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The Estonian stock market's readiness for option introduction

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Abstract

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Keywords: Option introduction, stock market development, Estonia.

Purpose: The purpose of this thesis is to find out whether or not the Estonian stock market is developed enough for introduction of a market for standardized options on index and stocks. This will be conducted through comparing the stock market development in Estonia today with the corresponding situation in Denmark, Hungary and Norway at the time of their introduction of trade in standardized options.

Conclusions: Our conclusion is that Estonia's stock market is less developed than the benchmark countries at the time of their option introduction. Especially the significantly lower turnover constitutes an obstacle. The capitalization measured as an absolute number and the number of listed firms are also lower in the case of Estonia. The volatility is comparable to the other countries in the comparison. However, the three first aspects indicate an insufficient degree of stock market development, making the Estonian stock market not ready for option introduction.

BRIEF CONTENT

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1. Introduction

In this chapter we will present the background, purpose and delimitations of the study. The chapter is finished with a brief outline of the thesis.

1.1. Background

The last two decades, large parts of the world have experienced an incredible development in the financial markets. The growth of the financial derivatives markets in general and option markets in particular have been one major part of this development. We believe that the suppliers and consumers of capital, the investors and corporations respectively, can benefit from higher developed and more efficient capital markets. Also, the rest of the society can benefit from financial development through the strong support it gives to economic growth.

Given the beneficial impacts of option markets, there must be another, or perhaps rather *some* other, explanations why many countries still lack such markets. When looking for these reasons, it is intuitively reasonable to look at the environment of the option market. The ability to build up a well functioning option market is dependent on several aspects of the environment, in which the exchange has to function.

This thesis will mainly focus on the development of the stock market, since we believe that a well-developed stock market is an important prerequisite to introduce an option market. As is the case in all business the customers' demand is what decides the market's potential. In this case, it is the investors' need for allocating risks using the option market that is crucial. This ought to be dependent on how developed the stock market is. The empirical investigation of this thesis will therefore look at stock market development only.

Other aspects of the environment, such as the banking system, regulatory framework, technological development and the market participants' knowledge, will be discussed in the theory part of the thesis. The last two issues are perhaps more closely related to the time perspective of the environment. When introducing an option market today, some 10-15 years later than most countries in the Western World, opportunities to exploit improvements in technology and to avoid some of the mistakes done earlier in the more mature markets arise.

Since the beginning of the 1990s, the formerly communist countries in Eastern Europe have been rebuilding their societies into liberal market economies, like the ones in the Western World. An important part of this transition is the construction of financial markets. Relatively short after the political turmoil in the early 1990s, most countries in Eastern Europe established stock markets. Today, most countries in the Western World have domestic exchanges for options trade. In Eastern Europe, however, many countries still lack such markets. Among those are the three Baltic States Estonia, Latvia and Lithuania.

For these reasons we wanted to study the degree of stock market development in the Baltics and compare it to other stock markets at the time of their option introduction, in order to find out whether the Baltic markets are developed enough for introduction.

Since 1999, the three Baltic stock exchanges are running a cooperation that has, among other things, resulted in joint international marketing efforts of the stock markets and a common list

consisting of the 15 largest firms in the region.[1] The aim of the project is to harmonize the three markets into one stock market. We do not think that the cooperation is thorough enough for the stock markets to be considered as merged, partly because the cooperation has not yet resulted in a common trading system.

When looking at each of the Baltic stock markets' capitalization and turnover in table 1.1, it is obvious that Estonia is superior compared to the other two countries, both measured in terms of capitalization and turnover. When it comes to number of listed firms on main and secondary lists, Vilnius scores significantly higher than Tallinn. Taken together, we consider Tallinn's higher capitalization and turnover more than compensates the number of firms. Furthermore, when looking at the individual companies, the two largest, both in terms of capitalization and turnover, are Estonian. Hence, of the three Baltic States, we decided to study the Estonian stock market's readiness for option introduction.

Table 1.1. *Indicators of the Baltic stock markets' development.*

	Tallinn	Riga	Villnius
Capitalization, USD million	2 327	737	1 509
Turnover in 2002, USD million	271	201	184
Number of listed firms on main and secondary list	14	13	47

Source: Baltic Stock Exchanges' Monthly Factbooks in 2002 and Bloomberg

1.2. Purpose of the study

The purpose of this thesis is to find out whether or not the Estonian stock market is developed enough for introduction of a market for standardized options on index and stocks. This will be conducted through comparing the stock market development in Estonia today with the corresponding situation in Denmark, Hungary and Norway at the time of their introduction of trade in standardized options.

1.3. Delimitations of the purpose

By taking into account every aspect of the environment that influence the potential of an option introduction, a vast amount of research and information has to be treated. Therefore, to make a study like this feasible, some limitations have to be made.

The empirical study will deal with stock market development only. The other factors deciding the stock market's readiness for option introduction, such as the banking system, regulatory framework, knowledge and technical improvements, will only be presented and discussed in the theory part of the thesis. Other aspects, as well as details in the law systems, will not be investigated.

[1] www.baltic-exchanges.com

1.4. Outline of the thesis

The presentation of the remaining part of this thesis is structured as follows.

Chapter 2 will present and explain the method used in this thesis. Motivations for the choice of method will also be given.

In chapter 3, the option markets impact on the economy in general and the stock market in particular will be discussed in order to provide a background, introduction and motivation for this topic of this thesis: option market introduction.

Chapter 4 will present and discuss the research made on the prerequisites for option introduction. The chapter is subdivided into five parts; banking system, regulatory framework, technology, knowledge and stock market development.

The conclusions from the theory about stock market development will be the base for the empirical study in chapter 5, where the Danish, Hungarian and Norwegian stock market development at the time of option introduction will be studied. To compare, the corresponding contemporary figures for Estonia will be presented. The indicators of stock market development used in this study are the stock markets' capitalization, volatility, turnover and number of listed firms.

In chapter 6 we will analyze and compare the findings regarding the indicators from chapter 5, in order to answer the question whether the Estonian stock market is developed enough for option introduction.

Finally, chapter 7 presents the conclusions drawn from the analysis. Suggestions of further research within the same topic are also given.

2. Methodology

The method is a tool that is necessary, but not sufficient, to fulfill the purpose of an investigation.[2] To facilitate the understanding of the thesis, we will here describe the method we have chosen.

2.1. Choice of method

A scientific method can roughly be divided into two different categories: quantitative and qualitative method.[3] Even though there is no distinct difference between them, some important characteristics differ. Quantitative method is aimed at finding concrete information like resemblances and averages out of a large number of samples. Qualitative method, on the other hand, concentrates on fewer and more thorough observations in order to reach comprehension.

The two methods mentioned above do not exclude each other and can accordingly well be used in combination.[4] The method used in this thesis can be described as a combination of a quantitative and qualitative method. Only four stock markets are investigated through the use of several aspects. In that sense the method is qualitative. Each stock market's liquidity is measured in terms of turnover, calculated by the use of a large sequence of figures. An alternative method could be to make tests or interviews with investors in order to find out the liquidity. The first of these two methods, i.e. the one we have chosen, can be described as a quantitative method.

2.2. Data collection

In order to provide a perspective on the information that the thesis is based on, we will here describe the process of data collection. In this subsection and the following, we will separate primary data from secondary. Generally, we consider data that is not processed as primary data and other data secondary, although the line of demarcation is not absolutely clear. Very few types of data are not processed in any way. Thus, the strictly literal interpretation of this is not feasible; the separation is rather a matter of degree.

2.2.1. Primary data

The stock market data was gathered by using the major databases for such purposes: EcoWin, Bloomberg, Reuters, Six Trader and Six Trust. Also the involved companies' annual reports and investor relation departments helped us find information about the market conditions at the time of option introduction.[5] General information about the companies and their option introduction was found in the companies' annual reports and web sites. GDP and population figures were found in International Monetary Fund's International Financial Statistics.

[2] Holme and Solvang (1991)
[3] Ibid.
[4] Ibid.
[5] For a complete list of our correspondence with involved companies and stock exchanges, see References

Finally, when translating all figures in domestic currency to US Dollar, exchange rates from Bloomberg were used.

The stock markets' capitalization figures were calculated by the nearest available figure, adjusted to the exact day of introduction by the movements of the market's index. The turnover of the markets are the value of all trades in the same calendar year as the introduction. Regarding Estonia, no data for the entire year 2002 is published yet. We calculated the turnover using extrapolation of the eleven first months. Thus, for this figure to be correct, we assume the turnover in December 2002 to be equal to the average of the other months in 2002. The volatility is measured as the index's standard deviation as a percentage of the average on a daily basis the year preceding the day of option introduction. In the case of Estonia, the volatility is measured the same way for the entire year 2002.

The figures of the companies' capitalization were calculated by the use of the nearest available figure, adjusted to the introduction day by the movements in the stock price and possible new share issues. For the companies, the yearly turnover was calculated for the entire year preceding the introduction by the use of data from Bloomberg and Reuters. The volatility was calculated the same way as for the market, but with stock price instead of the index value.

2.2.2. Secondary data

When searching for relevant theory we have mainly used bibliographical databases like ELIN, Electronic Library Information Navigator, provided by Lund University Library. Also ABI/Inform and JSTOR were used in order to gain access to most of the major journals within economics and finance. Ordinary search engines on the Internet have also been used to find research working papers not published in any journals, e.g. the World Bank's Policy Research Papers.

2.3. Criticism of sources

Generally, no information can be guaranteed to be entirely free from biases or errors. By being aware of the possible sources of errors, the problem it causes can be mitigated.

2.3.1. Validity

Validity refers to the absence of systematic errors in measurement. Possible sources of such errors are the use of data that are correct but irrelevant for the study.[6]

2.3.1.1. Primary data

When making a study, one can always find different data and ways of processing that data. To the extent we have used data and methods that are not optimal in each case, the validity is less than perfect. We believe that the validity is sufficiently high for the purpose of the study. For instance, when measuring volatility, we could have used a more sophisticated measure like rolling standard deviation. However, that would require much more work in terms of data

[6] Lundahl and Skärvad (1999)

collection and processing and we believe that the benefit it would add to this study is insignificant.

2.3.1.2. Secondary data

There is a risk that the existing research used in this study is not relevant for the study's purpose. Specially, this risk has to be considered when the amount of research in the exact same area is limited and research with another perspectives for that reason is used, as is the case with this study. By always bearing the different perspective in mind, we think that this problem is mitigated and the study has a sufficiently high level of validity regarding secondary data.

2.3.2. Reliability

Reliability means absence of random errors in measurement. The concept is crucial for a study like this, since data that is incorrect might be detrimental for the findings.[7]

2.3.2.1. Primary data

In the gathering of primary data, we have used EcoWin, Bloomberg, IMF, Reuters, SIX Trader and SIX Trust. These are databases that are all well known and accepted as sources by researchers and practitioners. Accordingly, we consider the reliability of the primary data sufficiently high.

2.3.2.2. Secondary data

There is always a risk that the information gathered from previous research is incorrect or biased. The use of research published in major journals, recognized for its credibility and acceptance in the academic community, vouch for reliability. So do the use of research from international organizations like International Finance Corporation and The World Bank.

To a large extent we have used several different sources in the same topic. By doing this, the sources of errors and biases are further mitigated. For example, section 4.6 uses ten sources in order to get a wide selection of measures of stock market development.

[7] Lundahl and Skärvad (1999)

3. The benefits of option markets

Before we start the discussion about the prerequisites for option introduction, we will look at the possible ways by which an economy can derive advantages from an option market. This chapter is not aimed at options as instruments, but the market for standardized options. The social usefulness of an option market may be somewhat difficult to grasp. Therefore, this chapter will bring up a discussion on the option market's potential benefits and problems to the economy, with the main focus on the results from empirical studies of the effects on the underlying markets. By this, we intend to give a background and introduction to this topic, as well as a motivation for why we chose to study introduction of option markets.

Today, there is a wide agreement that introduction of trade in options, at least to some extent, influence the markets for the underlying assets, which in turn have implications in a broader sense. For instance, stock options influence the volatility, liquidity and price of the underlying stocks.[8] The stock market in turn, influences the entire macro economy through corporate finance and investments. This sequence will be the basis for the presentation in this chapter that starts with an introduction, followed by a section describing the theoretical and empirical research made within the topic of option market's impact on the underlying stock market. In the end of this chapter we will take a broader perspective to the issue and discuss the impact on the macro economy.

3.1. Introduction

An option is a right but not an obligation to buy or sell an asset at a given price. The purpose of the option as a product is to transfer risk from investors not willing to bear the risk connected to the underlying asset, to investors who want to earn a premium for taking that risk. Options that are not traded on markets are called over-the-counter (OTC) options and are tailor made for each customer by banks or other financial institutions. The options contracts traded on markets have to be highly standardized in order to attract enough traders to attain the necessary level of turnover and liquidity.[9] The OTC market for options always includes some degree of counterpart risk. In the market environment of an option exchange, the clearinghouse acts as counterpart for both parts and takes care of the risk. Mark-to-market mechanism, a way to reset the balance each day, reduces the obligation and that way mitigates the counterpart risk faced by the exchange.[10] Basically, the function of option markets is to increase the liquidity and price transparency and that way facilitate the risk transfer between market participants.[11] The extent to which the option markets manage to fulfill this function has been subject to many investigations, both empirical and theoretical.

In some of the most dramatic financial breakdowns in the 1990s, options played a crucial role. This has lead to a common impression of options as gambling, albeit more seldom seen in academic research. Melamed pointed out that the fundamental difference between options and gambling is that gambling *creates* risks, while options *allocate* risks that already exist.[12] The

[8] See, for instance Conrad (1989)
[9] Hull (2000)
[10] Tsetsekos and Varangis (1997)
[11] Ibid.
[12] Melamed (1997)

risks are inherent in business, i.e. in the companies or countries involved, regardless of option markets.

3.1.1. Bodie and Merton's financial innovation spiral

Bodie and Merton described the financial evolution in general and the securitisation of instruments in particular as a financial innovation spiral.[13] The basis of the theory was that financial intermediaries and markets not only compete, but also complement each other. Financial intermediaries are best suited to produce tailor made instruments in small volumes. As the popularity of these instruments increases, so do the trade, standardization, recognition, and the market's ability to correctly value them. As the financial instruments move from intermediaries to markets, the creation of new instruments is necessary for the intermediaries to maintain the base for their profit. To hedge against the risks connected to these newly developed instruments, the financial intermediaries use instruments traded on exchanges, which increase turnover and liquidity on the markets for the newly securitised instruments.

This way, the securities traded on the markets gain larger turnover and liquidity and smaller spreads and transactions costs. The same time, the number of different instruments developed by the intermediaries on the OTC market increases. The two forces work together towards the goal of market completeness where transactions costs are zero, the investors' demand for risk allocation are met and the financial markets channel savings to investments in an optimal way. Subscribing to this view, the launching of option trade appears very urgent, provided that financial development is considered something for the economy to strive towards.

3.2. The impact on the underlying assets

In option theory Black and Scholes contributions are definitely among the most important. In 1973 they launched a formula for option pricing where one of the assumptions was that options are redundant assets in the sense that the same effects can be achieved by formations of positions in the underlying asset.[14] Accordingly, they can be priced with a no-arbitrage relationship, which was the basis for the model. This assumption implies that options can have no impact on the underlying assets. Although the model has gained recognition for its ability to value options, the full validity of the no-arbitrage-assumption has been questioned.[15] Hakansson argued that the introduction of options expands the opportunity set faced by investors, i.e. providing investment opportunities that previously did not exist.[16] Though it is possible to replicate the options by using positions in existing assets, due to transaction costs, it would be too expensive to exploit all the possibilities. The use of derivative instruments reduces the investors' required return and increases the price of the underlying assets. Even if it is not explicitly said in their paper, we believe that Black and Scholes assumption of an option market that cannot affect the underlying stock market is more based on the aim of making the option pricing model valid than on an actual belief about the market. Another assumption for the model is that an option market involves no transaction costs. The same way, this can of course not be regarded as a statement about the option market, but rather an assumption that must be made in order to make the model applicable. This way, the

[13] Crane et. al. (1995)
[14] Black and Scholes (1973)
[15] Conrad's theory on this is briefly presented in section 3.2.1.
[16] Hakansson (1978)

disagreement between Black and Scholes on the one hand and those who question the assumption on the other, does not necessarily have to be that important.

A vast amount of research has been made about the impact from introduction of trade in derivatives on the underlying assets. Some of it will be presented here, subdivided by the different aspects of the impact, although there are interrelations between these aspects. For example, the bid-ask spread stems partly from information inefficiency. Under each of the headings we will briefly present the theoretical research within the topic followed by the empirical evidence.

3.2.1. Stock price

Conrad tested the trustworthiness of Black and Scholes' assumption of no relation between option market and stock market.[17] The argument for this was that the existence of an option market makes it possible for investors to take new positions in the underlying asset. Perold's example of this is probably easier to understand; stocks are safer to own when "insured" with put options. As a result, the stock's demand and price increase.[18]

Damodaran and Subrahmanyam made a summary of earlier investigations covering the impact of option listing on the underlying assets in the US between 1978 and 1988.[19] A common conclusion was a one-time increase in the stock price and a decrease of the required returns in a longer perspective, due to the improved welfare of market participants in terms of available positions.

Conrad's empirical investigation looked at the impact of the option introduction on the underlying stock market in the US between 1974 and 1980.[20] Among the findings was that a permanent increase of the stock price starts, not at the announcement day of the option, but at the day of introduction of trade in the option. The size of the increase was 2 percent on average and positively correlated with the option's trading volume. The positive correlation is in line with the hypothesis that the investors use the option market to manage risk. The more they do that, the larger is the decline in the risk premia on the stock market. The price increase observed was constant over the six-year period of the study, both regarding the timing and the size.

Damodaran and Subrahmanyam's compilation of empirical investigations on this revealed a somewhat different result.[21] The introduction of call options turned out to increase the stock price, while the put options had the opposite impact. A possible explanation for this can be that restrictions of short positions can easily be circumvented using options and that way, bearish market views can be reflected in the price to a larger extent.

[17] Conrad (1989)
[18] Crane et. al. (1995)
[19] Damodaran and Subrahmanyam (1992)
[20] Conrad (1989)
[21] Damodaran and Subrahmanyam (1992)

3.2.2. Stock price volatility

In a study by Sahlström on the impact of option introduction on the Finnish stock market, the stock price volatility is divided into three parts; the intrinsic variance stemming from variance in the fundamental value of the stock, the imperfect price adjustment, and a noise term caused by uninformed traders.[22] Option introduction cannot influence the first source of volatility. However, the other two are results of imperfect markets that can be improved by option trade. By making the stock market more liquid, options can contribute to lower market imperfections and that way lower volatility. If an option market can improve the information efficiency, the volatility will also be lowered.

The results from Damodaran and Subrahmanyam's survey contain some different conclusions.[23] DeTemple and Selden showed that when an option is introduced, it opens for two different strategies. Less risk-averse investors, who believe that volatility of the underlying asset will be high, can shift their portfolio from stocks to options. More risk-averse investors with lower volatility expectations do the opposite. These shifts in demand result in a more efficient allocation of risk bearing; the demand for the underlying asset increases with a consequent decline in the volatility of the asset. The opinion that improved risk transfer between market participants decreases the volatility is also supported by Stein, although he points out that there is a risk that uninformed investors can lower the information content in the stock price and that way contribute to higher volatility. Which one of these two forces that is the strongest decides if the volatility will increase or decrease.

Conrad came to the conclusion that the stock price volatility decreased after option trade started.[24] A possible explanation, according to Conrad, could be that the option exchange chose stocks that were "in the limelight" and therefore had a high volatility that was going back to normal the time after the introduction. Using the number of articles in *Wall Street Journal* as a proxy for the public attention to the stock, this did not seem to be the case.

Of eight empirical studies of stock price volatility in Damodaran and Subrahmanyam's survey, seven came to the conclusion that the volatility decreased and one found no statistical change. The authors considered this "very strong evidence" that the volatility decreases.[25]

An investigation on the Mexican option introduction found no change in volatility.[26] Although the result contradict most other studies, it is interesting because it might reveal a peculiarity of relatively small and less developed stock markets. However, the evidence from Sahlström's study of the Finnish market was rather the opposite. In that report, over half of the stocks exhibited a significant decrease in variance. A comparison with a control sample of companies without options but otherwise comparable sizes and other characteristics confirmed the result, since these companies did not experience any differences in volatility during the same time period.

[22] Sahlström (2001)
[23] Damodaran and Subrahmanyam (1992)
[24] Conrad (1989)
[25] Damodaran and Subrahmanyam (1992)
[26] Hernandez-Trillo (1999)

3.2.3. Bid-ask spread

Market makers have to protect themselves against losses to better informed traders and therefore set the spread so that the gains from trade with less informed traders compensates for losses to traders with superior information. This way, information asymmetry within a market increases the bid-ask spread. Thus, if option trade can improve information efficiency and transparency, the spread will decrease.[27]

Sahlström's study of the Finnish stock market showed a decrease in both the bid-ask spread and the adverse information component of that spread.[28]

Kumar, Sarin and Shastri investigated the US stock market between 1983 and 1989 to find evidence on whether listings of derivative securities in general and stock options in particular, have a beneficial or harmful effect on the market for the underlying securities.[29] The examination was accomplished through a comparison of market data of the underlying asset for a 100-day period before the introduction of the option, and data from a 100-day period after the introduction. The results regarding bid-ask spread showed that for the underlying assets the bid-ask spread decreases and the depth[30] increases after the listing of options. These findings indicate higher liquidity in the underlying stock market, i.e. larger trades can be executed at lower transaction costs. The lower spread and the higher depth is also the result of an increased trading volume in the underlying stock, caused by a combination of higher trading frequency and higher average transaction size. The study also found that the adverse selection component of the stocks' spread decreases after options listings. The results are more significant for firms with market capitalization less than the median of the entire sample, indicating that these firms have more to gain on options listings than do larger ones.

In an overview of empirical investigations, Damodaran and Subrahmanyam found that the spread decreased between 15 and 25 percent.[31]

3.2.4. Information transparency

The availability of option instruments allows the market to reflect new information more quickly since investors can adjust their portfolios quicker and with lower transaction costs. The option markets also facilitate the investors' trade on private information so that the quantity and quality of information available about the underlying security increases.[32]

Damodaran and Lim found that prices for securities adjust more quickly to information after option introduction and drew the conclusion that option markets attract participants to collect more information. The number of articles in *Wall Street Journal,* increased significantly after option introduction, giving further evidence of increased information.[33]

[27] Sahlström (2001)
[28] Ibid.
[29] Kumar, Sarin and Shastri (1998)
[30] Depth is the number of bid and ask quotes at each price level
[31] Damodaran and Subrahmanyam (1992)
[32] Kumar, Sarin and Shastri (1998)
[33] Damodaran and Lim (1991)

The majority of the empirical studies presented in Damodaran and Subrahmanyam's article indicates increased information efficiency. For instance, Skinner showed smaller abnormal returns on news about unexpected earnings after the listing of options. Also, he concluded that there were smaller over all reactions to earnings reports after the listing of options. [34]

A study by Jennings and Starks also came to the conclusion that the price of a stock with exchange-traded option adapts faster to information releases about quarterly earnings.[35]

3.3. Influence in a broader sense

The theoretical and empirical research presented in section 3.2 provides rather strong evidence that underlying markets benefit from option trade in terms of lowered volatility and bid-ask spreads, increased information efficiency and price of the underlying stocks. Stock market development however has no value per se, but through the consequences for corporate finance and macro economy, the real benefits of option markets can appear.

3.3.1. Economic growth

An increase in the stock price implies, ceteris paribus, a decrease in the company's cost of capital. As the cost of capital decreases, more investments become profitable and accordingly realized. This way, options trade can lead to higher GDP-growth.

Much attention has been paid to the relationship between financial development and economic growth. In a study of emerging countries Haque, Hauswald and Senbet confirmed the "well-documented positive linkage between finance and growth" and stressed the role of the financial markets rather than institutions.[36] Levine and Zervos investigated the influence on bank and stock market development on economic growth.[37] Using data from 47 countries between 1976 and 1993, they found that stock market liquidity was robustly and positively correlated to short- and long run economic growth. Regarding the other measures for stock market development, namely capitalization, volatility and international integration, their relation to growth was not that clear.

3.3.2. Emerging markets

Between 1992 and 1995 the US pension funds increased their foreign investments from 4,5 to 8 percent of their entire portfolios. To achieve higher diversification, most funds have a target level of 15 - 20 percent. A large part of this can be expected to be invested in emerging capital markets, giving these markets a great opportunity to raise capital to build up their economies. The US investors seeking investments opportunities in emerging countries are likely to require possibility to hedge their investments on derivatives markets.[38]

[34] Damodaran and Subrahmanyam (1992)
[35] Jennings and Starks (1986)
[36] Haque and Hauswald (1999)
[37] Levine and Zevros (1998)
[38] Jorion (1995)

Tsetsekos and Varangis stressed the importance of the message an emerging economy, which is launching an option market, sends to international investors; "here, capitalism is not a dirty word".[39] This might contribute to get rid of a reputation of a hostile environment for companies and that way attract more foreign investments.

3.4. Concluding remarks

We consider the theoretical and empirical evidence of option markets' beneficial impacts on stock markets strong enough to consider introduction of option trade a highly desirable step in financial development for both developed and emerging countries. Bearing this in mind, we can approach this thesis' actual subject and start the discussion on whether or not a financial environment in general and an underlying stock market in particular are developed enough for introduction of an option market.

[39] Tsetsekos and Varangis (1997)

4. Theory

This chapter will present and discuss some of the research that is relevant for the topic of this study. Based on the categorization presented in the first subsection, the following subsections will discuss banking development, regulatory framework, improvements in technology, knowledge and stock market development.

4.1. Introduction

The theory within this topic is quite fragmented and vague. As far as we know, no investigation has been done in this exact area of research. Therefore this is not a replication of earlier research, but rather a new investigation in a quite unexplored area. In this section, the prerequisites mentioned in two studies are discussed rather briefly, simply because the discussions on these issues were limited and not in the studies' main focus.

4.1.1. Jorion's perspective[40]

In a study arranged by the United Nation's Department of Development Support and Management Services, Jorion investigated the implications of taxation on derivatives markets. The paper begins with a rather comprehensive presentation of derivatives markets. There, Jorion's opinion on the prerequisites for a successful introduction of a derivatives market are given. These are:

1) An efficient banking system, which provide a payment system as an artery for any market economy,
2) A regulatory framework, that ensures that capital markets function efficiently and
3) A secondary market in financial assets, money market instruments, bonds and equities, which provide a means to identifying the cost of capital and to allocating capital among competing uses.

4.1.2. Tsetsekos and Varangis' perspective[41]

Tsetsekos and Varangis conducted an investigation for The World Bank of how derivatives exchanges are structured. Even though the main focus was on the microstructure of the exchanges, other aspects of the market were discussed.

4.1.2.1. The market's prerequisites

Tsetsekos and Varangis state the following prerequisites for introduction of a derivatives exchange in an emerging market:

1) Well functioning cash market and credit institutions,

[40] Jorion (1995)
[41] Tsetsekos and Varangis (2000)

2) Many traders and speculators,
3) A legal structure that protect the property rights,
4) The support of the government and policymakers,
5) A clearinghouse with adequate financial resources and
6) Absence of competition from foreign derivatives exchanges.

As can be seen, the prerequisites are to a large extent about the same subjects as Jorion's. The first item here is closely related to the last one of Jorion's prerequisites. Furthermore, Tsetsekos and Varangis' third and forth item are in line with Jorion's claim on the regulatory framework.

Tsetsekos and Varangis stressed the importance of the clearinghouse's financial resources. This might in part be explained by the approach of the study, as its purpose was to study the microstructure of derivatives exchanges. Also, the degree of competition from foreign exchanges is mentioned as an important factor. For instance, the ability to list options on international exchanges like Eurex constitutes a threat to domestic exchanges.

The second prerequisite, many traders and speculators, is connected to, or perhaps rather a result of, all the other issues mentioned. After all, the traders and speculators are the options exchange's customers and no business can make it without customers.

4.1.2.2. The product's prerequisites

According to Tsetsekos and Varangis, some characteristics of the underlying asset are crucial for the success of a derivatives market. These are:

1) High price volatility,
2) Significant amount of money at risk,
3) Significant number of domestic market participants,
4) Large number of producers, processors and banks interested in using the instruments,
5) Weak correlation between the underlying asset and derivatives traded on other exchanges and
6) Homogeneity in product specification, quality and grade.

The first two characteristics are connected to volatility, while the second also is related to capitalization. The next item, market participants, involves both the number of investors and listed firms. These items on stock market development have important resemblances both to Tsetsekos and Varangis' prerequisites regarding the market and Jorion's items above.

The fourth of the characteristics is related to the appropriateness of the microstructure of the exchange. The requirement of weak correlation is more important when it comes to commodity derivatives. In the case of stock options, the demand is always met, except in the cases where the same options are traded on a foreign exchange. To hedge against an unfavorable change in a stock's value, a foreign option on a different stock, even in the same industry, will not provide enough protection. The last item is also more related to commodity derivatives. As stocks are homogenous products by nature, the problem is rather easily solved by specifying the name of the stock.

4.1.3. The effects of liquidity

Scholes pinpointed that options give the holder the possibility to sell, not just to a better price than the spot price, but at all.[42] Thus, in a market with extremely poor liquidity, options can function as a liquidity insurance for the holder. This makes liquidity in the underlying assets important for the option market, but in the opposite direction than what is meant by Jorion, Tsetsekos and Varangis. However, Scholes mentioned this effect in the context of exercise patterns and not option introduction, why the statement can hardly be interpreted meaning that low liquidity in the underlying market is generally beneficial for option markets.

4.1.4. The perspective of the presentation of theory

The items stated above by Jorion will be the basis for this presentation of theory. When taking into account the last decade's development in finance and information technology, it is obvious that the difference between the Estonian stock market today and other stock markets several years ago, not only is a matter of *where*, but also a matter of *when*. The start up of an option market today arises opportunities both to take advantage of improvements in information technology in recent years, and to learn the lessons from the more mature markets and that way avoid their mistakes. To capture this time perspective of the environment, the improvements in information technology and knowledge are added in addition to Jorion's three items; banking system, regulatory framework and degree of development in the underlying market.

4.2. Banking system

In this section the first of Jorion's prerequisites for introduction of a derivative market is handled. A well-functioning banking system is an important precondition for a market to develop. The banking system can be divided into two main areas; the payment system and the clearing and settlement system.

4.2.1. Payment system

The payment system involves the use and provision of card services, cheques, giros and cash.[43] According to Mendelson, an efficient payment system is a prerequisite for a well functioning banking system, in order to reduce the risks in the post-trade settlement process of delivering securities and payments for them.[44] If the market for payment services is to function efficiently, prices should reflect the cost of producing these services. Such prices give users an incentive to choose the most cost-efficient payment instruments and this contributes to an optimal balance between supply and demand for the various types of payment services.[45] Throughout the last decades the use of electronic payment services has gone through an immense growth, which has largely contributed to the decrease in spread between prices for payment services and the cost of producing these services. A further

[42] Engström (2001)
[43] Szegö (1993)
[44] Mendelson and Peake (1993)
[45] www.norges-bank.no

discussion about the electronic progress and its effects on the capital market can be found in section 4.5. An efficient payment system is vital in the development of an equity market, so that high and continuous liquidity can be obtained. This in turn means a better environment in which introduction of derivatives exchanges can be established.

4.2.2. Clearing and settlement system

The second main part of an efficient banking system is interbank systems, i.e. the clearing and settlement system. The organization and management of systems for clearing and settlement is largely dictated by the type of security being settled, by the structure of the banking system, and by laws governing transfers of funds and securities.[46] Large amounts of payments are channeled daily through the clearing and settlement system. Banks' financial exposures in connection with settlement therefore entail considerable risk for the entire payment system.[47] The clearing and settlement procedures are consequently vital when it comes to introducing an option exchange.

4.2.2.1. Involved risks

The design of the system may be a source of systemic risk. Failed trades, arising out of an inefficient clearing and settlement system, do not only put the participants at substantial risk, they create substantial system risk as well, i.e. the risk that financial problems in one institution will spill over to others.[48] The central bank is therefore interested in ensuring that the development and operation of clearing and settlement systems will reduce systemic risk. A clearing and settlement system may also be a source of settlement risk, since the clearinghouse is the counterpart to both the buyer and seller, and thereby discharges any obligations between the parties to the original transaction. To back this guarantee, the clearinghouses require their members to post collateral and to agree to loss-sharing arrangements.[49] It is vital that the clearing organization confirms that the market participants both have the capacity and intention to fulfil their transactions. Such action is crucial to reduce the risk of settlement failure. [50]

The clearing organization can reduce counterpart credit risk by standardizing and simplifying transaction processing between participants and the clearinghouse.[51] Banking services could be built so as to eliminate all risks, except those derived by fraud or by careless management; they can be heavily automated and require minimal skills.[52]

4.2.2.2. Functions

The clearing system handles transaction issues such as reporting, confirmation, matching, reconciliation, and sorting of trades. When it comes to exchanges that already have option trade, the clearing service is generally performed by an organization owned by the exchange, or in some cases by banks and other financial institutions. The settlement system involves the

[46] Crane et al (1995)
[47] www.norges-bank.no
[48] Mendelson and Peake (1993)
[49] Crane et al (1995)
[50] Ibid.
[51] Tsetsekos and Varangis (1997)
[52] Szegö (1993)

exchange of securities for funds. Normally this has been the task for banks and other intermediaries acting as supervisors.[53]

The clearinghouse also formalizes the netting process. Netting means summing up the flows that go from one organization through the clearinghouse and into a different organization, in order to decrease the number and size of transactions, and thereby also decrease the transaction costs and risks. In some countries netting can be controversial considering the tax aspect, since it leaves less of an audit trail to track payment flows. Though it is one of the tasks of a clearing organization to leave an audit trail, this is not always done.[54]

Emerging countries often present a weak legal environment, where individuals and firms in the economy face problems in their contractual arrangements with each other. This gives rise for temptations to renege on a contract given the poor legal support for contract enforcement. In this situation, the derivatives clearinghouse is a vital institution, which enables the functioning of the economy by supplying credit guarantees and producing contract performance. Indeed, the derivatives' clearing corporation is often referred to as a credit guarantee corporation.[55]

In an economy with weaknesses in commercial law, many individuals and firms are kept out of the market place due to their uncreditworthiness[56]. It is therefore important to construct a clearing facility that reconsiders this creditworthiness and thereby possibly acquire new markets participants, which in turn boosts market liquidity and lowers entry barriers in the securities industry. In a strong legal system many of these firms could have fully participated in the economy even without the existence of the clearing organization.[57]

Derivative instruments serve as an important extension of the payment system because they substitute in a variety of ways for trading in cash market instruments. Thus, derivatives transactions and positions represent virtual cash market transactions and hence effectively constitute an alternative payment mechanism.[58] Finally, it is almost redundant to note that equity markets operate best where there is a stable currency, which without a sound banking system hardly is possible.[59]

A complete banking system must also contain a system for property rights for the involved market participants. This issue will be further discussed in the next subsection.

4.3. Regulatory framework

In the previously shown Jorion model the second prerequisite for an introduction of a derivatives market is a well-adjusted regulatory framework. This factor contains a wide variety of different laws and regulations, some too complex and complicated to cover in a finance thesis. The main objective in the long run must be to reduce the need for regulation. The more transparent the market is, the fewer are the regulations which must be written or

[53] Tsetsekos and Varangis (1997)
[54] Crane et al (1995)
[55] Ajah Shah (1997)
[56] E.g. the level and type of collateral demanded for receiving credit differs between countries
[57] Ajah Shah (1997)
[58] Crane et al (1995)
[59] Mendelson and Peake (1993)

enforced.[60] By adopting regulation from developed markets, the emerging countries can reduce the gap. But even though it looks promising, there still remains a problem with the law enforcement. The courts move ponderously, and judges often lack a sure grasp of the new laws. As a result, legal protection of investors does not yet always mean effective protection of investors.[61] A very important part of the development of a financial market is to protect the market participants from misbehavior from other market participants and the government.

4.3.1. Property rights

The regulatory system must ensure the types of rights inherent in the different kinds of property; real and personal, tangible and intangible. For securities markets contract law must be connected to the types of transactions found there. It must protect property rights in a way that sees through the various levels of intermediaries through which control is passed.[62]

For an emerging economy that wants to turn foreign and domestic savings into productive assets, the investors have to be protected from mischief. The link between investor protection and growth of financial markets is often seen as a key viewpoint when studying the further progress of the financial development in emerging countries. The law and finance literature has found that financial markets are better developed in countries with strong legal frameworks and that more developed financial markets find it easier to attract external financing.[63] Though the importance of property rights to financial development of a market is less documented, it is stated that secure property rights are a necessary condition for entrepreneurial investment.[64] North suggested that investment in particular types of assets will be higher the more protected the property rights of the assets are.[65]

In an investigation by Claessens and Laeven, evidence is shown that weak property rights affect the allocation of investible resources by a firm in a sub-optimal way. Their idea of property rights is the degree of protection of the return on assets against powerful competitors. It is important that a country set up a legal framework that protects from exploitation of intangible assets, such as patents, copyrights and trademarks and financial assets such as stocks, bonds and derivatives, in order to support the development of the financial market. The authors argue that a firm operating in a market with weaker property rights may be led to invest more in fixed assets relative to intangible assets as it finds it relatively more difficult to secure returns from intangible assets than from fixed ones.

According to the study, in countries with less secure property rights, there is less growth consistent with the hypothesis that the allocation of firms' investment is inefficient as firms underinvest in intangible assets. The investigation shows that there is a significant difference between developed and emerging countries when it comes to the protection of property rights, in favour of the developed countries. It is argued that this is one reason for the higher degree of financial development in these countries.[66]

[60] Mendelson and Peake (1993)
[61] "Like uncle Sam", *The Economist*, March 10th 2001
[62] Mendelson and Peake (1993)
[63] La Porta et al (1998)
[64] Johnson et al (2002)
[65] North (1990)
[66] Claessens and Laeven (2002)

The level of investor protection in a market can be traced back to the country's legal tradition. Many emerging countries have in recent years adopted regulatory regimes derived from English common law, which tends to have strong investor protection.[67]

As measures of the preservation of the rights of minority shareholders, the number of shares required for one vote, or the percentage share required on a general shareholders' meeting in order to demand an independent audit, is often used.[68] Above this, effort has to be put on the requirement of disclosure of corporate information to all market participants. The head of Warsaw Stock Exchange, Wieslaw Rozlucki, believes that full disclosure of corporate going-on will help to increase the WSE market capitalization to GDP[69] from 17 to the West European average of 60 percent.[70]

4.3.2. Deposit guarantees

The regulation for bank deposits guarantees is of great importance for the consumer protection, and thereby a significant factor for the multitude of savings in a country.[71] The problem of deposit guarantees, their limits and method of implementation, is very important in the case of formerly centrally planned economies in which investors do not have many investment opportunities. A reduction of bank deposit guarantees would increase the risk of bank saving, and thereby increase consumption, which would have a strong inflationary impact.[72] On the other hand, if deposit rate ceilings are not introduced, all deposit insurance schemes induce perverse behaviour of the depositors, inducing them to search for the highest interest rates regardless of the risk of default of the depository institution.[73]

4.3.3. Prudential regulations

For the development and maintenance of emerging markets it is important to have internationally recognized accounting standards, if foreign portfolio or direct investments are to be attracted.[74] Accounting standards, tax regulations, and corporate law must be adjusted to suit the requirements of the potential investors. Due to the fact that these issues are very complex and unforeseeable, no further efforts are made in this thesis to analyze their potential effects on the derivatives market development. To describe the difficulties and importance of a well-functioning regulatory framework in the financial markets, Bodie and Merton used an example in which eleven different alternatives are available to take a levered position in Standard & Poor's 500 stocks. The legitimate claim on similar taxation and regulation on all the alternatives gives the regulatory system a delicate task.[75]

[67] Ajah Shah (1997)
[68] "Like uncle Sam", *The Economist*, March 10th 2001
[69] Gross Domestic Product
[70] "Like uncle Sam", *The Economist*, March 10th 2001
[71] Szegö (1993)
[72] Ibid.
[73] Ibid.
[74] Mendelson and Peake (1993)
[75] Crane et al (1995)

4.3.4. Price regulations

The restriction of market forces is the most obtuse form of regulation since it imposes heavy penalties in the form of restriction to competition.[76]

4.4. Knowledge

Even though the derivatives markets over the world have experienced tremendous growth during the last decades, the development has not been completely without trouble. In the early 1990s large companies like Procter & Gamble and Barings Bank were severely hurt by losses from derivatives trade. Those spectacular losses attracted much attention and got many people wary of derivatives operations. In the wake of those incidents, some non-financial companies decided to cut down their use of derivatives, causing a decline in demand for the instruments, at least temporary.[77]

If markets that are about to introduce option trade are able to avoid setbacks like this in the development of the markets, they can that way reap the benefits out of not being among the first to introduce option trade. Bodie and Merton stressed the importance of the learning curve this way; "when one has created nine new markets, the tenth one becomes a lot easier"[78].

4.4.1. Institutions

According to Hull, the lessons that can be learned from the incidents mentioned above is the importance of internal control and knowledge of the risks and other features connected to derivatives trade.[79]

Kilcollin and Frankel considered the lack of education and the weak knowledge about free market mechanisms as the primary barriers for option introduction in emerging economies like the young democracies in Eastern Europe.[80] Especially the financial institutions and the regulatory agencies' knowledge are crucial for the development of the markets. Even if these basic aspects are understood, institutions within these newly reconstructed economies are often either not aware of derivative products or do not understand how they work and how they can benefit from them. Among international investors, there are doubts whether the potential customers have the training and background to be interested and able to handle derivative products. Thus, many firms see the education issue as a primary barrier, which discourages them from expanding their presence and efforts in Eastern Europe. In order to attract foreign investors, not only education is necessary, but also international acknowledgment about the country's educational level.

[76] Szegö (1993)
[77] Hull (2000)
[78] Crane et al (1995)
[79] Hull (2000)
[80] Kilcollin and Frankel (1993)

4.4.2. Authorities

According to Kilcollin and Frankel, regulatory agencies are often less informed and knowledgeable about international derivative markets than their counterparts in the private sector.[81] They sometimes have a conservative and suspicious outlook on such innovations, since it is their role to regulate markets and safeguard the public trust. Regulatory agencies that lack full understanding of derivative markets are likely to concentrate on the potential for harm and risk, rather than the new value that such products can bring. This lack of understanding linked with a primary concern for stability and conservatism, may result in opposition to the expansion of these markets.

4.4.3. Education

The conclusion Kilcollin and Frankel drew, was that it is of vital importance that the public and private sector provide these services for derivate products and markets, so that entering the market will be facilitated. A way to make the education better and less costly for small countries is a team effort with other exchanges. Cooperation like this has been made between the Chicago Board of Trade, China, Russia and Hungary.[82]

4.5. Improvements in information technology

The last 20 years, advances in computer and telecommunication have changed the conditions for derivatives trade. This subsection will discuss possible improvements for option exchanges and to what extent they have facilitated and contributed to a lowered threshold for the start-up and operation of the exchange with focus on cost savings.

Chapman, the former Chief Executive Officer at Chicago Board Options Exchange, said that, without progresses in information technology, the risk management practices available today would be nothing but academic theories.[83] In 1994 he noted that the advances in technology have had a dramatic impact on option exchanges in terms of reduced costs, larger amounts and faster flows of information and better service and surveillance of the markets. Even so, he expected the progresses up to then to be the tip of the iceberg.

Mendelson stressed the importance of information in finance by labeling the financial markets as information business.[84] Because of the value of information, financial markets have always stretched the limits of information technology and quickly embraced new technology.

According to Bodie and Merton the progresses in telecommunications, data processing and computation have lowered the transactions costs dramatically and that way contributed to a lowered threshold for implementing financial innovations.[85]

[81] Kilcollin and Frankel (1993)
[82] Ibid.
[83] Chapman (1994)
[84] Mendelson and Peake (1993)
[85] Crane et. al. (1995)

Even though "open outcry", the traditional floor trading system, might appear a bit obsolete, the system is far from abandoned. For example, in 1997, a $200 million investment in a trading floor for bond futures was completed in Chicago. Still, electronic systems are more common today, especially for newly established exchanges.[86]

4.5.1. Start-up costs

By comparing automated trading systems to traditional floor trading, Domowitz estimated the derivatives exchanges' cost savings from computerization.[87] Experience from recently opened exchanges varied considerably, even though a distinct difference between the two systems was revealed. The traditional floor trading exchanges had start-up costs somewhere between $200-$400 million, while the electronic systems brought costs $10-$100 million. Thus, the cost saving from electronic trade relative to floor trading varied between 50 and 97,5 percent. Assuming that the true difference is somewhere in between, the savings are considerable even in the smaller part of the range.

4.5.2. Transaction costs

According to eight studies on stock markets between 1996 and 1998 involving 42 countries the total trading cost is reduced by on average 40 basis points by the use of exchange automation.[88] The results were statistically significant and varied between 33 - 46 basis points. To put the figures in perspective, during the same time period, the average transaction costs for a one-way trade of an equally weighted global portfolio of stocks was 71 basis points.

The same study found that, between 1996 and 1998, the trading costs on exchanges worldwide, regardless of what type of system, declined by 10 – 53 percent in the different regions, with an average of 16 percent.

From the U.S. OTC-market the evidence is that cost savings from automation is greater under "difficult" market conditions.[89] The meaning of that is threefold; (a) large trades on market with (b) small capitalization and (c) high volatility. The cost savings from trades on markets below the capitalization median was 53 times as large as for those above the median. The trades with above median volatility experienced a cost reduction that was 162 percent larger than the trades with lower volatility.

4.6. Stock market development

This subsection will present some of the research made about stock market development, the purpose of the studies and which proxies that were used to measure development. The topic has attracted much attention, and several investigations dealing with stock market development have been conducted in recent years. However, we have not found any studies

[86] Domowitz (2002)
[87] Ibid.
[88] Ibid.
[89] Ibid.

aimed at the introduction of option markets. Instead, most of them investigate the connection between stock market development and economic growth and many of the studies are focused on emerging markets. In the absence of research in the exact same area as this study, we will rely on the existing investigations' approaches to stock market development.

Most studies do not provide detailed information about why the indicators were used and their pros and cons. Their mere existence in the investigations has to suffice as ground for their adequacy. Common motivations for using a specific indicator are that researchers, financial analysts and others often use it, and that it is generally accepted as a measure of development.

Three of the papers brought up a relatively comprehensive discussion about the different measures. For that reason and the fact that these papers and the proxies presented there appear in many of the other studies within the area, we give them the most attention and dedicate each of them an own subsection. The remaining seven studies will be presented more briefly further down. Levine and Demirgüc-Kunt are both involved in two studies, which give rise to some overlapping. Since both papers present interesting ideas about how to measure development and since they, at least to some extent, choose different indicators, both are presented here.

4.6.1. Rajan and Zingales[90]

In a study of the financial development in 24 countries around the world in the 20th century, Rajan and Zingales started the search for relevant measures by looking at the characteristics of a well-developed financial market. The discussion's point of departure was the "ease with which any needy entrepreneur or company with a sound project can obtain finance". The authors emphasized that, on a well-developed financial market, anyone can raise capital, regardless of connections or economic resources. In other words, what should determine the access to capital is the quality of the business concept rather than the entrepreneur. As additional important aspects of development, the authors mentioned the investors' confidence, transactions costs and the markets ability to measure, subdivide, spread and allocate risks.

The above-mentioned concept is rather abstract and has to be translated into a measurable indicator to be applicable when measuring financial development. In the authors' opinion, the indicators that best capture this concept are the ones that measure the size of the stock market. Three indicators were chosen for this purpose; equity market capitalization over GDP, equity issues over gross fixed capital formation and number of listed firms related to population.

Each of the indicators' pros and cons were discussed and the conclusion was that, despite their individual shortcomings, taken together, the indicators provide a fairly good measure of financial development. In addition to these indicators, one measure concerning banking development was used. This will not be discussed here, since we focus on stock market development only.

The total amount of equity issues divided by gross fixed capital formation was used as a measure to capture the part of equity in corporate investment. Due to lack of data about corporate investments, the equity issues had to be related to gross capital formation instead. The cyclicality of equity issues makes this measure fluctuating in a way that not mirrors the

[90] Rajan and Zingales (2002)

actual development. Thus, biases will occur when comparing countries in different phases of the business cycle.

To capture stock market size, the equity market's capitalization, i.e. the total value of domestic shares listed on the stock exchange, was used. To make the figures comparable, they were divided by each country's GDP. This measure is more stable over time and for that reason better for comparisons, both between countries and across time periods. The major drawback of this measure is that it does not capture the amount of capital actually raised by the companies. When the listed companies have grown considerably since the last equity issue, this measure will overestimate the companies dependence on equity capital and thereby the market's degree of development in that sense.

To measure development using the number of listed companies in relation to the population has two key benefits. It does not suffer from fluctuating stock market valuation or problems measuring GDP. On the other hand, different structures in the economy will influence this indicator. Consolidation through mergers, for instance, will indicate lower degree of development, which probably few would agree on.

4.6.2. Levine and Zervos[91]

Levine and Zervos examined the link between stock market and bank system development and economic growth. The degree of stock market development was measured in a rather comprehensive model using six indicators, one each for stock market's size and volatility and two each for stock market liquidity and integration with global capital markets. They admit that none of the measures comes without drawbacks, but argue that, taken together, the indicators provide a richer picture of stock market development than a model using a single indicator.

The stock market's size is measured using capitalization over GDP, since this measure is a common indicator for stock market development, even though it has shortcomings. For instance, different taxation on debt and equity may influence the companies' choice of funding.

To measure the stock market's liquidity, two indicators were used; turnover, measured as the value of all trades of domestic stocks, divided by the market's capitalization as the first indicator and by GDP as the second. These measures of liquidity rest on the assumption that high turnover brings low transactions costs, which in turn facilitates trade and makes the market more liquid. One problem with this assumption is that stock prices reflect the investors' profit expectations for the listed companies. An increase in the expectations increases the value of the stocks which indicates higher turnover and thereby liquidity, even though the number of transactions and transaction costs are unchanged. As the stock's value is reflected in market capitalization, both the numerator and the denominator in the first turnover measure contain the stock's value, making that measure unaffected of this problem. Thus, by using both measures, the problem is at least to some extent mitigated.

The integration between the domestic and the world stock markets was measured using two different models that both are based on the assumption that financial integration implies

[91] Levine and Zervos (1998)

similar pricing of risk. The two models are the international capital asset pricing model (ICAPM) and international arbitrage pricing theory (APT). As both models are well known, we will not go into further details about them.

The 12-month rolling standard deviation measured the stock market's volatility. The only reason given for including volatility was the interest it attracts from academics, practitioners and policy makers. The study does not say whether it is high or low volatility that should be interpreted as stock market development.

4.6.3. Demirgüc-Kunt and Levine[92]

Demirgüc-Kunt and Levine used six indicators for stock market development that were aggregated into one index. The stock market capitalization to GDP ratio was used as it was considered to capture the market's ability to mobilize capital and diversify risk. The number of listed firms was used as an additional indicator for stock market size. Even though small differences between countries measured by this indicator hardly reveals any important difference in actual stock market development, large differences might do.

An indicator measuring liquidity should capture the costs and uncertainty associated with buying or selling an asset. Two ratios related to turnover were chosen. The reason for this seems to be the access to data rather than their superior ability to capture liquidity. However, high turnover was assumed to reflect low transactions costs and by the use of two different measures, the biases were mitigated. The two ratios were the same as Levine and Zervos', i.e. turnover divided by GDP and market capitalization respectively.

Also volatility was measured the same way as in Levine and Zervos' study, using the market return's 12 month rolling standard deviation. In contrast to that study, Demirgüc-Kunt and Levine give their hypothesis on how volatility reflects market development, albeit somewhat vaguely. No direct connection is claimed, only that low volatility, for simplicity, sometimes is used as reflecting stock market development.

To capture the stock market's concentration, the compound capitalization of the ten largest firms listed on the stock exchange was calculated and related to the entire market's capitalization. A high ratio was assumed to indicate low degree of development. The stock market's integration to the surrounding world was measured using ICAPM and APT, i.e. the same way as in Levine and Zervos' study.

As the institutional and regulatory environment is important to stock market development, these aspects were measured using seven of the International Finance Corporation's (IFC) indices. Without going into any further details about the indices, we will only mention that they capture, among other things, accounting standards, investor protection law and corporate information disclosure.

[92] Demirgüc-Kunt and Levine (1995)

4.6.4. Other studies

In an investigation by Bonser-Neal and Dewenter the relation between stock market development and saving in emerging economies was studied. The authors used three of the six measures used by Levine and Zervos.[93] These where market capitalization in relation to GDP, turnover over GDP and over market capitalization. That is, stock market volatility and the two measures of integration were omitted from their study.

The authors argued that high stock markets' capitalization is an important indicator of stock market development as it is necessary for opportunities for raising capital and diversify risk. The indicators for liquidity, turnover divided by GDP and capitalization, are "generally associated" with stock market development and therefore included in their model.

Another study similar to Levine and Zervos' made by Durham, used stock market capitalization and liquidity, where turnover was used as proxy for the latter.[94] Neither any details about the indicators nor motivations for them are found in the paper.

Demirgüc-Kunt and Huizinga investigated foreign portfolio investments in emerging economies.[95] They used stock market capitalization divided by GDP as a proxy for stock market development, but did not give any reasons for using this indicator.

Hargis studied the foreign portfolio investments in Latin America and their impact on stock market development.[96] As proxies for the latter, he used market capitalization and liquidity. The change in the stock market's turnover was used as an indicator for liquidity. As the paper did not study differences between countries but changes over time within the same country, the measures were not related to any other proxy, such as GDP, controlling for other characteristics than stock market development.

Singh and Weisse conducted a study very similar to Hargis'.[97] The measures used were capitalization ratio, the stock market's capitalization divided by GDP and the number of listed firms and investors in the market.

In another study of stock market development and economic growth in emerging countries, Kassimatis and Spyrou used the equity market's capitalization as a proxy for its development.[98] The motivation was that capitalization is "directly related to size" and more often available in continuous series of data.

In a study of the impact of privatization and political risk on stock market development in emerging countries by Perotti and Oijen, five proxies for stock market development were used. [99] Except more common indicators, such as market capitalization and turnover, the number of listed firms and yearly average of monthly return were included. Both market capitalization and turnover were related to GNP. Turnover was also related to market capitalization. The yearly average monthly return was adjusted for the return of the Morgan

[93] Bonser-Neal and Dewenter (1999)
[94] Durham (2002)
[95] Demirgüc-Kunt and Huizinga (1995)
[96] Hargis (1998)
[97] Singh and Weisse (1998)
[98] Kassimatis and Spyrou (2001)
[99] Perotti and Oijen (2001)

Stanley Capital International-world index. Regarding the number of listed firms as indicator, the authors mentioned the problem that some governments list the shares of state-owned enterprises on stock exchanges before selling them, and that way disturbing that indicator.

4.6.5. Summary of stock market development

Table 4.1 provides an overview of the stock market development indicators that occurred in more than one of the studies presented above. To sum up, all studies used market capitalization as a measure of stock market development, and seven of them related capitalization to GDP. Most of the studies used complementary indicators; only two relied solely on one measure.

The second most commonly used indicator is liquidity, present in six studies, of which four used turnover divided by GDP and capitalization as proxies. The number of listed companies occurred in four studies, one of them related the number to the country's population. Two studies measured the stock market's volatility and degree of international integration. Regarding both indicators, the method of measurement was the same. Levine's involvement in both studies might explain this.

The indicators that only occurred in one study, and for that reason not included in table 4.1, were the number of investors, monthly return, equity issues over gross fixed capital formation, stock market concentration and IFC's indices regarding institutions and regulation.

4.7. Concluding remarks

We have now discussed five aspects of the option market's environment, with the main focus on the last one, stock market development. The methods presented in that section will be the basis for the empirical study, where we will use some of these indicators to compare the Danish, Hungarian and Norwegian stock markets by the time of option introduction with the Estonia's corresponding figures of today. This is what the next chapter is dedicated to.

Table 4.1. *Summary of the stock market development indicators that occured in more than one study*

Study	Market capitalization	Liquidity	Number of listed firms	Volatility	International integration
Rajan and Zingales	Cap. / GDP		Divided by population		
Levine and Zervos	Cap. / GDP	Turnover / GDP Turnover / cap.		12m standard deviation	ICAPM APT
Demirgüc-Kunt and Levine	Cap. / GDP	Turnover / GDP Turnover / cap.	X	12m standard deviation	ICAPM APT
Bonser-Neal and Dewenter	Cap. / GDP	Turnover / GDP Turnover / cap.			
Durham	X	X			
Demirgüc-Kunt and Huizinga	Cap. / GDP				
Hargis	Δ in cap. over time	Δ in turnover over time			
Singh and Weisse	Cap. / GDP		X		
Kassimatis and Spyrou	Δ in cap. over time				
Perotti and Oijen	Cap. / GDP	Turnover / GDP Turnover / cap.	X		

The use of an indicator is marked with an X or a description of the indicator in the cases that was provided in the study.

5. Empirical study

Based on the measures on stock market development discussed in chapter 4, we will here study the Danish, Hungarian and the Norwegian stock markets at the time of option market introduction. The same indicators will be applied on the Estonian stock markets in order to compare the degree of development. The chapter will start with a motivation for our choices of indicators and stock markets. After that we will present each of the stock markets one by one. Finally, the findings are summarized.

5.1. Introduction

First, we will provide the motivation for selecting the indicators for stock market development and the countries in question.

5.1.1. The indicators

As seen in table 4.1, all studies about stock market development presented in chapter 4 used market capitalization as an indicator. Six of them also used liquidity, measured as turnover, either in absolute numbers or related to capitalization. Four studies used the number of listed firms as a proxy. These three measures of stock market development will be used in this empirical investigation.

We think that the number of listed firms is an interesting indicator as it captures the stock market's attractiveness in two important ways. If many companies see an opportunity to lower their cost of capital through listing on the stock exchange, there are reasons to believe that the market is well developed. Moreover, the number of firms also tells something about the ability to have relatively small companies listed, especially when related to population, suggesting an efficient and well functioning market place.

The capitalization is directly connected to the stock market's size. Transactions costs have to be dispersed to a sufficiently large amount of underlying value to avoid them from eliminating every profit opportunity. For that reason, we consider stock market capitalization as an important factor for the option market's prospects. When related to GDP, the measure tells something about the economy's dependence on the stock market. In times when GDP growth is negative, this measure indicates rising stock market development, ceteris paribus. This consequence might appear somewhat awkward, but as GDP decreases, the capitalization is likely to follow. If not, the development of the stock market is fairly satisfactory when considering the circumstances. Thus, the capitalization related to GDP is also a useful indicator of stock market development.

As mentioned in section 4.1.3, Scholes brought up the point that options can serve as a liquidity guarantee for the holder, making low liquidity in the underlying market, not a problem, but a benefit for the option market. However, there has to be a writer of the same option, who would probably take this into account so that it will be included in the option's price. That is, the market cannot get rid of the problem with low liquidity by introducing options. Furthermore, all of the studies presented in section 4.6 used high turnover as an

indicator of a well developed stock market and it is implicitly said by Tsetsekos and Varangis when they mentioned a "well functioning cash market" as a prerequisite for option introduction. For those reasons, we will use high turnover as an indicator of stock market readiness for introduction of options.

The volatility is used in two studies. From these studies, there seems to be some confusion about both the theoretical and the empirical link to stock market development. We will use volatility, not as a measure of market development, but as a measure of the market's risk. Without a sufficient level of risk, the demand for risk allocation instruments like options are likely to be small. This view is supported by Tsetsekos and Varangis, who stressed the importance of high volatility of the underlying asset. By stating a sufficient amount of money at risk as a prerequisite for an asset to have options introduced, they also emphasize the importance of high capitalization.[100]

The domestic stock market's integration to the world's stock markets is used as an indicator of stock market development in two studies. We will not use this measure, as we do not believe that it would add enough value to the study, when taking into account the time it would take to gather and process this kind of information. The fact that eight of the studies chose not to link integration to development gives support for this view.

5.1.2. The stock markets

When selecting stock markets to use as benchmarks, we started by delimiting the countries of investigation to the ones in Europe. This was done for two reasons. The first one is that we believed that countries within the same continent are more comparable when it comes to the general environment of business. The other reason is the expected problems of gathering data from countries geographically far from Europe.

Within Europe we decided to look for countries of comparable size to Estonia, i.e. relatively small countries. Taken together with the obvious condition that an option market must exist, the selection of countries was reduced significantly. Among these countries we decided to select Denmark, Hungary and Norway.

The meaning of the underlying market of an option market can either be the entire stock market in a country, or those stocks that have options introduced. Since none of the studies of stock market development presented in chapter 4 dealt with option markets, we did not get guidance from there. Also, the prerequisites by Tsetsekos, Varangis and Jorion were not clear enough to give an answer to this question. Our opinion is that both definitions of the underlying market are important in the comparison and hence they are both included in this study. The investigation of the entire market is aimed at the introduction of index options, while the study of the individual companies is aimed at the introduction of options on their stocks.

The companies that have gone bankrupt or had their options delisted shortly after the introduction are excluded from this investigation. The reason is simply that the introduction in those cases cannot be regarded as successful. It should be noted that no other measure of the successfulness of the examined option markets are used in this investigation.

[100] Section 4.1.2.2.

5.2. Denmark

5.2.1. The entire stock market[101]

In 1919, the first actual Stock Exchange Act was introduced at Copenhagen Stock Exchange, an international marketplace for transactions in Danish securities. By the end of 1989 the exchange abandoned floor trading and introduced an electronic trading system. In 1997, Copenhagen Stock Exchange A/S and FUTOP Clearing Center A/S were amalgamated and the latter became a wholly owned subsidiary of Copenhagen Stock Exchange A/S. The ambition was to create a better strategic platform for future and options activities in the new European securities market.

5.2.1.1. Københavns Fondsbørs Index

The Københavns Fondsbørs index, the KFX index, was first introduced July 3, 1989 at a base value of 100 points. The index was originally designed to be used as an underlying instrument for trade in futures and options listed on Copenhagen Stock Exchange. KFX is Copenhagen Stock Exchange's leading stock index and consists of those 20 stocks in the Total Share Index, which have had the highest turnover in the preceding six months. The KFX index is calculated on the basis of the prices of these 20 stocks, weighted for market value. Since unit trusts, foreign companies and certain holding companies are not included in the Total Share Index, they are not eligible for the KFX index either. In 2000 the KFX-stocks represented 67 percent of the total, index-weighted, market value of the companies listed on Copenhagen Stock Exchange.

Copenhagen Stock Exchange is the market place for standardized futures and options and FUTOP Clearing Centre is the issuer and the clearinghouse. Trading in options on futures on the KFX index began September 21, 1990. In 1995 the options were changed to be written on the index itself. In November 2000 this was changed once again, meaning that today the options are on the future on the KFX share index.[102] Since these option combinations all serve the same purpose, no further notice will be appointed on this subject. The objective for 2003 is to have a tenfold increase in trading volume on the stock derivatives market.[103]

5.2.1.2. Capitalization

The aggregate market capitalization on Copenhagen Stock Exchange at the time of index option introduction was $50 036 million[104]. The capitalization-to-GDP[105] ratio at the same time was 36 percent.

[101] www.cse.dk
[102] Kirsten Thaarup, Copenhagen Stock Exchange
[103] Factbook 2001, Copenhagen Stock Exchange
[104] The calculation of capitalization is described in section 2.2.1.
[105] GDP: USD 145 000 million

5.2.1.3. Turnover

The stocks at Copenhagen Stock Exchange had an aggregate turnover of $17 236 million[106] for the year preceding the time of index option introduction, and the turnover-to-capitalization ratio was 34 percent.

5.2.1.4. Volatility

The KFX index's volatility the year before the time of option introduction was 4,06 percent.[107]

5.2.1.5. Number of listed firms

At the time of the index option introduction, 266 stocks were listed on Copenhagen Stock Exchange, which was 52 listed companies per million inhabitants.[108]

5.2.2. The underlying stocks

December 7, 1990, individual stock options on Danske Bank, Danisco, Novo Nordisk and Hafnia Holding B were introduced at Copenhagen Stock Exchange. Below follows a short briefing of these companies.[109]

5.2.2.1. Danske Bank[110]

Danske Bank Aktieselskab was founded in 1871, but created the way we know it by the 1990 merger of Den Danske Bank af 1871, Kjøbenhavns Handelsbank and Provinsbanken. Danske Bank also has retail bank subsidiaries in Sweden and Norway. In 2001, RealDanmark and BG Bank merged with Danske Bank, which is the continuing parent company of the Group. Realkredit Danmark is now a subsidiary of Danske Bank. The Danske Bank stock is listed on the stock exchanges in both Copenhagen and London.

5.2.2.2. Danisco[111]

Danisco A/S was established on January 1, 1989 by a merger of A/S Danisco, De Danske Spritfabrikker (Danish Distillers) and De Danske Sukkerfabrikker (Danish Sugar). The company is operating world wide in three core businesses: ingredients, sugar & sweeteners and advanced flexible packaging.

Danisco has been listed on Copenhagen Stock Exchange since 1989 and on Helsinki Stock Exchange from November 1999 to March 2002.

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[106] The calculation of turnover is described in section 2.2.1.
[107] The calculation of volatility is described in section 2.2.1.
[108] Population: 5,14 million inhabitants
[109] Kirsten Thaarup, Copenhagen Stock Exchange
[110] www.danskebank.com
[111] www.danisco.com

5.2.2.3. Novo Nordisk[112]

Novo Nordisk is a focused healthcare company, with a wide diabetes product portfolio. In 1974, Novo's B shares were quoted on Copenhagen Stock Exchange and in 1981, Novo became the first company in Scandinavia to be quoted on New York Stock Exchange. Novo Nordisk was listed at the Swiss Exchange SWX, but was delisted in March 2000, due to the resent year's insignificant trading volume as a percentage of the total trading.

In 2000 Novo Nordisk was split into three separate companies operating under the umbrella of the Novo Group: Novo Nordisk A/S, Novozymes A/S and Novo A/S, where the two first-mentioned both have stocks and corresponding options listed on Copenhagen Stock Exchange as of today.

5.2.2.4. Hafnia Holding

Hafnia Holding Ltd was one of the largest insurance companies in Denmark before the financial crisis beginning in mid-1992. Due to major uncertainties about the value of the stocks, the Hafnia Holding stock and its option was delisted from Copenhagen Stock Exchange in August 1992. In May 1993, Hafnia Holding A/S went bankrupt, after one of the largest financial scandals in Danish history.

5.2.2.5. Selection of the stocks

Since the options on Hafnia Holding have been delisted, the company is excluded from the investigation. The remaining three companies, Danske Bank, Danisco and Novo Nordisk have continuously had their options listed on Copenhagen Stock Exchange and accordingly included in this investigation.

5.2.2.6. Capitalization

At the time of stock option introduction, Danske Bank's capitalization was $2 400 million. The capitalization for Danisco and Novo Nordisk was $1 670 million and $1 996 million respectively. Together, the companies represented $6 066 million[113] and had a capitalization-to-GDP ratio of 4 percent. The corresponding ratios for the individual companies were 2 percent for Danske Bank, 1 percent for Danisco and 1 percent for Novo Nordisk.

5.2.2.7. Turnover

The turnover of Danske Bank for the year preceding the introduction of options was $347 million, for Danisco it was $110 million and for Novo Nordisk $829 million. Together, the turnover for the three stocks was $1 287 million[114], giving a turnover-to-capitalization ratio of 21 percent. For the individual companies the corresponding numbers were 14 percent for Danske Bank, 7 percent for Danisco and 42 percent for Novo Nordisk.

[112] www.novonordisk.com
[113] 11 percent of the total market value of Copenhagen Stock Exchange
[114] 7 percent of the turnover of Copenhagen Stock Exchange

5.2.2.8. Volatility

Danske Bank's, Danisco's and Novo Nordisk's volatility the year preceding the introduction was 8,97 percent, 3,29 percent and 4,73 percent, respectively. The weighted average volatility of the companies was 6,01 percent.

5.2.2.9. Number of listed firms

Of the four companies at the beginning, three still have options traded and for that reason included in this investigation. This was 0,6 companies per million inhabitants.

5.2.3. Summary

The indicators for stock market development are summarized in table 5.1

Table 5.1. *Summary of Denmark's stock market development indicators.*

	The entire market	The underlying stocks
Capitalization, USD million	50 036	6 066
Capitalization / GDP	36%	4%
Turnover, USD million	17 236	1 287
Turnover / capitalization	34%	21%
Volatility	4,06%	6,01%
Number of listed firms	266	3
Number of listed firms per million inhabitants	52	0,6

Sources: Reuters, IMF, Bloomberg and the companies' investors relations departments

5.3. Hungary

5.3.1. The entire stock market

Budapest Stock Exchange re-opened its gates on June 21, 1990 as a result of the political and economic changes in the late eighties. At the time of the introduction of stock options in early 2000, international investors considered the Hungarian stock exchange an upcoming market, a step upwards from its earlier qualification as an emerging one.

Derivatives are traded independently in a separate derivatives section on the BSE. The market of derivatives includes both futures and options products. The options traded in the equity and index based transaction category include the BUX index, Mol, Matáv and OTP. From October 2001 derivatives, just as stocks, are traded in an electronic remote trading system. Just as in the cash market, trading is made via an order book where trades are concluded using the equilibrium price and the continuous matching algorithms.[115]

[115] www.bse.hu

5.3.1.1. Budapest stock index

The Budapest stock index (BUX) was introduced January 2, 1991. The basis of the index was 1000 points. The form of the index was finalized on January 1, 1995, when it became the official stock index of the BSE. The basket is reviewed twice a year at dates fixed in advance, by an index committee appointed by the Exchange Council. The basket may contain a maximum of 25 stock series selected according to specific criteria. The exchange uses seven criteria for determining the composition of the index basket: number of cross trades and number of days traded, market value of the listed quantity of each series, turnover in number of trades and at market value, owner's equity and velocity of turnover. A fundamental rule provides that eligibility for inclusion into the basket is limited to series of ordinary stock that had been traded on the BSE for at least three weeks prior to basket review date. The BUX basket contained 18 companies February 18, 2000 when the options on the BUX index was introduced. The BUX index options have continuously been traded on Budapest Stock Exchange since then.

5.3.1.2. Capitalization

The aggregate market capitalization on Budapest Stock Exchange at the time of index option introduction was $18 157 million. BSE's capitalization-to-GDP ratio was 36 percent.[116]

5.3.1.3. Turnover

Budapest Stock Exchange had a turnover of $26 766 million for the year preceding option introduction, making the turnover-to-capitalization ratio 147 percent.

5.3.1.4. Volatility

The BUX index's volatility at the time of index option introduction was 14,08 percent.

5.3.1.5. Number of listed firms

The same time, 66 companies were listed on Budapest Stock Exchange, i.e. 7 companies per million inhabitants.[117]

5.3.2. The underlying stocks

February 18, 2000, also individual stock options on Matáv, Mol and OTP were introduced at Budapest Stock Exchange. The reason for the choice of these specific stock options were their high liquidity and turnover and that they were, and still are, the stocks with highest market capitalization.[118] The companies are briefly presented below. Since no delisting of these stock options has been made since the introduction, all three companies will be utilized in this study.

[116] GDP: USD 43 786 million
[117] Population: 10,02 million inhabitants
[118] Renáta Székely, Budapest Stock Exchange

5.3.2.1. Matáv[119]

The company has its origin in a split of the Hungarian Post on December 31, 1989. Separate companies were established for postal, broadcasting and telecommunications activities. Two years later, Matáv Hungarian Telecommunications Ltd. was established, 100 percent state-owned.

November 14, 1997 was the day when Matáv shares were first traded in Budapest and New York simultaneously. As a major step of privatization, 26 percent of the company's shares were put on the market, the largest public offering in Hungary up to that time. Matáv became the first company in Central Europe to obtain a listing on New York Stock Exchange. In 1999, Deutsche Telekom and SBC together owned 60 percent and the remaining 40 percent of the shares in Matáv were publicly traded.

5.3.2.2. Mol[120]

Mol was established as a result of the consolidation of nine enterprises active in the Hungarian oil and gas industry, which were member companies of the state-controlled OKGT (National Oil and Gas Trust).

State Privatization and Property Agency offered the shares available for sales through three transactions: in November-December 1995, in May 1997 and finally in March 1998 to international institutional investors, domestic private and institutional investors, as well as to Mol's employees and management. Mol's shares have been listed on the stock exchanges in Budapest and Luxembourg, since November 1995. The government ownership decreased from 88 percent in December 1995 to 25 percent in March 1998.

5.3.2.3. OTP[121]

Under the name of National Savings Bank, OTP Bank was established in 1949 as a nation-wide, state-owned, banking entity providing retail deposits and loans.

In 1995, the State Privatization and Holding Company sold a share package representing 33 percent of the bank's total share capital to the Hungarian public and to the bank's management and employees. This action reduced the public shareholding to 25 percent of the total share capital of the bank. Following the sale, on August 10, 1995 the shares were listed on the stock exchanges in Budapest and Luxembourg.

5.3.2.4. Capitalization

Matáv's capitalization at the time of option introduction was $9 383 million, while Mol's was $1 912 million and OTP's $1 644 million. Together, the three companies had a capitalization of $12 939 million[122] and a capitalization-to-GDP ratio of 30 percent. The corresponding ratio for the individual companies were 21 percent for Matáv, 4 percent for Mol and 4 percent for OTP.

[119] www.matav.hu
[120] www.mol.hu
[121] www.otpbank.hu
[122] 71 percent of the total market value of the BSE

5.3.2.5. Turnover

The turnover for the year preceding the introduction was $3 787 million for Matáv, $8 437 million for Mol and $4 213 million for OTP. The aggregate turnover of the three companies was $16 437 million[123] and their turnover-to-capitalization ratio was 127 percent. For the individual companies the corresponding numbers were 40 percent for Matáv, 441 percent for Mol and 256 percent for OTP.

5.3.2.6. Volatility

The year before the options were introduced, Matáv's stock had a volatility of 16,80 percent, Mol of 9,02 and OTP of 17,93 percent. The weighted average standard deviation was 15,79 percent.

5.3.2.7. Number of listed firms

As mentioned above, three firms on Budapest Stock Exchange had options introduced, a ratio of 0,3 companies per million inhabitants.

5.3.3. Summary

The indicators for stock market development are summarized in table 5.2.

Table 5.2. *Summary of Hungary's stock market development indicators.*

	The entire market	The underlying stocks
Capitalization, USD million	18 157	12 939
Capitalization / GDP	36%	30%
Turnover, USD million	26 766	16 437
Turnover / capitalization	147%	127%
Volatility	14,08%	15,79%
Number of listed firms	66	3
Number of listed firms per million inhabitants	7	0,3

Sources: BSE Fact Book, BSE Annual reports, IMF and Bloomberg

5.4. Norway

5.4.1. The entire stock market

Oslo Stock Exchange is one of the oldest exchanges in the world, with securities activity as early as 1881. In February 1997, the old open outcry auctions were replaced by an electronic trading system. The Norwegian Parliament decided in the autumn of 2000 that exchanges in

[123] 61 percent of the total turnover for BSE

Norway should be organized as public limited companies and in May 2001, Oslo Børs was privatized.

5.4.1.1. Oslo Børs index

The Oslo Børs index (OBX) was first introduced January 1, 1987, with a base value of 200 points. The index consists of the 25 stocks with the highest turnover on Oslo Stock Exchange and is adjusted in June and December each year depending on the turnover the preceding six months.

In the late eighties, the establishment of a market for trade in standardized stock options was discussed in the Norwegian market. Almost 20 years had past since this type of securities had been introduced in the US and the development of markets for derivatives trade had gone far in Sweden. May 22, 1990 the stock option market opened at Oslo Stock Exchange and for the first time in over 100 years a new financial product was introduced on the exchange. The established option market included only options on individual stocks at the beginning, but June 27, 1990 also options on the OBX index were introduced on Oslo Stock Exchange, and since then these index options have continuously been traded there.

5.4.1.2. Capitalization

The aggregate market capitalization on the Oslo Stock Exchange at the time of index option introduction was $31 436 million, generating a capitalization-to-GDP ratio of 28 percent.[124]

5.4.1.3. Turnover

The stocks at Oslo Stock Exchange had a turnover of $13 760 million for the year preceding the introduction of index options. Thereby the turnover-to capitalization ratio was 44 percent.

5.4.1.4. Volatility

The volatility of the OBX index the year preceding the time of introduction was 12,77 percent.

5.4.1.5. Number of listed firms

134 companies were listed on Oslo Stock Exchange at the end of 1989, i.e. 32 companies per million inhabitants.[125]

5.4.2. The underlying stocks

The option market for individual stocks started May 22 1990 and included the options for Bergesen B, Hafslund Nycomed B, Den Norske Bank, Norsk Hydro and Saga Petroleum A. At the time of introduction, these specific underlying stocks were very liquid and the market makers requested options on these stocks. Oslo Stock Exchange also intended to have options/forwards on stocks in different sectors.[126]

[124] GDP: USD 112 835 million
[125] Population: 4,24 million inhabitants
[126] Are Grongstad, Oslo Børs ASA

5.4.2.1. Bergesen[127]

Bergesen is one of the largest pure-shipping stock investments available in the world. The Bergesen stock is listed on Oslo Stock Exchange, London Stock Exchange and through an unlisted ADR facility in New York. The options on Bergesen B were delisted June 22 2001, due to insufficient liquidity at Oslo Stock Exchange during the preceding year.[128]

5.4.2.2. Hafslund Nycomed[129]

Hafslund Nycomed demerged in 1996 into Hafslund ASA and Nycomed Amersham Nycomed. Hafslund ASA is a Norwegian company listed on Oslo Børs and one of the largest listed electricity utility companies in the Nordic area. Hafslund's core activities are generation, distribution and sales of electricity.

The Hafslund ASA stock is listed in Oslo, Copenhagen, Frankfurt, London and Vienna. The Hafslund option was delisted on Oslo Stock Exchange in December 1990, reintroduced in 1991 and again delisted in 1996.

5.4.2.3. Den Norske Bank[130]

Den Norske Bank (DnB) was founded April 17, 1990 as a result of a merger between Bergen Bank and Den Norske Creditbank. The company is the largest Norwegian financial group and has been listed on Oslo Stock Exchange since April 1990.

5.4.2.4. Norsk Hydro[131]

Norsk Hydro ASA is an industrial company that uses natural resources to provide products for use in the food, energy and materials industries. Norsk Hydro was founded in 1905 and is the world's largest producer of magnesium and plant nutrition, the second largest Norwegian oil producer and the third largest light metals manufacturer globally. The stock is listed in Oslo, New York, Stockholm, Dusseldorf, Frankfurt, Paris, Hamburg, Zurich, Geneva, Basel and London.

5.4.2.5. Saga Petroleum

Saga Petroleum was amongst the largest oil companies in Norway, when it in the autumn of 1999 merged with the oil organization of Norsk Hydro. As a result of the acquirement, the options and forwards on Saga converted to Norsk Hydro's in June 25, 1999. The option on the Saga Petroleum stock was continuously listed from the beginning in 1990 until the merge with Norsk Hydro in 1999.

[127] www.bergesen.no
[128] www.ose.no
[129] www.hafslund.no
[130] www.dnb.no
[131] www.hydro.com

5.4.2.6. Selection of stocks

The options of Hafslund Nycomed were delisted in December 1990 and therefore the company is excluded from this investigation. The options of Den Norske Bank were delisted between 1992 and 1997 due to illiquidity and are therefore also excluded here. Even though the Bergesen option was delisted in 2001 due to recent illiquidity, the fact that the option was listed for eleven years suggest a quite successful option introduction and therefore Bergesen is included in this investigation. Norsk Hydro has continuously had their options listed on Oslo Stock Exchange and accordingly included in this investigation. So is Saga Petroleum, as their options were listed until the merge with Norsk Hydro.

5.4.2.7. Capitalization

Bergesen's capitalization at the time of option introduction was $2 026 million, while the figures for Norsk Hydro and Saga Petroleum were $6 531 million and $1 378 million respectively. Their aggregate capitalization of $9 935 million[132], generated a capitalization-to-GDP ratio of 9 percent. These ratios for the individual companies were 2 percent for Bergesen, 6 percent for Norsk Hydro and 1 percent for Saga Petroleum.

5.4.2.8. Turnover

The turnover of Bergesen for the year preceding the introduction was $482 million, while Norsk Hydro's turnover was $1 113 million and Saga Petroleum's was $730 million. The companies had an aggregate turnover of $2 325 million[133] and a turnover-to-capitalization ratio of 23 percent. For the individual companies these ratios were 24 percent for Bergesen, 17 percent for Norsk Hydro and 53 percent for Saga Petroleum.

5.4.2.9. Volatility

The companies' volatility the year preceding option introduction was 12,80 percent for Bergesen, 12,08 percent for Norsk Hydro and 27,74 percent for Saga Petroleum. Their average volatility, weighted by capitalization, was 14,40 percent.

5.4.2.10. Number of listed firms.

Among the five original companies in the option introduction, three were able to remain listed in the aftermath of the introduction. Three companies divided by Norway's population at the time yields a ratio of 0,7 companies per million inhabitants.

5.4.3. Summary

The indicators for stock market development are summarized in table 5.3

[132] 32 percent of the total market value on Oslo Stock Exchange
[133] 17 percent of the total turnover for Oslo Stock Exchange

Table 5.3. *Summary of Norway's stock market development indicators.*

	The entire market	The underlying stocks
Capitalization, USD million	31 436	9 935
Capitalization / GDP	28%	9%
Turnover, USD million	13 760	2 325
Turnover / capitalization	44%	23%
Volatility	12,77%	14,40%
Number of listed firms	134	3
Number of listed firms per million inhabitants	32	0,7

Sources: Six Trust, IMF, Bloomberg and the companies' investors relations departments

5.5. Estonia

5.5.1. The entire stock market

After Estonia's independence in 1991, the stock exchange opened in May 1995. The exchange consists of three lists, the Main list, I-list and the free market. To be listed on the Main List, a capitalization of $4,16 million[134] is required. The corresponding figure for the I-list is $1,04 million[135]. The free market has no such requirement, but a company can only stay there for one year. After that, the company has to be either listed on the Main or I-list or be removed from the free market.[136]

Since April 2001, the Finnish HEX group, the owner of Helsinki Stock Exchange, has a 62 percent stake in Tallinn Stock Exchange. The remaining shares are mainly owned by Estonian banks. The stock exchange has the same order driven electronic trading system as Helsinki Stock Exchange.

5.5.1.1. Tallinn stock index

The Tallinn Stock Exchange index, the Talse index, was introduced in June 1996 at a base value of 100. The index reflects the market movements of all the shares listed on the Main and I-list, weighted by each company's capitalization.

5.5.1.2. Capitalization

Taken together, the listed companies at Tallinn Stock Exchange have a total capitalization of $2 327 million[137] and a capitalization-to-GDP ratio of 43 percent.[138]

[134] € 4 million
[135] € 1 million
[136] www.tse.ee
[137] As of November 2002
[138] GDP: USD 6 340 million

5.5.1.3. Turnover

In 2002, Tallinn Stock Exchange had a turnover of $271 million and a turnover-to-capitalization ratio of 12 percent.[139]

5.5.1.4. Volatility

The volatility of the Talse index in 2002 was 12,51 percent.

5.5.1.5. Number of listed firms

14 firms are listed on the Estonian stock exchange. This makes 10 companies per million inhabitants.[140]

5.5.2. The suggested underlying stocks

When deciding which stocks to select for the investigation, we started by ranking all five stocks on the main list of Tallinn Stock Exchange, both in terms of market capitalization and value traded in year 2002. The ranking can be seen in table 5.4. The outcome of this ranking made the choice rather easy, since two companies held the same top positions in both capitalization and turnover, measured as absolute numbers. Furthermore, the positions below Hansa Bank and Eesti Telekom were at a significantly lower level in both aspects, although Norma and Tallinna Kaubamaja have higher turnover ratios.

Table 5.4. *Ranking of the companies at Tallinn Stock Exchange's Main list*

	Capitalization, Nov. 2002	Turnover 2002
Hansa Bank	1 221	159
Eesti Telekom	852	42
Norma	55	21
Merko Ehitus	47	4
Tallinna Kaubamaja	24	9

In USD million. Turnover is calculated as an extrapolation of the 11 first months

Sources: Baltic Exchanges' Monthly Factbooks in 2002 and Bloomberg

By selecting the stocks in the comparison, we surely influence the result. However, we consider the result presented in table 5.4 as rather convincing evidence that this choice is the only plausible. If stock options were to be introduced in Estonia today, Hansa Bank and Eesti Telekom are rather obvious candidates. Thus, the fact that these companies are the ones included in this study is rather a result of the actual situation on the stock market than of our own discretion. These two companies will be presented below.

[139] The calculation of Estonia's turnover is described in section 2.2.1.
[140] Population: 1,38 million inhabitants

5.5.2.1. Hansa Bank[141]

Hansa Bank is the largest Estonian bank and the only bank operating in all three Baltic States. Hansa Bank's shares have been listed on the main list of Tallinn Stock Exchange since 1996. The stock is also listed on the secondary list of Helsinki Stock Exchange and on the free markets of Frankfurt and Munich Stock Exchanges. Hansa Bank was the largest company in the Baltics in 2002, both in terms of market value and turnover.

The Swedish bank FöreningsSparbanken holds 58 percent of the Hansa Bank shares. Other major shareholders are The European Bank for Reconstruction and Development with 9,7 percent and the Pan-Nordic Bank Nordea with 5,5 percent.[142]

5.5.2.2. Eesti Telekom[143]

Eesti Telekom is a holding company, with two wholly owned subsidiaries: leading Estonian mobile communication operator Eesti Mobiiltelefon (EMT) and fixed line and data communication operator Eesti Telefon (ETC). After the IPO[144] and restructuring of Eesti Telekom in 1999, The Republic of Estonia holds a 27 percent stake in the company, 49 percent of the shares are held by the recently merged TeliaSonera and the remaining 24 percent are held publicly.[145] Eesti Telekom is the second largest company in the Baltics, both in terms of market value and turnover.

5.5.2.3. Capitalization

Hansa Bank's capitalization is $1 221 million, while the corresponding figure for Eesti Telekom is $852 million. Together, these two companies have a market capitalization of $2 073 million[146] and a capitalization-to-GDP ratio of 39 percent.[147] The corresponding ratios for Hansa Bank and Eesti Telekom were 23 and 16 percent.

5.5.2.4. Turnover

Hansa Bank's annual turnover for the previous year was $159 million, while the turnover for Eesti Telekom was $42 million. By that, the sum of the two companies' turnover was $200 million and their turnover-to-capitalization ratio was 10 percent. The corresponding ratios for Hansa Bank and Eesti Telekom were 13 and 5 percent.

5.5.2.5. Volatility

Hansa Bank and Eesti Telekom had a volatility in 2002 of 12,09 and 12,55 percent, respectively. This results in a volatility of 12,28 percent, weighted by capitalization.

[141] www.hansa.ee
[142] Bloomberg
[143] www.telekom.ee
[144] Initial Public Offering
[145] Bloomberg
[146] 89 percent of Tallinn Stock Exchange's capitalization
[147] The capitalization figures are from November 2002

5.5.2.6. Number of listed firms

We have suggested two companies to introduce options, which is 1,5 companies per million inhabitants.

5.5.3. Summary

The indicators for stock market development are summarized in table 5.5

Table 5.5. *Summary of Estonia's stock market development indicators.*

	The entire market	The suggested underlying stocks
Capitalization, USD million	2 327	2 073
Capitalization / GDP	43%	39%
Turnover, USD million	271	200
Turnover / capitalization	12%	10%
Volatility	12,51%	12,28%
Number of listed firms	14	2
Number of listed firms per million inhabitants	10	1,5

Sources: Baltic Exchanges' Monthly Factbooks, IMF and Bloomberg

5.6. Summary of the empirical study

Below is a summary of all the indicators of stock market development, for the entire stock market in table 5.6 and for the underlying stocks, or in the case of Estonia, the suggested underlying stocks, in table 5.7. Table 5.8 summarizes the indicators for all the companies, one by one.

5.7. Concluding remarks

By that, we have finished the presentation of the empirical study and we can progress to the analysis where we will discuss the outcome and relate it to the theory presented previously in order to find out whether the Estonian stock market is developed enough for option introduction.

Table 5.6. *Summary of stock market development indicators - entire market*

	Denmark	Hungary	Norway	Estonia
Capitalization, USD	50 036	18 157	31 436	2 327
Capitalization / GDP	36%	36%	28%	43%
Turnover, USD million	17 236	26 766	13 760	271
Turnover / capitalization	34%	147%	44%	12%
Volatility	4,06%	14,08%	12,77%	12,51%
Number of listed firms	266	66	134	14
Number of listed firms per million inhabitants	52	7	32	10

Table 5.7. *Summary of stock market development indicators - underlying stocks together*

	Denmark	Hungary	Norway	Estonia
Capitalization, USD	6 066	12 939	9 935	2 073
Capitalization / GDP	4%	30%	9%	39%
Turnover, USD million	1 287	16 437	2 325	200
Turnover / capitalization	21%	127%	23%	10%
Volatility	6,01%	15,79%	14,40%	12,28%
Number of listed firms	3	3	3	2
Number of listed firms per million inhabitants	0,6	0,3	0,7	1,5

Table 5.8. *Summary of stock market develoment indicators - The underlying stocks one by one*

	Capitalization	Cap. / GDP	Turnover	Turnover / Cap.	Volatility
Danske Bank	2 400	2%	347	14%	8,97%
Danisco	1 670	1%	110	7%	3,29%
Novo Nordisk	1 996	1%	829	42%	4,73%
Matáv	9 383	21%	3 787	40%	16,80%
Mol	1 912	4%	8 437	441%	9,02%
OTP	1 644	4%	4 213	256%	17,93%
Bergesen	2 026	2%	482	24%	12,80%
Norsk Hydro	6 531	6%	1 113	17%	12,08%
Saga Petroleum	1 378	1%	730	53%	27,74%
Eesti Telekom	852	16%	42	5%	12,55%
Hansa Bank	1 221	23%	159	13%	12,09%

In USD million

6. Analysis

This chapter will discuss each of the indicators of stock market development that was presented in chapter 5.

6.1. Introduction

The aim of this analysis is not to decide the threshold levels of the indicators, since that would require a more comprehensive investigation. By comparing with the chosen benchmark countries some differences are revealed that give guidance to the Estonian market's readiness for option introduction.

As pointed out by some of the studies of stock market development presented in chapter 4, none of the indicators that were used to measure development are able to provide a complete picture, but taken together, they capture more aspects and provide a fairly true picture. The number of listed firms, for instance, does not tell much about how developed a stock market is, when used in isolation. Still, the indicator can enrich the picture provided by other measures such as capitalization and turnover and for that reason be justified.

6.2. Capitalization

The figures from the empirical investigation are of two different characters, the ones that are absolute numbers and the ones that are ratios reflecting a relationship to another figure. The reason for using both kinds of figures is that we believe that they are both important. On the one hand, one can argue that an option market needs a certain level of capitalization, turnover and number of firms, regardless of GDP or population. This view is in line with the use of absolute numbers. On the other hand, one can advocate ratios motivated by their ability to compare and reflect the stock market development in countries with large differences in size. The choice of measure becomes crucial when it comes to capitalization, as it determines the result of the interpretation of the figures.

In the comparison of stock market capitalization, Estonia is far behind the other countries if absolute numbers are used as benchmark. Estonia's market capitalization is only 13 percent of Hungary's, the country with the second lowest capitalization in this study and 5 percent of Denmark's, the country with the highest capitalization at the time of option introduction.

When comparing the stock market capitalization to GDP, the result is the opposite. Estonia's 43 percent is significantly higher than the corresponding figure for Denmark and Hungary, the countries with the second highest ratio.

We believe that for an option market to be introduced, a certain level of stock market capitalization is required, regardless of the size of the economy. This brings into focus the capitalization in absolute numbers. As mentioned, the Estonian stock market is considerably less developed than the benchmark countries in this aspect. We believe that this constitutes a major obstacle for an option introduction, especially since the problem is not easily solved in the foreseeable future. Thus, even though Estonia's capitalization ratio is competitive, the

absolute figure is not, making the capitalization issue a considerable problem for an option introduction.

Increasing the stock market's capitalization is a mission that takes a lot of time and effort. For this to be done the market's attractiveness has to be improved and the market participants have to be convinced about the improvement. One way might be efforts to improve the companies' information disclosure, as mentioned by Rozlucki, head of Warsaw Stock Exchange[148]. Even though such efforts might increase the capitalization-to-GDP ratio, we believe that it is hard for Estonia to that way reach the level of most European stock markets, mostly due to its relatively small size. The most plausible way to create a market with sufficiently high capitalization is through strategic alliances. Tallinn Stock Exchange's cooperation in Baltic Stock Exchanges and, more recently, with Finnish HEX, is presumably aimed at solving this problem.

When looking at the benchmark countries' figures for the companies involved in the option introduction and compare that to Eesti Telekom and Hansa Bank, the Estonian figures appear more promising than for the entire market. The capitalization-to-GDP ratios are among the highest in this investigation and the absolute numbers are more comparable to the companies in the benchmark countries than is the case when the entire market is studied. In this aspect the companies seem to fulfill the requirements for option introduction.

6.3. Turnover

The low turnover of Eesti Telekom and Hansa Bank might in part be explained by the companies' large extent of concentrated shareholding. Since the owner structure of all the benchmark companies could not be found for the time period in question, we decided not to make a comparison, but only point out the situation in the Estonian companies. As mentioned in the empirical study, only some 25 percent of the companies' shares are free floating, i.e. held by investors with less than 5 percent of the shares. The shares held by the major institutional shareholders are likely to have a turnover far below the average. A comparison to the corresponding figures of the remaining market reveals an interesting difference. By excluding Hansa Bank and Eesti Telekom the market's turnover-to-capitalization ratio increases from 12 percent to 28 percent, suggesting that the low turnover of Tallinn Stock Exchange is to a large extent explained by the concentration of ownership in Hansa Bank and Eesti Telekom. Despite the relatively low turnover, Eesti Telekom and Hansa Bank were the companies with the highest turnover on Tallinn Stock Exchange in 2002, measured in absolute numbers.

The moderate turnover could derive from market frictions, such as transaction costs, information asymmetry and tax wedges, making the potential number of profitable trades lower. Somehow these obstacles have to be passed, even though the development of the information technology is likely to lower the transaction costs and that way contribute to a higher turnover.

Another possible explanation of the low turnover is the Estonian stock market's limited number of possible investment opportunities. Only 14 companies are listed on Tallinn Stock

[148] Section 4.3.1.

Exchange. If more companies would be listed, the diversification possibilities and the demand for shifting the portfolio's holding are likely to increase.

6.4. Volatility

Regarding the entire stock market, Estonia has a volatility that ought to be sufficiently high for option trade. The volatility of Tallinn Stock Exchange's index is above the average of the three other markets and significantly higher than Denmark's.

The volatility of the individual stocks is generally higher than the index's, except in the case of Estonia, where the volatility is slightly lower. Still, it is above the average of the other countries' companies and probably high enough for options trade.

To conclude, for an option market to be introduced in Estonia, we consider this prerequisite met, both regarding the entire market and the two companies we have suggested.

6.5. Number of listed firms

When the companies that were delisted shortly after the option introduction are deducted, all the benchmark countries had three companies as underlying market, while Estonia, in our proposal, had two companies. As pointed out by Demirgüc-Kunt and Levine, small differences in this indicator hardly reveal any differences in stock market development, while large ones might do.[149] Thus, when the underlying market is defined as only those stocks that are involved in the option introduction, the number of listed firms is not a measure to pay too much attention to.

The number of listed firms as an indicator of stock market development is probably more applicable on the entire market. When it comes to the entire market, the differences are more interesting. Estonia is far behind the benchmark countries, especially Denmark and Norway. The Estonian and the Hungarian stock markets are relatively young and this might in part explain their lower number of firms, suggesting that the number will increase in the years to come.

Estonia's low ratio of listed firms to population indicates a deficient degree of stock market development, further adding to the impression given by the turnover figures. Furthermore, as mentioned above, Estonia's low number of listed firms at the stock exchange as an absolute number might have a negative impact on the turnover.

6.6. Other aspects of the option market's environment

It is intuitively plausible that the banking system and regulatory framework, not only affects an option market, but also the stock market. Thus, even though the empirical study only focused on stock market development, some of the other aspects such as a well functioning banking system and an appropriate regulatory framework can indirectly be captured due to the interrelations between these three prerequisites.

[149] Section 4.6.3.

We believe that the issues discussed in section 4.4 and 4.5, improvements in knowledge and information technology, contributes to lower the requirements of the stock market for an option introduction to be possible. The recent years' increased knowledge and experience of options as financial instruments and the radically lowered transaction costs might have contributed to a lower threshold of stock market development, in the sense that smaller and less liquid stock markets are able to be the base for option trade than else would have been the case.

The question whether or not these forces have lowered the threshold enough for making the Estonian stock market ready for option introduction has to be more closely investigated to be answered.

7. Conclusions

We consider Estonia's relatively low turnover as the most important obstacle to option introduction, as it is considerably lower than the benchmark countries both in terms of absolute numbers and related to capitalization.

Also the relatively low capitalization, measured in absolute numbers, constitutes an obstacle. While the low turnover is a more obvious sign of deficient stock market development, in the sense that it is apparent also in relative terms, the low capitalization might be a more difficult obstacle to deal with. It is easily understood that increasing the Estonian stock market capitalization to a level near the average of the European countries is a delicate task, not feasible in the near future. As we see it, Estonia's chance to achieve a sufficiently large underlying market for option introduction, lies mainly in strategic alliances with other stock markets. While increasing the turnover-to-capitalization ratio to the level of the more developed markets, by no means is an easy challenge, we still believe that this is more achievable.

While both volatility and capitalization-to-GDP ratios of the Tallinn Stock Exchange are high enough, the market's turnover and number of listed companies both indicate an insufficiently degree of stock market development for an index option introduction to be feasible. Furthermore, we do not consider the capitalization as an absolute number high enough to be the base for option trade. For these reasons we do not believe that Tallinn Stock Exchange is ready for introduction of index options.

Regarding the two Estonian companies in the study, Eesti Telekom and Hansa Bank, the conclusion regarding volatility is the same as for the entire market. We also consider the companies' capitalization sufficiently high, albeit a bit more hesitant. The turnover, however, is significantly lower than most of the benchmark companies, making this the major obstacle. Taken together, we do not believe that the stocks of Eesti Telekom or Hansa Bank are ready for option introduction.

Finally, an interesting consequence can be derived from the assumption that a well developed stock market is a necessary, but not sufficient, condition for option introduction. If that is the case, the conclusion that the stock market lacks a sufficient degree of development implies that the other aspects of the environment, such as banking system and regulatory framework, need no further investigation in the present situation.

7.1. Further research

A topic for a future investigation would be to find out what can be done in order to get rid of the obstacles that Estonia is facing according to this investigation, i.e. increasing the turnover and capitalization, to make the market more prepared for option introduction. For instance, it would be interesting to find out how Estonia's future entrance into the European Union will impact their regulatory and banking systems, and how this in turn will influence the stock market development.

So would an investigation aimed at establishing the threshold levels of certain indicators that are crucial for option introduction. However, we think that would require a more comprehensive investigation, involving more benchmark countries as well as indicators.

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