investigation

Bolt and Tieman (2004: 783, 786) investigated the effect the competition has on banks' risk taking. The main focus in their study was on the bank competition in the loan market. The study assumed a theoretical competition situation between two banks and the effect of tightness of the competition on risk taking was measured. There were obviously a whole lot of other factors affecting on risk taking as well, and in their study those potential disturbing factors were eliminated as well as possible. The bank managers were assumed to be the bank's stockholders, which means that there is no possibility of an agency problem. Banking regulation has also a significant role in bank's risk taking. Basel 2 contract was taken into account, and the study was realized according to the rules confirmed in the Basel 2. The main points of the Basel 2 Framework are introduced in brief in Chapter 5.2.4.

The results of the study showed that the higher the fixed capital adequacy ratio, the less the risk taking by commercial banks is. According to Bolt and Tieman's (2004) study it also seems that the more intense the banking competition, the greater the risk taking of commercial banks is. A higher risk taking seems to lead directly into higher failure rates. The study also suggested that, when having a choice, the banks may choose to hold more equity than the minimum equity level required by the regulator. Keeping more equity than required creates extra costs, but it also seems to lead into lower failure rates. Therefore many banks have considered holding more equity than required profitable and, as a consequence, determining the optimal equity level has become also a competitive issue. (Bolt et al. 2004: 793–794, 798, 800–801.)

2.2. The Relationship between Ownership and Performance

Banking performance and the factors affecting on it are popular fields of research in finance. Many elements have been shown to have an effect on performance, but there are still no absolute factors found to make a bank successful. Choi and Hasan (2005: 215) investigated whether the involvement of foreign investors in the ownership structure has any significant effect on the banks' performance. It is an important topic at the moment because an increasing portion of the banking sector is controlled by foreign capital in the majority of transition countries. Their study was based on the Korean financial market. It is typical that in the developing countries or in the poor countries in general, the majority of the owners of the banks are foreign investors. The question was whether the foreign ownership has an effect on banks' performance or not.

The sample data of Choi and Hasan's (2005) study was taken from the annual business filing report, which all the financial institutions are required to file with the Financial Supervisory Service. The sample period was from 1998 to 2002, and all the commercial banks listed during that period in Korea were studied in their paper. In most estimates it was found that there was a significant correlation between bank performance and the extent of foreign ownership. A significant effect of the presence of foreign board of director on bank return and risk was also found. (Choi et al. 2005: 221, 226, 234.)

Weill (2003: 570) has also investigated the role of foreign ownership on the banking efficiency. His study conducted a comparative analysis of the performance of foreign-owned and domestic-owned banks operating either in the Czech Republic or in Poland.

The sample used by Weill (2003) consisted of 47 banks operating in Poland and in the Czech Republic. The data were collected from year 1997. Stochastic frontier approach was used to compute cost efficiency scores. It was shown that a foreign ownership has a positive impact on banks' cost efficiency in both countries investigated. It was concluded that the advantage does not result from differences in the scale of operations nor the structure of activities. The advantage is explained by the fact that the banks with foreign owners benefit from a transfer of banking know-how, since many mother companies are banks, and by better corporate governance exercised by foreign stockholders. (Weill 2003: 569, 571, 580, 589.)

2.3. Financial Development and Stock Returns

Dellas and Hess (2005: 891, 908–909) studied stock returns to find out whether there is a correlation between financial development and stock returns. In their study a cross-section of emerging and mature countries over the period 1980–1999 was being used. The sample covered 49 countries around the world, including also Denmark, Finland, Norway and Sweden.

The results revealed that stock returns are significantly related to the degree of financial development. In general, a deeper and higher quality of the banking system is associated with lower volatility of stock returns and a greater synchronization in the movements of domestic and world returns. International synchronization also seemed to be greater the more liquid the stock market is. (Dellas et al. 2005: 891, 906.)

2.4. Banking Efficiency and Its Relation to Stock Prices and Stock Returns

Over the past decade, competitive pressures have progressively driven banks to strategically focus on generating returns to stockholders. As a consequence, it has become increasingly important to investigate the determinants of bank performance and their relationship with stock prices and stock returns.

Chu and Lim (1998: 155–156, 158) studied banking efficiency and its relation to stock prices in Singapore. Their sample consisted of the six publicly listed local banking groups in Singapore. The efficiency was measured by two methods; cost or X-efficiency and profit or P-efficiency.

Data envelopment analysis (DEA) was used to evaluate efficiency. The results indicate that X-efficiencies of Singaporean banks were higher, on average, than for example those in the Western Europe and in the North America. P-efficiencies seemed to be lower than X-efficiencies in Singaporean banks. The larger banks had better efficiency scores than the smaller banks. The results also showed that the percentage changes in stock prices reflect percentage changes in the profit efficiencies rather than in the cost efficiencies. (Chu et al. 1998: 158, 166.)

Beccalli et al.'s (2006: 246, 251) paper attempted to explain and understand the influence of efficiency estimates, derived from both stochastic frontier approach (SFA) and DEA. Their sample comprised all banks publicly listed in France, Germany, Italy, Spain and the United Kingdom. The sample period was from 2000 to 2001.

The results suggested that changes in the prices of banks' stocks reflect percentage changes in cost efficiency. The inclusion of further variables – size, risk level and profitability etc. – did not significantly increase the explanatory power of the model used. The conclusion was that stocks of cost-efficient banks tend to outperform their inefficient counterparts. (Beccalli et al. 2006: 258.)

Another study of the same field is one by Kirkwood and Nahm (2006). They studied the banking efficiency and its relations to stock returns in Australia. The target was the same as in the study by Beccalli et al.(2006) so to find out whether changes in a firm's efficiency are reflected in stock returns. The analysis was conducted between 1995 and 2002 for 10 banks listed in the Australian Stock Exchange. The DEA method was used also in this study. Efficiency was measured by using two different models, one of which is measuring banking service efficiency and the other one profit efficiency. (Kirkwood et al. 2006: 253, 256–257.)

The results showed that changes in efficiencies are reflected in stock prices and in stock returns. Technological change was considered to be the main contributor of improvements in total factor productivity over the sample period. Changes in profit efficiencies were also statistically significant in determining the stock returns of the banks. (Kirkwood et al. 2006: 253, 267.)

3. STOCK VALUATION

Stocks represent the stocks of ownership in a company. There are two kinds of stocks in the market; common stocks and preferred stocks. The basic characteristics of the two stock types are a little different, but clarifying the dissimilarities in details has been cropped from this thesis. Basically the difference between the two stock types is that common stocks give the stockholder a right to vote in issues concerning the company. The owner of a preferred stock does not necessarily have that kind of a right. The rights and obligations of an owner of a preferred stock vary a lot company-specifically. Here, however, the focus is on common stocks and from now on when talking about stocks in general the common stock is being referred to.

A corporation is owned by its common stockholders. Some of these common stocks are held directly by individual investors, but financial institutions are also significant stockholders. Each share of a common stock entitles its owner to one vote on any matters of corporate governance that are put to a vote at the corporation's annual meeting, and to a share in the financial benefits of ownership. Stockholders can also affect on the firm's management by electing the board of directors that controls the company and selects the managers. (Bodie, Kane & Marcus 2005: 45.)

The stocks of the most of the large companies can be bought or sold freely in one or more stock exchanges. The two most important characteristics of a common stock as an investment object are its residual claim and limited liability features. Residual claim means that the stockholders are the last in line of all those who have a claim on the assets and income of the corporation. Limited liability signifies that the most the stockholders can lose in the event of failure of the company is their original investment. Unlike owners of unincorporated businesses, whose creditors can lay claim to the personal assets of the owner, corporate stockholders may at worst have a worthless stock. They are not personally liable for the firm's obligations. (Adams 2005: 5; Brealey, Myers & Allen 2006: 366.)

3.1. Determinants of the Firm Value

Supply and demand are commonly seen as the factors determining the value of a firm. Defining supply and demand, however, is a difficult task. The future developments of stock prices are extremely hard to forecast and therefore determining a price for a stock is very difficult. The price level of a stock can be more than fifty percent lower from one day to another or it could become much higher than expected. Examples can be found also in the Finnish stock market for both cases. On 21st January 2001, the price of Elcoteq's stock collapsed and ended up less than half of the price it was the day before. The biggest Finnish company Nokia provides another good example for stock price fluctuation. Its market value was about 0.55 billion euro by the end of 1990, and about ten years later it was the highest valued firm in Europe with a market value of more than 300 billion euros. During the first months of 2001, Nokia lost about half of its market value, and has lost even more since. As the examples show, it is extremely difficult to correctly anticipate what the value of a firm is going to be, for example, five years from now. (Kjellman et al. 2004: 156–157.)

The stock prices of the banking firms have not varied as much as for example the stock prices of the companies operating in the technology branch. The general state of the economy, however, has a significant effect on banks' stock prices. For example recessions have caused serious problems to banks as was proved in the beginning of 1990's in Finland (Heffernan 2005: 450). When the clients cannot afford to pay their loans back as agreed it causes liquidity problems to banks. Banks are prepared for some losses but if the impecuniousness phenomenon is nationwide the banks are facing an impossible operating environment.

According to Kjellman et al. (2004: 157–158) the most stock market actors are valuing a firm mainly according to how they expect the firm to perform in the future. It is the expected performance of the firm that is most important when it comes to valuing the firm. In the 1980's the listed firms were usually valued according to the substance value of the firm, i.e. how much assets the firm had and how it was valued and reported, but

today the most of the firms are valued according to their future potential performance. The generally seen important factors behind pricing of the Nordic stocks are:

- Firms' growth potential
- P/E ratio
- Management quality
- Investments and future return
- Expectations about the long-term interest rate
- Development in the USA
- EMU (i.e. Euro) process.

If the important factors are assumed to be the ones presented above, the impact of the future value of a firm should be considered due to the management of the firm resources, expected social change and economic development.

3.2. Present and Future Values of a Stock

Bodie et al. (2005: 108) determine the value of each stock as the net asset value (NAV). Net asset value equals assets minus liabilities expressed on a per-stock basis:

$$(1) \quad \text{Net asset value} = \frac{\text{market value of assets} - \text{liabilities}}{\text{stocks outstanding}}$$

Net asset value is, however, quite a theoretical approach on valuing stocks. Brealey et al. (2006: 61) show that the present value (PV) of a stock can be calculated by discounting the future cash flows the stockholder will receive. Stockholders get cash from the company in the form of a stream of dividends, and so the present value can be calculated as

$$(2) \quad \text{PV}(\text{stock}) = \text{PV}(\text{expected future dividends})$$

Today's price for a stock can be estimated as shown in Formula 3, if some forecasts and estimates are known. The information needed for such calculations are investors' forecasts of dividend and price, and the expected return offered by other equally risky stocks. Formula 3 presents the same matter than Formula 2, but in a more precise way:

$$(3) \text{ Price } (P_0) = \frac{DIV_1 + P_1}{1 + r}$$

In Formula 3, the present value of a stock is marked as P_0 . DIV_1 is the expected dividend per stock and P_1 is the expected stock price at the end of the year. r is the expected return of a stock. Also the future stock price can be calculated according to the same principle. The accuracy of the future forecasts naturally depends on how close to the reality the estimates of the variables used in the formula are. The estimation period also affects on the results. The forecasts concerning the near future tend to be more realistic than ones made for a longer period of time. (Brealey et al. 2006: 62.)

3.3. Expected Stock Return

The cash payoff to stockholders comes in two forms: 1) cash dividends and 2) capital gains or losses. Suppose that the current price of a stock is P_0 , that the expected price at the end of a year is P_1 , and the expected dividend per stock is DIV_1 . The rate of return that investors expect from this stock over the next year is defined as

$$(4) \text{ Expected return } E(r) = \frac{DIV_1 + P_1 - P_0}{P_0}$$

This expected return is often called the market capitalization rate. The general conclusion from the equation is that at each point in time all the securities in an equivalent risk class are priced to offer the same expected return. This is a condition for equilibrium in well-functioning capital markets. (Brealey et al. 2006: 62.)

3.4. Stock Market Indices

A stock market index is a listing of stocks and a statistic reflecting of the composite value of its components. It is used as a tool to represent the characteristics of its component stocks, all of which bear some commonality such as trading on the same stock market exchange, belonging to the same industry, or having similar market capitalizations. Many indices compiled by news or financial services firms are used to benchmark the performance of portfolios such as mutual funds. (Carew 2006.)

Stock market indices may be classed in many ways. A broad-base index represents the performance of a whole stock market – and by proxy, reflects the investor sentiment in the current state of the economy. The most regularly quoted market indices are broad-base indices including the largest listed companies on a nation's largest stock exchange, such as the American Dow Jones Industrial Average and S&P 500 Index, the British FTSE 100, the French CAC 40, the German DAX and the Japanese Nikkei 225. More specialized indices exist for tracking the performance of specific sectors of the market. (Carew 2006.)

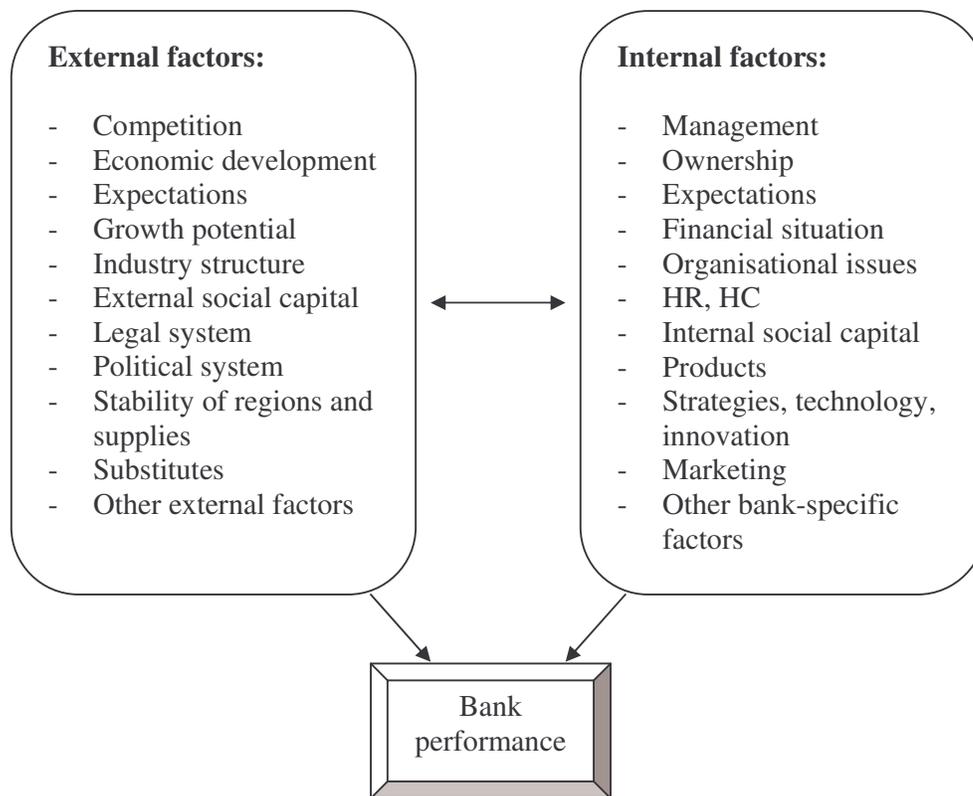
There are many kinds of stock market indices calculated and published on a daily basis. The indices tell us about the development in the stock market. The index measuring the performance in the Nordic Exchange is the OMX Nordic 40. It includes 40 big Nordic companies' stocks listed in the Nordic Exchange. The stocks included in the index are those of companies from different branches. There are also banks' stocks included in the OMX Nordic 40 index. The main index in the Norwegian stock market is the Oslo Børs Benchmark Index, which also includes banks and other companies operating in financing branch. These main indices tell about the prevalent development in the stock market. (Nordic Exchange 2006; Oslo Børs 2006.)

Industry analysis is an important tool when forecasting a firm's future development, because it is difficult for a firm in a troubled industry to perform well. Just as well as the economic performance can vary widely across the countries, it can also vary across in-

dustries. There are also industry indices formed by companies operating in financials branch. Such indices exist also in the Nordic Exchange and in the Oslo Bourse. The both indices are called Financials and the companies studied in this study are all included in either of those indices according to their place of listing. (Bodie et al. 2005: 585; Nordic Exchange 2006; Oslo Børs 2006.)

4. PERFORMANCE MEASUREMENT

The issue of bank performance is a complex thing to study. Firstly, there is no single, unambiguous measure to describe organizational performance. Secondly, the interpretation of obtained data is a process which involves the human factor, and as is well known, the capacity of humans is always limited. Some potential factors influencing bank performance are listed in Picture 1.



Picture 1. Potential Factors Influencing Bank Performance (Kjellman et al. 2004: 10).

The factors that may affect an organization's performance are grouped into external and internal factors in Picture 1. The external factors combined present the macroeconomic development and the internal factors describe the organizational capabilities. So accord-

ing to Kjellman et al. (2004: 308), one can assume that the general economic development in a country or worldwide will affect the performance in the banking sector. This means that when the economy is growing, the financial intermediaries are growing with the economy, and when the economy is hit by a recession, the banks suffer with the economy. This was seen for example in Finland, when the recession hit the country in the 1990's, the banks were also having problems. However, there are also economists who would argue that the banks are sensible to the macroeconomic performance of their market areas.

Undoubtedly, the both groups of factors presented influence organizational performance. However, it is not clear how external and internal factors interrelate. The final result always depends on all the factors and circumstances included, and therefore it is impossible to say that any specific factor alone could guarantee an excellent result. A good example of this is the banking crisis in the beginning of 1990's. Even though the circumstances were the same for all the banks, most of the savings banks failed and yet some banks showed their best results ever during the banking crisis (Kjellman et al. 2004: 277). This argues that no single factor determines the result and also that organizational capabilities are usually more important than the external factors. All single factors might have a significant effect on the final outcome, but eventually it is a combination of all the external and internal factors involved.

4.1. Commonly Used Measures of Economic Performance

According to Tainio, Korhonen and Santalainen (1991: 426), the three most commonly used measures of economic performance are profitability, growth and financial position. Several indicators have been developed for each of them. In performance research it is usual to use either a single, but relatively comprehensive and widely used indicator or to construct a combined measure from multiple performance indicators, such as turnover or return on equity, which is presented in Equation 7.

Mishkin (2003: 226) states that a basic measure of bank profitability is the return on assets (ROA), which is the net profit per monetary unit of assets:

$$(6) \quad \text{ROA} = \frac{\text{net profit after taxes}}{\text{assets}}$$

The return on assets provides information on how efficiently a bank is being run because it indicates how much profits are generated on average by each monetary unit of assets. The banks' stockholders however care the most about how the bank is earning on their equity investment. This information can be found out by using the other basic measure of bank profitability, the return on equity (ROE), which is the net profit after taxes per dollar of equity capital:

$$(7) \quad \text{ROE} = \frac{\text{net profit after taxes}}{\text{equity capital}}$$

ROA measures how efficiently the bank is run and ROE expresses how well the owners are doing on their investment. There is a direct relationship between these two measures, which is determined by so-called equity multiplier (EM). It is the amount of assets per monetary unit of equity capital:

$$(8) \quad \text{EM} = \frac{\text{assets}}{\text{equity capital}}$$

4.2. Competition between Banks

There has been an intensive discussion about the key factors in the banking competition, and many factors have been associated with a successful banking. According to a survey (Heffernan 2005: 60) where bank managers were interviewed, there are six characters considered important to the competitiveness of a financial centre. The scores beside each attribute are based on a scale of 1 (unimportant) to 5 (very important).

- Skilled labor: 4.29
- Competent regulation: 4.01
- Favourable tax regime: 3.88
- Responsive government: 3.84
- A “light” regulatory touch: 3.54
- Attractive living/working environment: 3.50

According to the survey results, the bank managers see skilled labour clearly as the most important factor behind successful banking. Also the macroeconomic environment is seen to have a significant effect on bank performance. All in all, the key factors were quite obvious and the results provided no surprise. Though, it should be noted that despite the reduction of the personnel, which has been the trend also in banking as well in many other branches, the management still sees the employees as the most important factor behind success.

Financial deregulation, allowing the new entry of more and more banks, has made modern banking a very competitive business. Banks compete with one another both in the interest rates they offer to attract deposits and in the interest rates they charge borrowers for loans. The interest rate spread is the gap between the interest rate a bank pays on deposits and the rate it charges for loans. The spread covers the cost of providing banking services. When spreads exceed this amount, they generate profits for banks. Profits can be seen as a signal for new banks to enter, which tends to compete away spreads. With more banks, interest rates on bank loans fall. Increased competition for deposits also raises interest rates paid to depositors. Both of these effects reduce the spread and so also the profits of the banks. (Begg, Fischer & Dornbusch 2000: 387.)

Equilibrium in the banking industry occurs at the point at which it is not worth attracting any more deposits in order to make more loans. In a perfectly competitive industry, any supernormal profits are competed away eventually by free entry. Although banking branch is regulated more loosely than before, the regulation still exists. Moreover, there are substantial scale economies in banking, and competition is therefore imperfect. For

both of these reasons, equilibrium profit margins in banking are usually positive. (Begg et al. 2000: 387.)

Adapting modern technology has been an important tool in the banking competition during the past two decades. Internet and telephone banking have become popular and the majority of the customers take care of their daily banking via these channels. Once the systems have been developed and set up, it is in the interest of the banks to get the user volumes high in order to decrease the personnel and office related costs. ATM technology is known to reduce banks' operating costs, but if the customers access the machine more frequently than they would visit the branch, the cost savings might be lower than expected. Banks also may find that electronic delivery methods decrease their ability to cross-sell other financial products, which leads to lowering of the income. The competition in banking seems to be a complex issue and therefore investigating the possibilities and threats carefully before making strategies is extremely important. (Heffernan 2005: 473–474.)

As mentioned in the introduction, there has been a rising trend of mergers and acquisitions (M&A) in banking. They are seen as a usable method to improve efficiency in strengthening competition. In the global economy, there have been two waves of consolidation identified, in 1987–1990 and 1997–2000. In the first wave, 63 % of M&As were in the manufacturing sector, 32 % in the tertiary or services sector, and 5 % in the primary sector. In the second wave, 1997–2000 the majority, 64 % of M&As were in services and 35 % in manufacturing. In both periods, within the service industry, a good proportion of the M&As were among financial institutions, especially between banks. (Heffernan 2005: 517.)

The reasons for mergers and acquisitions are divided into three categories. The first is stockholder wealth maximization goals. If mergers lead to greater scale/scope economies and improved cost/profit X-efficiencies, the sector as a whole should become more efficient and create value, all of which benefits stockholders. The second category is managerial self-interest: managers might see mergers as a way of enhancing or defending their personal power and status. In the third category are a number of miscellaneous

factors that create an environment favorable to M&As. They include changes in the structure of the banking sector, such as increased competition from non-bank competitors. In Europe, the Banking and Investment Services Directives and the introduction of the euro have encouraged greater integration of EU markets. Another factor is technological change, which has affected cost and profit X-efficiency both by encouraging more revenue earning financial innovations and cutting costs, such as the delivery of retail banking services. It is estimated that IT accounts for 15–20 % of total bank costs, and the percent is growing constantly. Mergers can help control these costs and improve IT systems, and therefore lead into rising efficiency figures. (Heffernan 2005: 519–520.)

4.3. Efficiency in Banking

Efficiency measures how well a producer succeeds in transforming inputs into outputs according to his behavioral objectives. A company is said to be efficient if it achieves the goals set and inefficient if the performance is weaker than expected. Usually the company's goal is assumed to be cost minimization of production by avoiding idleness and functionless use of resources. (Kuussaari 1993: 13.)

To find out the key factors affecting the efficiency in banking it is essential to understand how a bank operates. A natural way to find out bank's operations is to examine its balance sheet, a list of the bank's assets and liabilities. It is characteristic for a balance sheet that total assets are equal to total liabilities plus capital. A bank's balance sheet lists sources of bank funds (liabilities) and uses to which they are put (assets). Banks obtain funds by borrowing and by issuing other liabilities such as deposits. They then use these funds to acquire assets such as securities and loans. Banks make profits by charging an interest rate on their holdings of securities and loans that is higher than the expenses on their liabilities. An example of a bank's balance sheet is presented in Appendix 1. It demonstrates well the approximate portions and significances of the main assets and liabilities of a bank. The major assets are loans, especially real estate, commercial and industrial loans. The biggest source of liabilities is small-denomination time deposits and savings deposits. Recognizing the most significant items in the balance

sheet is important, so that the concentration can be directed to the main factors affecting the performance. (Mishkin 2003: 211–212.)

Throughout the history there has been a continuous discussion about potential factors affecting the excellence in the performance of organizations. People working in the field of business have tried to identify and understand the generative mechanisms of successful organizations. The search is far from over, but at least by now there are some factors identified behind bank performance.

Kjellman et al. (2004: 299–302) state that there are five main factors behind successful banking:

- 1) *Good management*, which knows how and towards what they are steering their teams and financial institution. It is evident that the bankers must know how he or she is making the profit today and tomorrow. The managers must be able to predict the future, and understand the transformation of the society, and the actors inside.
- 2) *A skilled and motivated personnel*. A personnel that understands the importance of putting the customer need first is essential. The personnel needs to be motivated to look at both costs and income of the bank, while being prepared to always recall to customer satisfaction. For example, economic compensation and ownership are seen as important factors for motivating the personnel.
- 3) *An organization structure* in which there are sufficient own funds, freedom under financial supervision, and a decentralized responsibility is extremely important. According to surveys, small or decentralized organizations perform better and therefore such organization structure is preferred.
- 4) *New and improved products* of the financial intermediates are essential for keeping the position reached. However, the traditional banking concepts also always

have to work well. One should always recall that the interest income in a depository bank is usually the most important source of income.

- 5) *One has to understand the past in order to be able to anticipate the future.* The institutional background is tremendously important in order to understand what might happen in the future. One also has to understand how bank's customers think and act, in order to satisfy customer need. Understanding the instruments of banking is also essential in order to understand what the risk exposures are in the banking industry.

4.4. Risks in Banking

The probability of risk can be measured by different kinds of calculations. The standard deviation of the rate of return is a commonly used measure of risk. It is defined as the square root of the variance, which in turn is the expected value of the squared deviations from the expected return. Symbolically,

$$(9) \quad \sigma^2 = \sum_s p(s) [r(s) - E(r)]^2$$

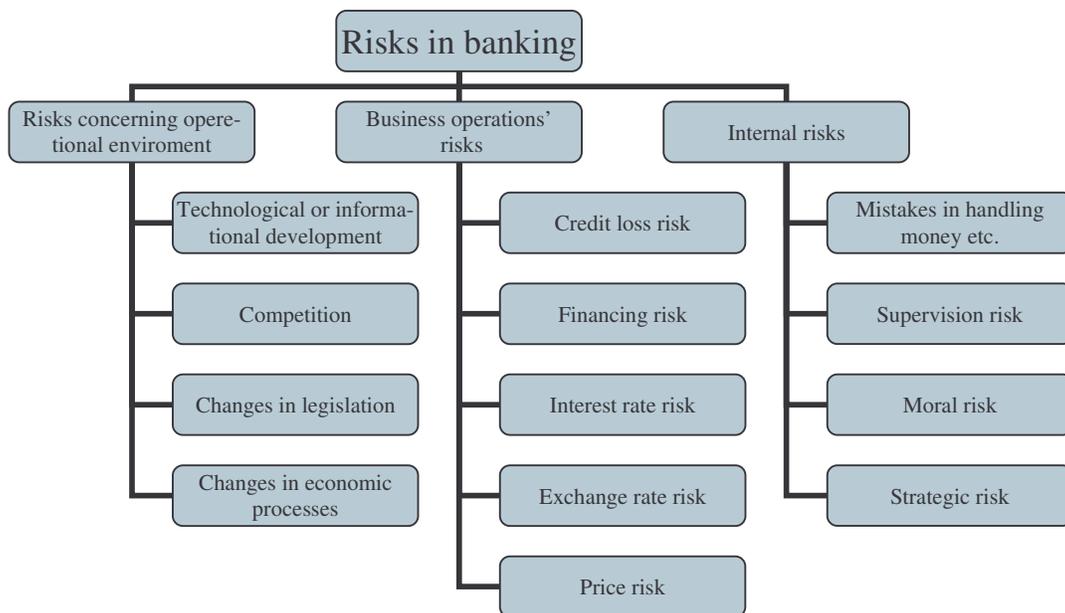
where $p(s)$ = the probability of each scenario,
 $r(s)$ = the holding period return in each scenario, and
 $E(r)$ = the expected rate of return.

The higher the volatility in outcomes, the higher will be the average value of these squared deviations. Therefore, variance and standard deviation measure the uncertainty of outcomes. (Bodie et al. 2005: 143.)

According to Ranta-aho (1993: 61) risk is an essential part of the banking business, and taking risks in some extent is necessary if a bank wants its business to be profitable. Anderson (2000: 23) believes that the characteristics of the risk are contingency and randomness. A risk, however, does not always have to be unforeseeable. Normally the

bank management knows that there are risks and is prepared for them, but it is still impossible to control all the risks in advance.

Banking is in a way a same kind of business than any other entrepreneurship. Banking is based on well-advised risk taking, where the bank has a scale advantage. Also the profit the bank gains is based on the risk taking. Bank's proportional benefit in risk taking results from scale advantage and decentralization. This means that the whole bottom line is not dependant on a few credit losses. Banks have estimated in advance how big a share of credits given to the public will become losses in the future. The credit loss risk is included in the prices of the loans. Risk taking is an essential part of banking and therefore it is necessary to investigate the market to make the business profitable. This is why banks have analysts and experts working for them and taking care of gaining enough information. The know-how of the bank determines if taking risks is profitable so that the risk taking is priced correctly and the losses have been prevented as well as possible. The main risks in banking are introduced in Picture 2.



Picture 2. Risks in Banking (Kontkanen 1996: 64–68).

Kontkanen (1996: 64) divides risks into pure and speculative risks. Pure risks include only the possibility of a loss and no possibilities of obtaining benefits, whereas speculative risks include possibilities for both losses and gains. The risks in banking can also be divided into three as presented in Picture 2. Risks in group one are external banking risks concerning the operational environment. These are the kind of risks bank does not have an effect on. Second group of risks are operational risks that are based on banks own decisions. Risks in group three are bank's internal risks that bank has an effect on.

Operational environment and internal risks are mainly pure risks and operational risks are speculative. Risks in banking typically appear rarely alone. The risks can also be transformed into others or they can change without anyone intervening. A typical example is financing risk transforming into an interest rate risk. If there is stringency in the money market and there is not much money available, the only way for a bank to avoid the lack of money is to pay a higher price for it. Then bank gets the money needed but is forced to pay a higher interest than expected. This assumed situation illustrates well how eliminating risks or transforming them into others is possible but costly, and therefore not always worthwhile. (Kontkanen 1996: 64.)

5. BANK STRUCTURE AND REGULATION IN THE NORDIC COUNTRIES

The structure of banking sector varies widely from country to country. Often, a country's banking structure is a consequence of the regulatory regime to which it is subject. Different types of banking structures do not alter the core functions of the banks, but the operating principles may differ between separate types of banking structures. The main banking regulation principles in the Nordic countries are briefly explained in Chapter 5.2.

The Nordic countries studied – Denmark, Norway, Sweden and Finland – are small economies in comparison with the most of the other economies in Europe. The institutions of banking and finance in these countries are, however, of general interest because of their history. Also their current interaction between structural changes in the financial systems and the diversity of monetary policy frameworks in the region are in the interest of many researchers. (Howells & Bain 2005: 153.)

Moreover, the four countries enjoy a relatively high degree of cultural homogeneity. It has been estimated that if their financial institutions continue to merge and cooperate at their current pace, the region – with its 24 million inhabitants and a total GDP that matches that of Spain plus Portugal – will soon have an integrated financial market that ranks among the 10 largest in the world. (Howells et al. 2005: 153.)

5.1. Development of the Banking Sector

A special feature of banking sector in the Nordic countries is a high level of concentration. By 1998, the five largest banks in each Nordic country accounted on average for 86 % of the total balance sheet of the Nordic banking sector, while the equivalent average for the EU member states was 64 %. Since then the concentration in the Nordic countries has increased even more. In 2005 the figures were 96 % in Finland, 94 % in Sweden, 84 % in Denmark and 71 % in Norway, respectively. The degrees of concentration have stayed relatively high for a long time. It is a rather common phenomenon in

small countries, because it has been shown that the banks need to be of a certain size in order to work efficiently. (Heffernan 2005: 267–268; Howells et al. 2005: 162–163.)

In recent years the concentration has gone towards cross-border integration. This process is, to a large extent, a by-product of the banking crises, because they created an atmosphere in which the consolidation of the banking sector was given a strong priority. The area experienced quite a severe banking crisis in the early 1990's, which led to a large number of mergers, giving this region the most concentrated banking system in the Europe. Some researchers even argue that the Nordic countries are closer to achieving a single financial market than the EU as a whole is. (Heffernan 2005: 267–268; Howells et al. 2005: 162–163.)

Current features in the Nordic banking are the strategies of all-finance and electronic banking. All-finance strategy means that the same corporation offers the full range of banking and financial services, including insurance and pension fund management. Scandinavian banks are currently in the world's leading position in the technologies of electronic banking. Because the population density is really low in the Nordic countries, the financial services groups have extra incentives to exploit the economies of scope from all-finance and the economies of scale from electronic banking. (Howells et al. 2005: 163.)

5.1.1. Case Nordea

One example of the increased concentration which crosses national boundaries is Nordea, the biggest banking group in the Nordic countries. Its history is a perfect example of cross-border and gross-segment integration of financial activities, and therefore Nordea has been in the interest of researchers and managers. In 1993, a Swedish bank called Nordbanken bought Gota Bank, which was in great trouble. At the same time in Finland, two of the main banks, Kansallis-Osakepankki and Yhdyspankki merged into Merita Bank. Norbanken and Merita Bank merged in 1997, and later also the Danish Unibank and Norwegian Christiania Bank joined the corporation. The name Nordea has been in use since 2001. (Nordea 2006.)

Nordea has kept expanding both by growth and mergers, and in 2004 its total assets were already in the range of Sweden's GDP. Also other banks have expanded in similar ways, though in a smaller scale. Nearly all of the large new holdings have set up subsidiaries in the Baltic countries and some also in the Continent. Nordea's aim of the mergers is to improve efficiency and, as a consequence, also to increase profits and improve profitability. (Howells et al. 2005: 163; Nordea 2006.)

Mergers in banking are an international phenomenon, but it is remarkable that in the Nordic countries the concentration has almost exclusively been intra-Nordic. Financial institutions from outside Scandinavia have so far had little success in penetrating the markets in the Nordic countries. (Howells et al. 2005: 163.)

5.1.2. The Currencies in Use in the Nordic Countries

The main differences in banking systems in the Nordic countries have been created by European Monetary Union (EMU). Finland, Denmark and Sweden are members of the European Union (EU), while Norway is not. Finland is one of the founding members of the EMU, whereas Denmark and Sweden have opted out from the monetary union – at least for the time being. (Howells et al. 2005: 154.)

Because of Finland being a member of the EMU, the currency in use in Finland is euro (€). Denmark, Norway and Sweden each have their own national currencies. Norwegian and Danish currencies are called krone and the Swedish currency is krona. Because different currencies are being used in all the countries involved in this study, also the exchange rate becomes an issue needing to be solved. (Bank of Finland 2006.)

Briefly described, the exchange rate is the price of one currency in terms of another currency. The exchange rate can either be expressed as units of a country's own currency per one unit of a foreign currency, or as units of foreign currency per one unit of a country's own currency. The former expression is used mainly in Anglo-Saxon countries, whereas the latter is used, for example, in the Euro area and in the Nordic countries. So in other words the Finns, for example, express the euro exchange rate against the Swed-

ish krona as units of krona per one euro. In this thesis, the currency issue has been solved by exchanging all the Nordic currencies into euros. (Kjellman et al. 2004: 181–182.)

Exchange rates are sensitive to changes in supply and demand like all prices. An exchange rate that is allowed to fluctuate freely according to changes in supply and demand on the foreign exchange market is called a floating exchange rate. The euro, the U.S. dollar and the Japanese yen are all examples of floating currencies. Because the floating exchange rates sometimes tend to fluctuate very strongly, some countries have opted for fixed rather than for floating exchange rates. In a fixed rate regime, the domestic currency is pegged either to another currency or to a “basket” including several foreign currencies, usually those of the country’s most important trading partners. Denmark has pegged the exchange rate of its currency to the euro to decrease the risk for having its own currency, whereas Sweden and Norway have left their exchange rates floating. (Kjellman et al. 2004: 182; Howells et al. 2005: 154.)

In the case a country has a fixed exchange rate it is a task of the central bank to maintain the fixed exchange rate by intervening in the foreign exchange market when necessary. This can be done by either selling or buying a foreign currency. (Kjellmann et al. 2004: 182.)

5.2. Authoritative Regulation in Banking

Banking branch in general is more strictly regulated than other areas of the economy, and therefore the regulation encourages to innovations in banking industry. Regulation leads to a financial innovation by creating incentives for firms to skirt regulations that restrict their ability to earn profits. This kind of process is described by term “loophole mining”. The economic analysis of innovation suggests that when the economic environment changes so that regulatory constraints are so burdensome that large profits can be made by avoiding them, loophole mining and innovation are more likely to occur. (Mishkin 2003: 242.)

An authoritative regulation is extremely important in order to create well-functioning financial markets. According to Daesik and Santomero (1988: 1231) banking regulation can also affect against the common good if it is taken care of carelessly. If the banks are restrained from taking risks inevitable for their functioning, the business cannot be profit-making enough. On the other hand, if too risky operations are allowed, the customers' trust in banks and in their functions will be ruined, which can on its worst lead into a wide economic crisis. This was well proved in the beginning of 1990's, when all the Nordic countries experienced a steep and comprehensive recessionary period. The banking regulation was neglected, which caused the Nordic economies to face a standstill. The state of the banking sector has a significant effect on the whole economy, and therefore it is extremely important to pay attention to its regulation and to secure its function.

There are many reasons for the need of regulation in banking. Heffernan (2005: 174–175) states that the main motives for regulation are:

- 1) *Protecting the investor.* The quality and nature of many investment products is not easily observed, which makes it important to the investor to be kept informed about the risks he or she cannot find out about without help. Investors are expected to assume some of this responsibility, but often legislation or government directives are needed to ensure the financial firms provide adequate information.
- 2) *The concentration of financial firms in the market place.* The financial sector is made up of many different markets, and the competitive structure of each of these markets varies considerably. It is important to check that no one is abusing oligopolistic or monopoly power they may have.
- 3) *Illegal activities.* The public needs to be protected from criminal activity. In the financial market there might be agents operating, who engage in financial fraud, money laundering and tax evasion. The regulator should be able to prevent such illegal activities.

- 4) *Externalities*. The effects of the actions of one agent on the economy of others, which is not reflected through the price mechanism. There are both positive and negative externalities, and the governments intervene to minimize the effects of negative externalities. In banking the problem are actions done by agents, which undermine the stability of the financial system.

5.2.1. Bank for International Settlements

The Bank for International Settlements (BIS) was established in 1930 to facilitate the payment of First World War reparations by Germany. The BIS is the world's oldest international financial organization. Since its foundation it has evolved into a central bank for many of the world's central banks. Its head office is situated in Basel, Switzerland and it has representative offices in Hong Kong and in Mexico City. (Bank for International Settlements 2006.)

The BIS is an international organization, which fosters international monetary and financial co-operation and serves as a bank for central banks. The BIS has hosted regular meetings of central bank governors since the early 1960's. In the meetings the issues of common interest are being discussed. The BIS is organized as a commercial bank, with 84 % owned by central banks, and the remainder held by private investors. The latter group of owners has, however, no say in the running of the bank. Under an international treaty, the bank is immune for government interference and taxes. (Carew 2006.)

The BIS also has a number of important sub-committees, such as the Basel Committee on Banking Supervision, the Committee on Payment and Settlement Systems, the Euro-Currency Standing Committee and the Gold and Foreign Exchange Committee. The BIS has 33 central bank members, including all the central banks of the Nordic countries. The non-European members are the Reserve Bank of Australia, the Bank of Canada, the US Federal Reserve System, the Bank of Japan and the South African Reserve Bank. (Bank for International Settlements 2006; Carew 2006.)

The BIS' most important decision-making bodies are 1) the general meeting of member central banks, 2) the board of directors; and 3) the executive committee. The annual general meeting gathers the member central banks of the BIS to approve the annual financial statements at the end of the BIS' financial year, and to decide on other related business issues. The board of directors has 20 members from different countries, and its task is to take care of the daily management (Bank for International Settlements 2006.)

5.2.2. Impact of the Central Banks

Though most central banks began life as commercial banks with responsibility for special tasks, for example note issue, the modern central bank is a government institution and does not compete with banks operating in the private banking sector. Modern central banks are normally responsible for monetary control and, in addition, may be involved in prudential regulation and placing government debt on the most favorable terms possible. The traditional methods for controlling the money supply include the following:

- 1) *Open market operations.* Traditionally this has been done by selling treasury bills, but in contemporary times also repurchase agreements are often included in the trade. It means that the bank commits to buy back the treasury bill at a specified date and at an agreed rate of interest.
- 2) *Buying or selling securities in the financial market.* This causes the monetary base to be affected. For example, if the Bank of Sweden prints new money to purchase government securities, then the monetary base will increase. This works also vice versa, i.e. if the bank sells government securities, the monetary base is reduced.
- 3) *Reserve ratios.* In some countries, the banks are required to hold a certain fraction of deposits as cash reserves, and as a consequence the central bank can influence the money supply. If the reserve ratio is raised, it means banks have to reduce their lending, so the money supply is reduced. In most western countries,

the reserve ratio is no longer used as a key monetary tool.

- 4) *Discount rate*. The rate charged from commercial banks when they want to borrow money from the central bank. By raising the discount rate above the general market interest rate, it is more expensive for commercial banks to borrow in the event that withdrawals suddenly rise. The banks hold more cash in reserves to avoid the “penal rate”, which again reduces the money supply because it means fewer deposits are loaned out. (Heffernan 2005: 29–31.)

The second of the central bank’s three tasks mentioned earlier is prudential control, which means that the central bank is expected to protect the economy from suffering the effects of a financial crisis. It is widely accepted, that the banking system has a unique position in the national economy, and problems in banking can lead to an inefficient allocation of resources in the economy. Therefore, when banks are facing problems the central bank should interfere and make sure the economy is not overly affected by the problems the banks are facing. (European Central Bank 2007.)

The last one of the central bank’s tasks mentioned is the government debt placement. If a central bank has this responsibility, it is expected to place government debt on the most favorable terms possible. This task is important in emerging markets, but by the end of the 20th century it had become less critical than the other two functions in the industrialized world. This was because the policies to control government spending reduced the amount of government debt to place. (Heffernan 2005: 33; European Central Bank 2007.)

5.2.3. Central Banks in the Nordic Countries

All the countries with developed economies have a central bank, although the functions taken care of by the institution vary between jurisdictions. Banking regulation in the Nordic countries is based on their national legislations and the EU legislation, excluding Norway. The national central banks control financing sector in all the Nordic countries. The Bank of Sweden, *Sveriges Riksbank*, is the oldest existing central bank in the world.

Its history as a public institution dates back to 1668, when it succeeded the world's oldest note-issuing bank. Under the auspices of the parliament, the Bank of Sweden was actually in operation long before private banks started to do business in the mid-nineteenth century. The Financial Supervisory Authority is responsible for individual bank soundness, which means that the Riksbank controls the payment system and ensures financial stability prevails. (Adams 2005: 8; Howells et al. 2005: 153.)

The Danish central bank, *Danmarks Nationalbank*, is somewhat younger but its history is remarkable for its shifts between public and private ownership. The institution was founded as a private bank in 1736 and, due to insolvency, it was transformed into a state bank in 1773. As the finances of Denmark were ruined by the Napoleonic wars, the old state bank was declared bankrupt in 1813 and first replaced by a new state bank. In 1818, the state bank was transformed into privately owned Nationalbank, as the large property holders received stocks of the bank in exchange for the rent charge. Even though Nationalbank has been independent of government since 1936, its monetary policy is driven by the fixed exchange rate regime it has with the euro. This is because the Danish krona is a part of the Exchange Rate Mechanism as explained earlier. There is also a separate supervisory authority in Denmark, though the both institutions have joint responsibility for the financial stability. (Heffernan 2005: 268; Howells et al. 2005: 153.)

The Bank of Finland, *Suomen Pankki*, was founded in 1811. In Finland, banks are supervised by a Financial Supervision Group, which is located at the Bank of Finland, but is independent of it. Because Finland has adopted the euro, its monetary policy is largely determined by the European Central Bank (ECB). According to its statute, the ECB's primary objective is price stability in the Euro area, thus it is responsible for monitoring inflation levels and maintaining the purchasing power of the common currency. (Bank of Finland 2006; Casu, Girardone & Molyneux 2006: 140.)

The Bank of Norway, *Norges Bank*, was established in 1816. It implements monetary policy set by the government. Norges Bank also controls the investments of the Government Petroleum Fund, which receives the profits from the oil and gas sector. The su-

pervision in Norway is taken care of by a separate institution, the *Kredittilsynet*. (Hefernan 2005: 268.)

The banking regulation in the Nordic countries is taken care of well today. The internalization of the branch is, however, seen as a significant risk in the future. The increase in competition is a good thing for the consumers, but at the same time it creates new challenges for the supervision. As long as a bank has a subsidiary in Finland, for example, the Finnish authorities are allowed to supervise its actions. If the bank becomes a *Societas Europaea*, a.k.a. a European company, the Finnish authorities have no longer the right to supervise the branch office situated in Finland. The supervision is then taken care of by the authorities in the home country of the bank. The problem that might occur is that, in the case of problems, the bank's home country might not be too willing to give aid financing into a foreign country. The goal is now to improve the international co-operation and possibly create new laws or even a common supervisor, so that there would not be disagreements in case of liquidity problems. (Nikkanen 2006: 16.)

Because many of the Nordic banks offer all financial services, the regulation and supervision are facing new challenges. Therefore the supervisory authorities in the Nordic countries have extended their practical co-operation from the control of banks also into insurance and investment companies. The central banks participate in controlling the development by regularly publishing reports of financial stability in which they increasingly set their focus on the cross-border activities of the financial institutions in their domains. (Howells et al. 2005: 163.)

5.2.4. Capital Requirements in Banking

Banks hold capital partly because they are required to by the regulatory authorities. Because holding capital is expensive, bank managers would often want to hold less capital than required. Therefore, the minimum amount of bank capital is determined by the bank capital requirements. (Mishkin 2003: 227.)

The Basel 2 Framework is a base of capital adequacy published by the Basel Committee on Banking Supervision. The Basel 2 describes a more comprehensive measure and minimum standard for capital adequacy than existed before in banking. The national supervisory authorities are now working to implement it through domestic rule-making and adoption procedures. The Basel 2 seeks to improve on the existing rules by aligning regulatory capital requirements more closely to the underlying risks that banks face. In addition, the Basel 2 Framework is intended to promote a more forward-looking approach to capital supervision. The aim is to encourage banks to identify the risks they may face and to develop or improve their ability to manage those risks. (Bank for International Settlements 2006.)

The Basel 2 Framework was first published in June 2004. In November 2005, the Committee issued an updated version of the revised Framework incorporating some additional guidance. On 4 July 2006 a comprehensive version of the Basel 2 Framework was issued. The new Framework came into operation on 31 December 2006. Some of the more advanced calculating methods will not, however, be mobilized before the end of the year 2007, which gives the banks and supervisors a chance to get prepared for the change more thoroughly. During the first year of implementation, banks and national regulators are expected to run parallel computations, calculating capital charges based on both Basel 1 and 2. (Bank for International Settlements 2006; Rahoitustarkastus 2006.)

The Basel 2 Framework sets minimum requirements for the banks' capital adequacy. The Basel 2 consists of three pillars, which all have their own requirements for an acceptable minimum level. Pillar 1 includes risk sensitive minimum reserve requirements for the risks concerning credits, the market and operations. It reconciles the requirements better with banks' real risks and offers methods for calculating the minimum reserve requirements. Pillar 2 requires total estimations by both the supervised and the supervisor and so secures the capital adequacy in covering all the fundamental risks. The goal of Pillar 3 is to strengthen the market discipline by highlighting the transparency in banks' reporting and by requiring more extensive information publishing from

them. The main points of the pillars are presented in Picture 3. (Rahoitustarkastus 2006.)

PILLAR 1

Risk assets ratio

Measurement of risk assets ratio changed to include:

- 1) New measurement of credit risk;
 - 2) Measurement of market risk (unchanged since 1966);
 - 3) Measurement of operational risk.
-

PILLAR 2

Supervisors

Role of supervisors in their review of banks: to encourage banks to develop internal methods to assess capital, setting capital targets consistent with the bank's risk profile and its internal control methods.

PILLAR 3

Market discipline

Use of market discipline: banks to disclose their method for computing capital adequacy, how they assess risk, credit risk mitigation techniques.

Picture 3. The Three Pillars of Forming Basel 2 Framework (Heffernan 2005:194.)

There are many similarities between Basel 1 and 2, but there are also a lot of changes in the new framework compared to the previous one. According to the Bank for International Settlements (2006) the new Basel 2 seeks to achieve the following objectives:

- 1) It moves away from the "one size fits all" approach that was characteristic of Basel 1. In the new framework each bank can choose from a number of options to determine its capital charge for market, credit and operational risk.
- 2) Recognition of that, in terms of credit risk, lending to banks can be more or less risky than to OECD sovereigns. As a result, risk weightings have been changed

to such an extent that a bank can receive a lower risk weight than the country where it is headquartered.

- 3) Explicit recognition of operational risk, with capital to be set aside, though overall the amount of capital set aside should remain at 8 % of total risk assets.
- 4) Subject to the approval of national regulators, banks will be allowed to use their own internal rating models for the measurement of credit, market and operational risk. Otherwise, banks will have to adopt a standardized approach drawn up by the Basel Committee.
- 5) In addition to the new risk pillar, also new supervisory and market discipline pillars have been introduced as is presented in Picture 3.

5.3. Economic Performance and Future Scenarios in the Nordic Countries

Economic performance has been generally stable and positive in all of the Nordic countries during the last ten years. The main factors influencing positive development have been growing domestic demand and favorable developments in the world's economy. In addition, increasing profits in the corporate sector and growth of exports have supported gross domestic product (GDP) growth in the Nordic area. According to forecasts, GDP is expected to continue growing at a steady rate in all the Nordic countries. Other similar characters in the Nordic economies are low inflation and interest rates, rising equity prices and rapid lending growth. (Nordic Central Banks 2006: 8).

After several years of very high global growth there are signs that an economic slowdown is underway. The US economy is clearly losing momentum. Even though growth in Europe is at its highest level since the turn of the millennium and the Asian economies grow strongly especially in China and in India, the U.S. downturn is likely to affect on these regions as well. The experts of the Bank of Finland believe that, even if the growth in the U.S. will slow down to fewer than 3 %, it can be handled without very

serious problems. However, if the growth slows down even more, it will have significant effects on the global economy. (Nikkanen 2006: 16; Pedersen 2006: 5).

European Forecasting Network EUROFRAME (2006a: 2; 2006b: 1) researches the world economy and forecasts its future. According to its latest forecast, the growth in Europe will be slowing down during the next two years. In the Euro zone the growth is expected to be around 2 % in 2007 and 2008. The growth is also slowing down in the United States and to some extent in Asia as well. In China the growth is regardless still estimated to be 9.5 % in 2007. According to EUROFRAME, the economic situation in the world is continuing to develop positively, which makes it possible for banks to continue their growth and expand their businesses. The forecasts for 2007 and 2008 depend, however, on some monetary policy assumptions. EUROFRAME expects the European Central Bank (ECB) to raise interest rates to 3.50 % and to leave them unchanged from then. Also the oil price is expected to remain at around \$68 per barrel up to 2008 and the dollar/euro exchange rate is forecasted to rise only marginally to 1.31 by the end of 2008. Changes in these underlying assumptions naturally might cause inaccuracy in the forecasts.

In the Danish economy the rebound started earlier than in the Euro Area, and the growth is still gaining more speed from strengthening Euro Area. In Denmark, a strong growth of both private consumption and investment are now being added by stronger exports. The growth is expected to remain strong in 2007–2008, supported by fairly strong export demand. The Danish economy is forecasted to get dangerously close to overheating in the near future. Unemployment is at an all-time low, and several sectors report shortages of qualified labor. Economic growth will therefore hardly exceed growth in labor productivity significantly in the next few years. (EUROFRAME 2006b: 11; Pedersen 2006: 4).

Like in Denmark, also in Sweden the rebound of the economy started earlier than in the Euro Area. Strong exports and investment is supported by brisk consumption. The export markets are expected to start slowing, which will lead to a gradual cooling of the strong export performance. The global slowdown will affect Sweden, while inflation

will remain slow. The argument of additional tightening is expected to fade gradually and the Riksbank is expected to stop at 3.5 % by mid 2007. (EUROFRAME 2006b: 11; Pedersen 2006: 4).

In Norway, the unemployment has fallen faster and the employment growth has been stronger than expected. The improved labor market situation will lead to a higher consumption growth and to stronger growth in house prices. Norges Bank has warned of a higher pace of interest rate hikes, and will most likely continue raising rates still. Rates will then be higher than in both Sweden and Euro area, and the Norwegian krone will most likely strengthen significantly. Inflation is expected to remain well below target. Consequently rates will be on hold until well into 2008. (Pedersen 2006: 4.)

The Finnish economy is growing fast and the growth is set to exceed all earlier expectations. The economy is, however, expected to slow in 2007 fairly deeply from the figures reached in 2006. Higher interest rates are expected to cool down the booming housing market. The worrying characteristic of the economical development is a rising debt-equity ratio. Even though the ratio itself is not overweening, the problem is, that the debt is concentrated on a small amount of households. According to the Bank of Finland, the development, however, is not as serious as it was in 1989 and 1990. Back then the loan portfolio included also a lot of other debts than housing loans. The main risks in the next couple of years in Finland are expected to come from abroad. (Nikkanen 2006: 16; Pedersen 2006: 4.)

6. SAMPLE AND METHODS

In academic studies of costs and efficiency in banking, two main approaches – a parametric and a non-parametric one – have been adopted. Both of these methods require a specification of a cost or product function or frontier, but the former involves the specification and econometric estimation of a statistical or parametric function. The non-parametric approach provides a piecewise linear frontier by enveloping the observed data points. Hence, the latter technique has come to be termed data envelopment analysis (DEA). (Mullineux et al. 2003: 288.)

Unlike the parametric approach, DEA does not require the specification of a particular functional form for the cost or product function. Hence, the derived efficiency estimates are not functional form dependent. In contrast, the accuracy of the efficiency estimates in the parametric approach is conditional on the accuracy of the chosen functional forms approximation to the cost or production function. (Mullineux et al. 2003: 288.)

6.1. Data Envelopment Analysis

Data envelopment analysis is used to estimate the banking efficiency in this thesis. DEA is a linear programming technique, which estimates an efficient frontier based on the observations in the sample. The method was originally developed by Charnes, Cooper and Rhodes in 1978. They described the DEA as a mathematical programming model that provides a new way for estimating extreme relations from observational data. A variety of DEA-models have been developed since. The basic idea of the DEA is that the observations found to be most efficient are assigned a score of 1, while the other observations in the sample are allocated a score less than 1. The scores represent the relative efficiency of the company investigated compared to the other companies in the sample used. (Kuussaari 1993: 20; Kirkwood et al. 2006: 253–254.)

DEA is considered to be advantageous because it can vary over time and all inputs and outputs are handled simultaneously. It produces a true frontier from which relative efficiencies can be derived and no functional form is imposed on the data. However, there is a potential drawback when considering the DEA approach. Because it is a non-

parametric technique, there is no random error term specified as there would be in an econometric approach. This implies that any deviation above the cost frontier, for example, would be attributable to inefficiency, rather than to a combination of inefficiency and random error, as in the parametric approach. Data problems also arise because it is necessary to obtain the same input and output measures for all the firms in the sample. The potential of data error which is often mentioned as a shortcoming of the DEA (e.g. Chu et al. 1998: 159) is minimized by employing only audited figures culled straight from the respective banks annual reports. The efficiency scores are also not independent of the market structure. This, however, is not considered as a problem in this study, because there are no major differences between the market structures in the Nordic countries, and therefore the results of this study are completely comparable with each other. (Mullineux et al. 2003: 288; Heffernan 2005: 479.)

There are a lot of methods to choose from when estimating the efficiency. The appropriateness of a chosen approach depends on the distribution of the data set. Also the size of the sample affects on the results given by different methods. In the previous research it has been shown that DEA method is the best choice for estimating efficiency when the sample is small. DEA analysis is being considered as a best option for the data set chosen in this thesis, because it does not require a big sample size and also the functions of the banks are not limited. (Beccalli et al. 2006: 249.)

DEA is a non-parametric approach for testing efficiencies, because it is not based on any explicit model of the frontier. The methodology was originally developed for non-profit-making organizations, because for them the accounting profit measures are difficult to compute. Because no specified frontier is required, the method suits well for estimating banking efficiencies. DEA compares the observed outputs (Y_{jp}) and inputs (X_{ip}) of the organizations investigated. If measuring, for example, cost X-efficiency, the relatively more efficient firms can be compared against the relatively less efficient by identifying a “best practice” firm or firms. To do this, the following function is maximized:

$$(10) \quad E_p = \sum u_j Y_{jp} / \sum v_i X_{ip}$$

where $E_p \leq 1$ holds for all p values. p represents several organizations and weights for $v_i, u_j > 0$. This model is run repetitively with each firm appearing in the objection function once to derive individual efficiency rates. Each firm will have a derived rating of E , which is a measure of relative efficiency. The closer the E calculated is to 1, the higher the relative efficiency of the firm investigated is. $E = 1$ is for the “best practice” unit, and will be lower for all other firms in the study. Thus, $E < 1$, which implies relative inefficiency. (Heffernan 2005: 478–479.)

6.2. Hypotheses

The aim of this study is to find out whether there is a dependency between a bank’s efficiency and its stock returns in the Nordic countries. First the efficiencies in the countries studied are investigated to see whether there are differences between the countries by hypothesizing that banking service and profit efficiencies differ between the countries investigated (H1 and H2).

Investigating whether the changes in efficiency levels have an effect on stock returns in the Nordic countries is the intention of this study. It is hypothesized that banking service and profit efficiencies have a positive impact on the bank’s stock returns (H3 and H4).

Changes in the levels of earnings naturally cause changes in the stock returns of the banks. It is tested whether earnings are also affecting the efficiency levels, or if they are independent of each other. It is hypothesized that earnings are affecting the levels of banking service and profit efficiencies (H5 and H6). The statistical tests for investigating the accuracy of all the hypotheses are presented in Chapter 7.

6.3. Sample and Data Collection

The sample used in this study consists of 68 publicly listed banks in the Nordic countries. The sample period covers ten years, from 1996 to 2005 including listed banks in Denmark, Finland, Norway, and Sweden. Iceland is the fifth member of the Nordic council, and would therefore be justified to be a part of the study. However, Iceland is being left out of the sample because of the relatively small size and importance of its financial system. The structure of the banking sector in Iceland also differs significantly from the ones in other Nordic countries, and therefore the results might distort if Iceland was included. There is also a lack of data concerning Icelandic banks, because only one bank was publicly listed during the sample period and even for it there are data available only for four years of the ten investigated. All these factors together led to an exclusion of Icelandic banks from this study, and as mentioned earlier, here when talking about the Nordic countries only Denmark, Finland, Norway and Sweden are being referred to.

The banks included in this study have been chosen among the companies classified as “Financials” in the OMX and in the Oslo Bourse (Nordic Exchange 2006; Oslo Børs 2006). Not all the companies listed in the financials branch are included in this study, because the concentration in this study is on the traditional banks, and therefore for example investment banks and custody banks are being left out of the sample. Investment banks are not included in the study sample, because they differ to some extent from the traditional banks. They buy and sell corporate and government securities, underwrite securities issues and also advise companies on raising capital, but do not accept deposits or make loans in the traditional sense (Adams 2005: 8). Same kind of problems led also to an exclusion of the custody banks and some other non-traditional financial companies. The traditional banking service efficiency was part of the study, and therefore the companies included in the sample were required to offer also traditional banking services. Banks offering services in many fields were included in this study, as long as the traditional services were also offered in addition to services of other fields. The banks included in the sample are classified in the OMX or in the Oslo Bourse as regional banks or diversified banks.

Of the total sample 5 banks are Swedish, 3 banks Finnish, 40 banks Danish and the rest 20 Norwegian. The Danish and Norwegian banks are greater in number than the Finnish and Swedish ones, and this is mainly because in those countries all the local savings banks are listed in the exchange separately unlike in Finland and in Sweden.

All the international banks are classified according to their country of origin, so therefore for example Nordea is here a Swedish bank, even though according to some measures it is the biggest bank in Finland, and also a significant market participant in the other Nordic countries. It is also listed in Finnish and Danish lists in the Nordic Exchange, but in this study only the Swedish list's stock returns are investigated, because the results would be distorted if one bank would have multiple efficiency scores. All the 68 banks included in the sample are listed in the Appendix 2.

The data used in this study are collected from Thomson Financial –database. The data were not yet completely available for year 2006, so therefore the sample period investigated ends at the yearend 2005. As mentioned before, the euro is used as a currency in this study. The national currencies are all changed into euros using daily exchange rates. The financial statement information is transformed into euros using the closing exchange rates for each year.

Before the introduction of the euro, the calculatory European Currency Unit (ECU) was being used as a unit of account of the European Community. In January 1, 1999, the euro replaced the ECU. In this study, the figures presenting the period from 1996 to 1998 are in ECUs and the figures from then onwards in euros. The daily exchange rates are collected from the Kauppalehti's currencies archive.

The used data consist of various financial statement information and daily stock prices, from which the stock returns are calculated by comparing each day's closing value with the figures of the previous day. The financial statement information used can be seen from the Table 1, where the inputs and outputs of the used models have been presented.

6.4. Proposed Models

In order to investigate efficiencies or inefficiencies of the financial institutions such as banks using either the parametric or non-parametric frontier methodologies, it is necessary to develop a model of the productive process. It means that the inputs and outputs of the depository institution need to be specified. Unfortunately, it is a much more complicated process than as it would be for example when considering a manufacturing firm. Many alternative approaches of the classification of inputs and outputs have been presented, but no single best solution has been found for the banking branch. (Mullineux et al. 2003: 296.)

Researchers have used different methods according to what they believe describes the performance the best, but there are various opinions about the best method. The efficiency is measured by using two different models, one of which is measuring banking service efficiency and the other profit efficiency. Two models are being used, because there might be some banks that are efficient when using some efficiency measures and inefficient when using some other measures. Therefore using two separate models gives a better and more reliable view of the efficiency in banking. The proposed models are presented briefly in Table 1.

Model A measures banking service efficiency and Model B profit efficiency. Both models use the same input combinations, but the outputs differ from each other. The inputs include personnel costs, the value of property, plant and equipment and the amount of interest bearing liabilities. In Model A the outputs are interest-bearing assets and non-interest income, whereas Model B uses profit before taxes and abnormal items as an output.

Table 1. Proposed Models.

Model	Inputs	Outputs
Model A (banking service efficiency)	Labor costs Property, plant and equipment	Interest-bearing assets Non-interest income

(net of accumulated depreciation)
Interest-bearing liabilities

Model B (profit efficiency)	Labor costs Property, plant and equipment (net of accumulated depreciation) Interest-bearing liabilities	Profit before taxes and abnormal items
--------------------------------	---	---

All the input and output figures used in these models are collected from Thomson Financial –database. A part of the figures used were directly available and some are calculated based on the data available. The efficiency is measured by comparing the input and output figures of each bank. The less input units the bank uses for a certain amount of income the more efficient the bank is considered to be.

Model A is a fairly standard model for measuring the cost efficiency of producing banking services using the intermediation approach. The banking service outputs include not only the banking services generated from interest-earning assets, but also off-balance sheet activities. An omission of off-balance sheet activity from output is likely to result in understated measures of firm efficiency, and therefore such items are also included (Kirkwood et al. 2006: 257). In summary, Model A views a bank as using labor, physical capital and interest-bearing liabilities to produce two types of banking service output that are measured by the stock of interest-earning assets and non-interest income.

Labor is measured as the number of full-time equivalent employees the bank has at the end of each financial year. Physical capital is measured as the book value (cost less accumulated depreciation) of property, plant and equipment. Average interest-bearing liabilities is a figure reported by the banks and has been used as an input because it includes deposits as well as other sources of debt that the bank may substitute for deposit funding. Prices for the inputs were calculated as follows:

$$(11) \quad \text{price of labor} = \frac{\text{staff expenses}}{\text{number of full - time equivalent employees}}$$

(12)

$$\text{price of physical capital} = \frac{\text{expenses associated with property, plant and equipment}}{\text{book value of property, plant and equipment at yearend}}$$

$$(13) \quad \text{price of interest - bearing liabilities} = \frac{\text{interest expense}}{\text{average interest - bearing liabilities}}$$

Model B incorporates the same inputs as Model A, as explained earlier, but substitutes “profits before taxes and abnormal items” as the output. It means, that it is measured how efficient the same combination of inputs than used to produce banking services is at producing profit. By comparing these two models insights into revenue efficiency can be gained. In particular, a difference between banking service efficiency and profit efficiency for a bank would reflect

- 1) the bank’s ability to generate higher margins from interest-earning assets,
- 2) the bank’s ability to control bad loans; and
- 3) the difference in technologies (i.e. the efficient frontiers) to produce banking services and to produce profit. (Kirkwood et al. 2006: 258.)

As the inputs and outputs are calculated, they are compared with each other and these ratios are then compared with other banks’ ratios in the sample. The bank that produces the most outputs with the same amount of inputs is considered to be the most efficient bank in the sample.

Consider a group of N decision-making units (DMU) that produce M outputs using K inputs. Variable returns to scale (VRS) means that changes in output can be caused by unequal changes in the inputs, i.e. the same amount of increase in inputs can cause changes of different sizes in the outputs. The DEA model to measure efficiency of DMU i , under the assumption VRS, is given by

minimize θ (over θ and λ)

subject to $y_i - Y\lambda \leq 0_M$,
 $-\theta x_i + X\lambda \leq 0_K$,
 $I_N' \lambda = 1$ and
 $\lambda \geq 0_N$

where θ = scalar value bounded between 0 and 1,

$Y = (M \times N)$ matrix of actual quantities of M outputs by N DMU,

$y_i = (M \times 1)$ vector of the output quantities actually produced by DMU i ,
 which is the i th column of Y ,

$X = (K \times N)$ matrix of actually used quantities of K inputs by N DMU,

$x_i = (K \times 1)$ vector of the input quantities actually used by DMU i , which is
 the i th column of X , and

$\lambda = (N \times 1)$ vector of constants whose optimal values are to be found together
 with θ .

In the DEA model for efficiency θ is the reciprocal of the distance of the input vector x_i with reference to the frontier formed by the input-output combinations of peer DMU. Thus, θ measures by how much the quantities of inputs used by DMU i could be proportionally changed if the DMU produced the same level of outputs as efficiently as the peers that are the most efficient in the group. So, θ itself represents the degree of efficiency of production by DMU i . (Kirkwood et al. 2006: 256.)

Efficiency is measured compared to the other banks in the sample so that the efficiency scores vary between 0 and 1. The most efficient banks in the sample are assigned a score of 1 and the less efficient banks are allocated a score less than 1. The most efficient bank is not necessary efficient either, but it also is not less efficient than any of the other banks in the sample. An efficiency score of, for example, 0.80 can be interpreted as meaning that this bank could reduce inputs by 25 per cent $[(1-0.80)/0.80]$ without changing output levels.

As has been shown in the previous research (e.g. Beccalli et al. 2006: 258), an inclusion of further variables, – size, risk level, profitability – does not significantly increase the explanatory power of the model when measuring efficiencies. Therefore only the factors seen to be the most important ones when measuring efficiency are used in this study.

7. THE LINK BETWEEN EFFICIENCY FIGURES AND STOCK RETURNS

A strengthening competition in the banking market has forced the banks to reduce all the costs to the minimum and try to make increasing profits with less and less inputs. Being efficient has become necessary in order to survive in the market.

An interesting question is how to become efficient or how efficiency is even measured in the first place. Some factors have been shown to affect the efficiency, but no pattern for success has been found. It is tested whether the efficiency and stock returns correlate with each other and so if the stock returns can be explained by changes in the efficiency levels. The following chapters present the results of testing the relation between efficiencies and stock returns.

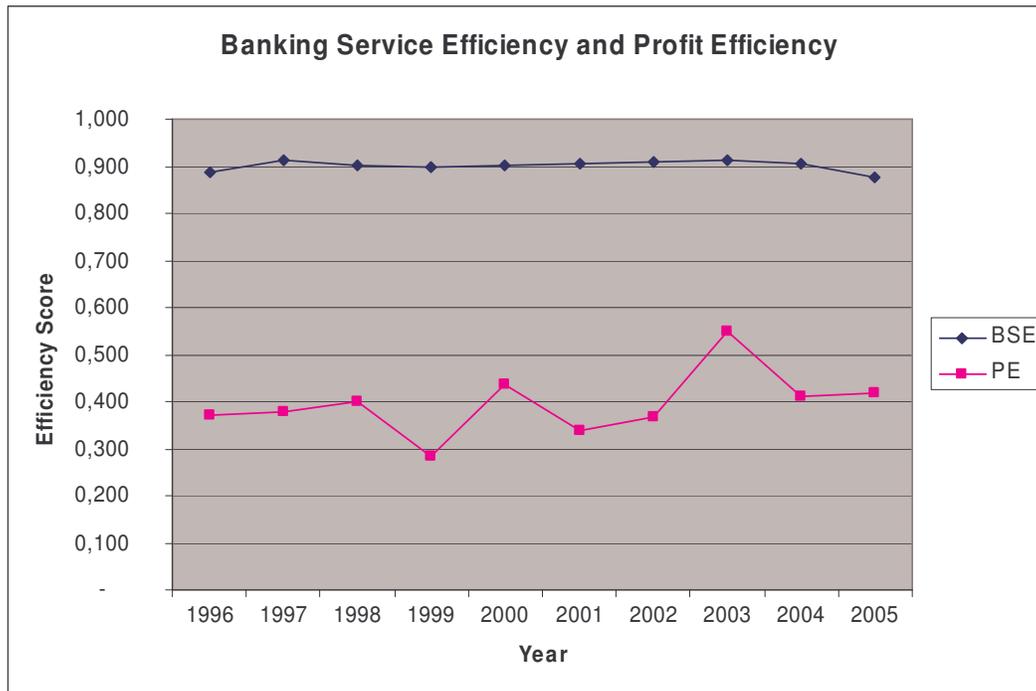
7.1. Banking Service Efficiency and Profit Efficiency in the Nordic Countries

Two efficiency scores are calculated for each bank in the sample, one score for banking service efficiency (BSE) and one for profit efficiency (PE). The yearly averages of these scores are presented in Table 2 for the ten-year sample period.

Table 2. Efficiency Scores (Yearly Averages).

Year	BSE		PE	
	Mean	SD	Mean	SD
1996	0,858	0,040	0,335	0,169
1997	0,861	0,032	0,295	0,165
1998	0,865	0,032	0,290	0,160
1999	0,871	0,035	0,283	0,175
2000	0,865	0,038	0,294	0,144
2001	0,859	0,031	0,227	0,158
2002	0,873	0,032	0,254	0,143
2003	0,878	0,034	0,357	0,142
2004	0,877	0,033	0,325	0,128
2005	0,875	0,036	0,318	0,150
Average	0,868	0,034	0,298	0,153

As can be seen from the Table 2, the banking service efficiency scores have been high during the whole sample period, whereas the profit efficiency of the banks has been at a very low level. Picture 4 demonstrates the development of these two measures of efficiency.



Picture 4. The Development of Banking Service Efficiency and Profit Efficiency.

Banking service efficiency figures have not fluctuated much, whereas profit efficiency scores have been more volatile. The development of these figures can be seen from Picture 4, and the fluctuation can also be noticed from the standard deviations (SD) presented in Table 2. During the whole sample period, the standard deviation of banking service efficiency has been lower than it of the profit efficiency. The higher fluctuation in the profit efficiency can be explained by market movements. Changes in the market are likely to affect on the profit efficiencies more strongly than banking service efficiencies, because the need for basic banking services is quite stable no matter the financial situation in the market. The main profits of the banks are gathered from their biggest customers, which are usually corporations. When the financial situation in the market is poor, the banks' customers are in trouble and the income gained from them is also smaller. This causes that the profit efficiency follows the movements of the market, whereas the banking service efficiency remains more stable.

Profit efficiency has diminished after year 2000, but has returned to its previous level by the end of the sample period. Fairly poor average scores in profit efficiency can be interpreted so that even though all the banks have increased their profits during the sample period, the most efficient units are still far ahead, which leads to low efficiency scores for the others.

The study results concerning banking service efficiency are in line with previous studies' results. For example, Heffernan (2005: 482) reports efficiency scores between 0.80 and 0.90 for the Nordic countries in 1997, which corresponds well the results of this study. As Table 2 shows, the average banking service efficiency is 0.87 during the sample period.

Profit efficiency has not been studied as often as banking service efficiency, but there are still some estimates available for this measure as well. Profit efficiency scores have usually been quite low, just as also is in the results presented in this study. For example, Kirkwood et al. (2006: 260, 262) reported relatively low scores for profit efficiency in Australia. The results reported indicate that the situation might be similar also in the Nordic countries.

7.1.1. Country-Specific Banking Service Efficiencies

Because the sample used in this study consists of banks operating in four different countries, comparing the efficiencies country-specifically could give new information about differences between the Nordic countries. The banking service efficiencies for each country are presented in Table 3. It should be, however, noted that the sample size varied a lot between the countries, and therefore the results might not be equally reliable for each country.

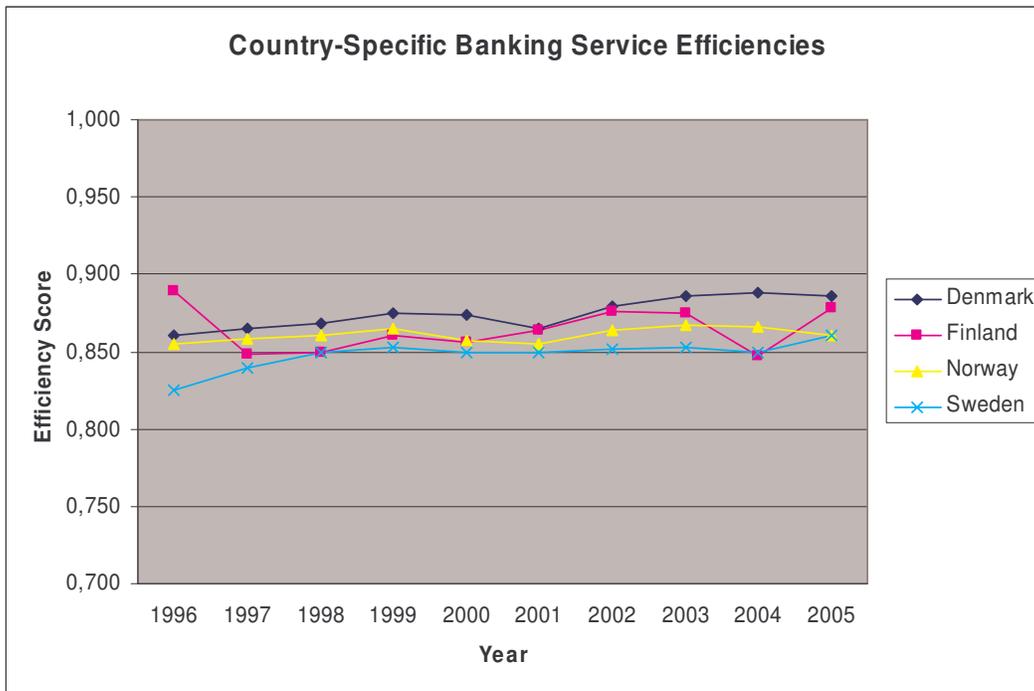
Table 3. Banking Service Efficiencies in the Nordic Countries.

Year	Denmark		Finland		Norway		Sweden	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1996	0,860	0,040	0,889	0,112	0,855	0,016	0,825	0,011
1997	0,865	0,036	0,848	0,042	0,858	0,011	0,840	0,006
1998	0,868	0,036	0,850	0,045	0,860	0,010	0,849	0,005
1999	0,875	0,038	0,861	0,067	0,865	0,007	0,853	0,005

2000	0,874	0,047	0,856	0,050	0,857	0,026	0,850	0,008
2001	0,865	0,041	0,864	0,053	0,855	0,020	0,850	0,007
2002	0,879	0,031	0,876	0,074	0,864	0,033	0,852	0,008
2003	0,886	0,032	0,875	0,083	0,867	0,032	0,853	0,005
2004	0,888	0,032	0,847	0,052	0,866	0,028	0,849	0,009
2005	0,886	0,046	0,878	0,021	0,861	0,014	0,860	0,023
Average	0,875	0,038	0,864	0,060	0,861	0,020	0,848	0,009

As can be seen from the Table 3, the standard deviations are especially high for Finland. There are two reasons for this; 1) the sample size for Finland is only three banks, and 2) the most efficient bank was a Finnish one in a few of the years investigated, which also increases the standard deviation. The standard deviations are even higher for Finnish banks' efficiencies when measuring the profit efficiencies (see Table 4).

The banking service efficiencies listed in the Table 3 are demonstrated in Picture 5. There are no major differences in banking service efficiencies between the countries' development and the average figures do not differ much. Denmark has been in a slight lead for almost the whole sample period. The Finnish banks have performed well during 2001–2003, and almost reached the level of the Danish banks by the end of the sample period. The graphs for Norway and Sweden have been very similar during the whole sample period. The Norwegian banks have performed a little better the whole time, but at the end of 2005 there seems to be no difference left between these two countries.



Picture 5. Country-Specific Banking Service Efficiencies.

In general, banking service efficiencies in all the countries seem to act quite similarly during the sample period and no significant differences between the countries seem to exist. It is hypothesized that

H1: Banking service efficiencies differ between the Nordic countries.

F-test is used to detect the possible statistically significant differences between the means of banking service efficiency figures in each country. It is found that there are no differences between the countries at 0.01 level, which is the confidence level used in this study. Very small differences are found between some countries at 0.05 level (see Appendix 3), but in general it can be stated that on average the banks perform the same in all the Nordic countries when it comes to banking service efficiency. At 0.01 level some differences in variances can be found ($p = 0.016$, see Table 4), but at 0.05 level they are found to be equal. Based on the test results, H1 is rejected and it is stated that

there are no statistically significant differences in BSE figures between the Nordic countries.

Table 4. Test of Homogeneity of Variances.

	Levene Statistic	df1	df2	Sig.
BSE	3,900	3	36	,016
PE	5,546	3	36	,003

7.1.2. Country-Specific Profit Efficiencies

Profit efficiencies are listed for each country separately just like the banking service efficiencies were in Chapter 7.1.1. Table 5 presents the means and the standard deviations for the profit efficiencies of the banks for the ten-year sample period covering the years from 1996 to 2005.

Table 5. Profit Efficiencies in the Nordic Countries.

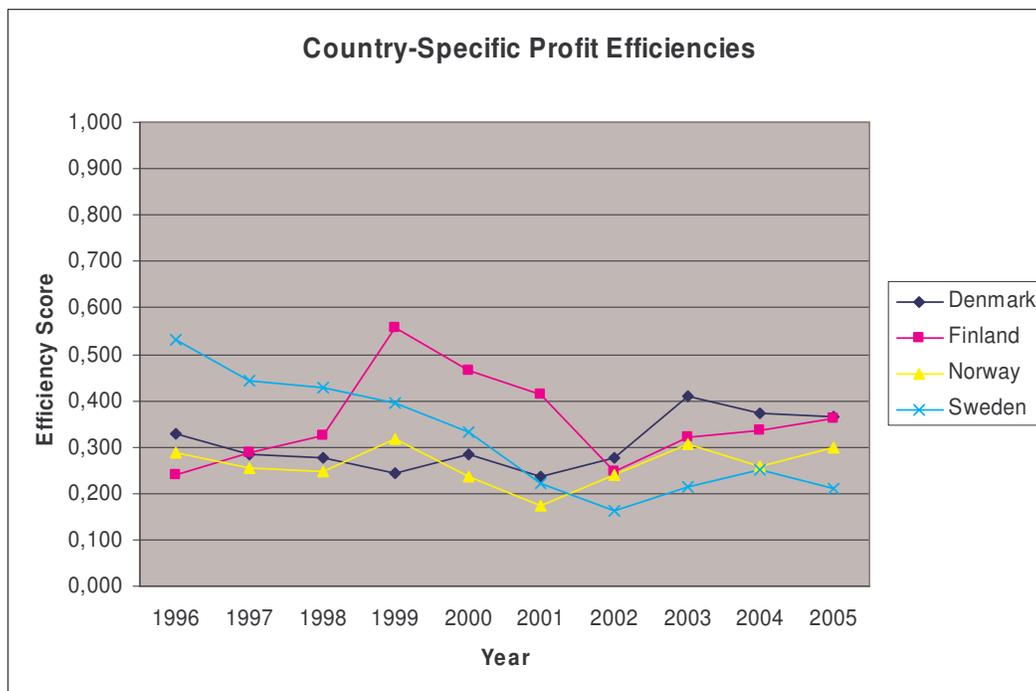
Year	Denmark		Finland		Norway		Sweden	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
1996	0,327	0,148	0,241	0,169	0,286	0,071	0,530	0,332
1997	0,285	0,151	0,287	0,209	0,255	0,084	0,442	0,318
1998	0,278	0,124	0,324	0,393	0,249	0,093	0,428	0,320
1999	0,245	0,113	0,559	0,624	0,318	0,122	0,394	0,252
2000	0,285	0,129	0,466	0,293	0,238	0,064	0,333	0,200
2001	0,238	0,119	0,415	0,361	0,172	0,133	0,220	0,167
2002	0,276	0,116	0,248	0,147	0,239	0,189	0,164	0,139
2003	0,408	0,124	0,321	0,010	0,308	0,141	0,214	0,134
2004	0,373	0,128	0,336	0,099	0,257	0,080	0,252	0,156
2005	0,364	0,172	0,363	0,223	0,298	0,087	0,212	0,100
Average	0,308	0,132	0,356	0,253	0,262	0,106	0,319	0,212

The mean levels of profit efficiencies vary quite much from year to year, as was already noticed when the combined profit efficiencies of the Nordic countries were presented.

The standard deviations are the highest for Finland, just as they were also in the case of banking service efficiencies. The reasons for that are the same as presented previously; small sample size and one exceptionally efficient unit increase the standard deviations.

The average profit efficiency has been the highest in Finland during the ten-year period, whereas Norwegian banks have performed the poorest. The development of country-specific profit efficiencies are demonstrated in Picture 6.

As explained earlier when the profit efficiencies were studied as averages for the Nordic countries, the efficiency scores are quite volatile and are following the market movements. As Picture 6 presents, all the countries' graphs move mainly into the same direction. Sweden is an exception, as it started as a most efficient and ended up in the last place among the Nordic countries at the end of the sample period. In all the other three countries in the sample the development has been the opposite; in all of these countries the banks have been able to improve their profit efficiencies during the sample period.



Picture 6. Country-Specific Profit Efficiencies.

The negative development in the profit efficiencies in Sweden can be explained by massive changes in the banking market during the sample period. The banking sectors in all the Nordic countries have gone through changes lately, but in no other country have the changes been as outstanding as in Sweden. There have been numerous mergers and acquisitions in Sweden during the years investigated, which have temporarily decreased the profit efficiencies in banking. As the new corporations are functioning flawlessly the efficiencies are expected to grow.

Mergers and acquisitions have been common also in the other Nordic countries, but the scale has been much smaller than in Sweden. Also not all the national changes in the banking markets are affecting the efficiencies, because the banks are categorized according to their country of origin. Therefore for example all the arrangements done to create Nordea in Denmark, Finland and Sweden are lowering the efficiency scores for Sweden, because it is Nordea's country of origin. This can be assumed to have had a significant impact on the efficiency figures in Sweden, because Nordea is such a big operator in the Nordic banking market. However, as mentioned earlier, the impact is believed to be temporary and in the long run the efficiency figures are expected to end up at the same level as in the other Nordic countries.

The country-specific differences between the mean levels of PE are tested by hypothesizing

H2: Profit efficiencies of the banks differ between the Nordic countries.

The differences are investigated by using F-test. No differences are found at 0.01 level nor at 0.05 level between the means in different countries (see Appendix 3 for the results). The means in general vary more than when considering BSE, but no country-specific differences can be found. The variances, however, are not equal in all the countries ($p = 0.003$, see Table 4). H2 is rejected and it is stated that profit efficiencies do not differ between the Nordic countries.

7.2. Linking Efficiencies to Stock Returns

Up to now the banking service and profit efficiencies have been considered without linking them to market returns. It is expected, that a semi-strong form efficient market reflects all publicly available information, including information about profit and banking service efficiencies. Therefore changes in the efficiency figures should have an effect on the stock returns so that as the efficiency improves, also the stock returns increase. It is hypothesized:

H3: Banking service efficiency has a positive effect on the bank's stock returns.

H4: Profit efficiency has a positive effect on the bank's stock returns.

The hypotheses H3 and H4 are tested by using a model, which takes the general form

$$(14) \quad R_{it} = \beta_i E_{it} + \varepsilon_{it}$$

where R_{it} = capital-adjusted stock returns,
 E_{it} = percentage change in banking service or profit efficiency scores between year $(t - 1)$ and t ,
 ε_{it} = random error term.

The subscript i notes different market returns are applied to the banks with different financial years. The basic idea of the model is, that it assumes that capital adjusted stock returns R_{it} are affected by changes in efficiency levels. The changes in efficiency are measured by comparing the previous year's level to the efficiency level of the year investigated. If the efficiency has improved, also the stock return should be better than it was the last year, and vice versa. Capital-adjusted stock returns R_{it} are calculated as

$$(15) \quad R_{it} = \frac{\text{stock return}}{\text{market value of the stock}}$$

Stock returns consist of an increase in the market value of the stock during the year investigated and the paid dividend. Market value of the stock is measured by using the year-end value for each stock. By comparing the returns with the amount of capital invested they are made comparable with each other.

The descriptive statistics of the sample used are presented in Table 6. As can be seen, the values of stock returns vary a lot. The values presented consist of the change in the stock price and the paid dividend. Some banks have even had negative return figures, while others have managed to gain great returns. Banking service efficiency figures are not varying as much as the profit efficiency figures, as can be noticed from the standard deviations. Some banks with negative returns were signed a profit efficiency score of 0.0, while the lowest score for banking service efficiency was 0.77.

Table 6. Descriptive Statistics of the Sample Used.

	N	Minimum	Maximum	Mean	Std. Deviation
Stock return	459	-18,763	131,940	7,211	14,222
BSE	459	,771	1,000	,869	,035
PE	410	,000	1,000	,304	,154
Valid N (listwise)	410				

The efficiency figures' effect on the returns per stock in banking branch is being estimated by calculating the correlations between these variables. Pearson correlation coefficient is used to estimate the correlations, which are presented in Table 7. The correlation matrix shows that both banking service efficiency and profit efficiency are linearly dependent on the earnings per share of the banking firm. The correlation between banking service efficiency and capital-adjusted stock returns is 0.342, which is statistically significant at the 0.01 level. The correlation between profit efficiency and capital-adjusted stock returns is 0.336 and also significant at the 0.01 level.

Table 7. Correlations between the Variables Used.

		Stock re- turn	BSE	PE
Stock return	Pearson Correlation	1		
	Sig. (2-tailed)			
	N	459		
BSE	Pearson Correlation	,342(***)	1	
	Sig. (2-tailed)	,000		
	N	459	459	
PE	Pearson Correlation	,336(**)	,394(***)	1
	Sig. (2-tailed)	,000	,000	
	N	410	410	410

*** Correlation is significant at the 0.01 level (2-tailed).

Banking service efficiency and profit efficiency also correlate with each other, which was expected because they use the same input combinations and are both measuring efficiency. It is natural that a bank that is efficient when banking services are measured is also efficient in making profit. However, this is not necessarily always the case and therefore two different measures of efficiency were used in the first place.

Pearson correlation coefficients presented in Table 7 showed that the correlation between BSE and PE is 0.394 and significant at 0.01 level. Therefore the existence of multicollinearity needs to be tested to be sure it does not impact the results of the linear regression. Normal situation, i.e. no multicollinearity is assumed in the linear regression, and in case it would exist the results might be affected by it. Multicollinearity means that the independent variables used in a regression correlate strongly with each other. The existence of multicollinearity is measured by using variance inflation factor (VIF), which measures the level of multicollinearity. These test results are shown in Table 8. When VIF is high there is a high multicollinearity between the independent variables. The minimum value for VIF is 1. In this data the VIF figures are low and therefore multicollinearity is shown not to be a problem in the regression model used. (Metsämuuronen 2005: 594.)

The same model is used for measuring both banking service and profit efficiencies. The figures for both efficiency measures are calculated as has been described earlier, and

here the efficiency figures are compared with stock returns. The model presented in Equation 14 is used in the regression model and it takes the specified form

$$(16) \quad R_{it} = \beta_0 + \beta_1 \text{BSE} + \beta_2 \text{PE} + \varepsilon$$

where $\beta_0 = \text{constant}$,

BSE = percentage change in banking service efficiency scores between year $(t - 1)$ and t ,

PE = percentage change in profit efficiency scores between year $(t - 1)$ and t ,
and

$\varepsilon = \text{random error term}$.

The set hypotheses H3 and H4 are tested by using linear regression and the results are presented in Table 8. It is found that banking service efficiency and profit efficiency together explain 17.2 % of the changes in the stock returns of banks investigated. The results are significant at 0.01 level.

Table 8. The Results of the Linear Regression.

Model 1	Model Summary	ANOVA(b) Regression	Coefficients(b)			
			Unstandardized coefficients		t	Collinearity Statistics: VIF
			B	Std. Error		
R	,414(a)					
R Square	,172					
Adjusted R Square	,168					
Std. Error of the Estimate	12,338					
F		42,160				
Sig.		,000(a)				
(Constant)			-90,922	16,542	-5,496(***)	
BSE			105,505	19,622	5,377(***)	1,183
PE			20,393	4,315	4,726(***)	1,183

a Predictors: (Constant), BSE, PE

b Dependent Variable: Stock return

*** significant at the .01 level

The regression model coefficients can be interpreted so that when the banking service efficiency increases by 0.105 %, the stock return increases by 1 %. Respectively, an increase of 0.02 % in the profit efficiency increases the stock returns by 1 %.

The effects of the explaining variables are also tested separately. The following model is used to test the effect BSE has on stock returns:

$$(17) \quad R_{it} = \beta_0 + \beta_1 \text{BSE} + \varepsilon$$

Respectively, it is tested whether PE has a significant effect on stock returns by employing the regression

$$(18) \quad R_{it} = \beta_0 + \beta_1 \text{PE} + \varepsilon$$

The variables in the equations are the same as explained earlier in Equation 16. It is found that both efficiency measures explain also by themselves significant amounts of stock returns. R square for BSE model is 0.117 and for PE 0.113. As can be seen from the Table 7, the R square for the model using the both efficiency figures as explaining variables is 0.172. It can be concluded that even though the both efficiency measures are significant in explaining the stock returns also by themselves, they also have some synergy. Therefore including two efficiency measures to the model is shown to be reasonable.

The set hypotheses are tested by using two methods; correlations and regression. Both methods indicate that banking service efficiency and profit efficiency explain a statistically significant portion of the stock returns. The correlations were showed to be statistically significant at 0.01 level, and the regression analysis also gives significant factors for the variables. The coefficients for both BSE and PE are significant ($t = 5.377$, $p = .000$; $t = 4.726$, $p = .000$). Based on the two methods used both hypotheses, H3 and H4, are accepted.

It is also tested if BSE and PE are influenced by earnings to make sure the efficiency figures are not measuring the same matter as the earnings represent. Earlier research (see e.g. Setiono & Strong 1998) has found out that earnings have a positive effect on stock returns, and that future stock returns can be predicted by using earnings. It is hypothesized that

H5: Earnings are affecting the level of banking service efficiency.

H6: Earnings are affecting the level of profit efficiency of a bank.

The possible effect earnings could have on efficiency measures is tested by using the following linear regression model:

$$(19) \quad \text{EBIT} = \beta_0 + \beta_1 \text{BSE} + \beta_2 \text{PE} + \varepsilon$$

where EBIT = Earnings Before Interest and Taxes.

The results indicate that the earnings have no statistically significant effect on the efficiency figures at 0.01 level nor at 0.05 level. Also the correlations between these variables were tested, and they found to be below and not statistically significant. Because no statistically significant results were found, the more specific describing of the results is being cropped out of this thesis.

Even though both earnings and efficiency measures explain changes in the stock returns, they are not dependent on each other. Therefore, both hypotheses H5 and H6 are rejected and it is shown that even though earnings and efficiency both have an effect on stock returns, they are not in relation with each other.

8. SUMMARY AND CONCLUSIONS

As has been proved by many researchers, banking as a business differs somewhat from other fields of business and the functioning of the banking market is therefore at least in the interest of investors, researchers and bank managers. The banking market has developed a lot during the past couple of decades. The major changes in the Nordic banking market have been its internalization, technological development and changes in the legislation.

The goal of this thesis is to investigate the banking efficiency in the opened and competitive Nordic banking market and to find out whether there is a dependency between stock return and efficiency. Efficiency is measured by using two different models, banking service efficiency and profit efficiency. Both the models use the same combination of inputs, but the outputs differ from each other.

Two hypotheses are set for investigating whether changes in efficiency figures have an effect on stock returns. One states that there is a dependency between banking service efficiency and stock returns and the other hypothesis suggests that there is a dependency between profit efficiency and stock returns (H3 and H4).

Also efficiencies between the Nordic countries are compared, but no major differences are found between these four countries (H1 and H2). The levels of the efficiency figures and their development have been quite similar in all the countries during years 1996–2005.

The effect banking service efficiency and profit efficiency have on stock returns are investigated by using Pearson correlation coefficient and a regression model. The effect of these two efficiency figures is tested also separately. It is found that the both measures explain significant amounts of changes in stock returns also by themselves, but they also have some synergy. Also previous studies have found similar results.

There is a lot of field for new research left concerning the banking performance. The efficiency's impact investigated here is able to explain only a limited amount of the changes in stock returns and it can be assumed that adding more variables into the model could improve its explanatory power. Previous studies have proved that for example the bank's size and location have an effect on the performance, but the significance of these factors in the small Nordic banking markets is still to be investigated. Some other studies, however, found that such factors are not explaining statistically significantly the changes in the stock returns. It would be interesting to study if the explanatory power could be increased by adding new factors or if other more covering efficiency measures could be developed to survey banking efficiency in the Nordic countries.

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APPENDICES

Appendix 1. Example of a Bank's Balance Sheet (Mishkin 2003: 212).

Assets (Uses of Funds)*		Liabilities (Sources of Funds)	
Reserves and Cash Items	1	Checkable deposits	10
Securities		Nontransaction deposits	
Treasury bills	15	Small denomination time deposits (< € 100,000) + savings deposits	48
Other eligible bills	7	Large-denomination deposits	11
Loans		Borrowings	23
Commercial and industrial	18	Bank capital	8
Real estate	35		
Consumer	6		
Interbank	11		
Other	2		
Other assets (e.g. physical capital)	5		
Total	<hr/> 100	Total	<hr/> 100

* In order of decreasing liquidity.

Appendix 2. List of Banks Included in the Study.

	The Name of the Bank	Country Code
1	Amagerbanken A/S	DNK
2	Bonusbanken A/S	DNK
3	Danske Bank A/S	DNK
4	Diba Bank A/S	DNK
5	Djurslands Bank A/S	DNK
6	Egnsbank Han Herred A/S	DNK
7	Fionia Bank A/S	DNK
8	Forstaedernes Bank A/S	DNK
9	Gronlandsbanken A/S	DNK
10	Hadsten Bank A/S	DNK
11	Hvidbjerg Bank A/S	DNK
12	Jyske Bank A/S	DNK
13	Kreditbanken A/S	DNK
14	Laan & Spar Bank EM A/S	DNK
15	Lokalbanken I Nord A/S	DNK
16	Lollands Bank A/S	DNK
17	Max Bank A/S	DNK
18	Mons Bank A/S	DNK
19	Morso Bank A/S	DNK
20	Nordfyns Bank A/S	DNK
21	Nordjyske Bank A/S	DNK
22	Norresundby Bank A/S	DNK
23	Ostjydsk Bank A/S	DNK
24	Ringjobing Bank A/S	DNK
25	Ringjobing Lndobk A/S	DNK
26	Roskilde Bank A/S	DNK
27	Salling Bank A/S	DNK
28	Skaelskor Bank A/S	DNK
29	Skjern Bank A/S	DNK
30	Spar Nord Bank A/S	DNK
31	Sparbank Vest A/S	DNK
32	Sparekassen Faaborg A/S	DNK
33	Svendborg Sparekasse A/S	DNK
34	Sydbank A/S	DNK
35	Tonder Bank A/S	DNK
36	Totalbanken A/S	DNK
37	Vestfyns Bank A/S	DNK
38	Vestjysk Bank A/S	DNK
39	Vinderup Bank A/S	DNK
40	Vordingborg Bank A/S	DNK

41	Alandsbanken PLC	FIN
42	OKO Bank PLC	FIN
43	Sampo PLC	FIN
44	Aurskog Sparebank ASA	NOR
45	DNB Nor ASA	NOR
46	HOL Sparebank ASA	NOR
47	Indre Sogn Sparebank ASA	NOR
48	Melhus Sparebank ASA	NOR
49	NES Prestegjeld Sparbanken	NOR
50	Ringerike Sparebank ASA	NOR
51	Sandnes Sparebank ASA	NOR
52	Sandsvaer Sparebank ASA	NOR
53	Sparebanken Midt-Norge ASA	NOR
54	Sparebanken More ASA	NOR
55	Sparebanken Nord-Norge ASA	NOR
56	Sparebanken Oest ASA	NOR
57	Sparebanken Pluss ASA	NOR
58	Sparebanken Rogaland ASA	NOR
59	Sparebanken Vest ASA	NOR
60	Sparebanken Vestfold ASA	NOR
61	Storebrand ASA	NOR
62	Totens Sparebank ASA	NOR
63	Voss Veksel ASA	NOR
64	HQ Bankaktiebolag AB	SWE
65	Nordea Bank AB	SWE
66	Skandinaviska Enskilda Banken	SWE
67	Svenska Handelsbanken AB	SWE
68	Swedbank AB	SWE

Appendix 3. Multiple Comparisons of Country-Specific BSE and PE figures.

Dependent Variable: BSE mean

Bonferroni

(I) country	(J) country	Mean Difference (I-J)	Std. Error	Sig.
DNK	FIN	,010	,005	,196
	NOR	,014(**)	,005	,029
	SWE	,027(**)	,005	,000
FIN	DNK	-,010	,005	,196
	NOR	,004	,005	1,000
	SWE	,016(**)	,005	,007
NOR	DNK	-,014(**)	,005	,029
	FIN	-,004	,005	1,000
	SWE	,013	,005	,053
SWE	DNK	-,027(**)	,005	,000
	FIN	-,016(**)	,005	,007
	NOR	-,013	,005	,053

** The mean difference is significant at the .05 level.

Dependent Variable: PE mean

Bonferroni

(I) country	(J) country	Mean Difference (I-J)	Std. Error	Sig.
DNK	FIN	-,048	,039	1,000
	NOR	,046	,039	1,000
	SWE	-,011	,039	1,000
FIN	DNK	,048	,039	1,000
	NOR	,094	,039	,127
	SWE	,037	,039	1,000
NOR	DNK	-,046	,039	1,000
	FIN	-,094	,039	,127
	SWE	-,057	,039	,918
SWE	DNK	,011	,039	1,000
	FIN	-,037	,039	1,000
	NOR	,057	,039	,918