UNIVERSITY OF JYVÄSKYLÄ

The School of Business and Economics

THE EFFECT OF THE NORDIC LIST MERGER ON FINNISH STOCK PRICES: AN APPLICATION OF THE MERTON MODEL

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Tiivistelmä – Abstract

I study if the list merger of the Copenhagen, Helsinki and Stockholm OMX stock exchanges affects prices of Finnish stocks. My work builds on stock price, investor base and liquidity data of 106 Finnish stocks. My main theoretical backbone is a version of the CAPM developed by Merton (1987). Regression tests that I replicate on my data were first used by Kadlec and McConnell (1994).

Previous studies on list mergers are virtually non-existing but there are studies on global stock market integration indicating that the markets have become more integrated over the recent decades. I also exploit previous studies on stock index additions and (cross-)listings which apply Merton's model. These studies indicate that changes in stock prices related to these events can be explained by Merton's model. I assume this could also be the case with list mergers. I find that the Nordic list merger has not had any effect on Finnish stock prices which could be explained by Merton's model. This may be due to already high level of integration of the Nordic stock markets whereby the list merger does not bring about any higher level of integration. It is also possible that a longer research period should be used to detect changes that may occur slowly in the foreign investor base of Finnish stocks.

Asiasanat

shadow cost, stock market integration, list merger, anomalies

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1. INTRODUCTION

In this work I set out to study how the Nordic list merger of the Copenhagen, Helsinki and Stockholm OMX stock exchanges affects prices of the Finnish stocks listed in Helsinki. The Nordic list merger is undoubtedly part of a larger process of global integration of financial markets. During the past two decades, the integration of the global financial market has accelerated and made it easier to own and trade stocks from around the world. For instance, Karolyi (2006) notes that the total cross-border flows of capital between the U.S. and all other countries represented less than one percent of the U.S. GDP in 1980, but today, they comprise almost 30 percent. This upward trend of global investing can be motivated by portfolio theory which implies gains to be obtained by international diversification if correlations between domestic and foreign stocks are lower than correlations between domestic only stocks. It has been estimated that the U.S investors would be 10-50% percent better off in terms of risk-return by investing internationally rather than purely domestically (Cuthbertson & Nitzsche 2004, 154-155). As the cross-border trade of stocks is playing a growing role in the financial market, it means that stock exchanges are compelled to compete over their share of the global trading volume and foreign listings of stocks. Investors and companies undoubtedly appreciate the most liquid of the stock exchanges since the best liquidity translates to the lowest transaction costs. High trading volume typically indicates good liquidity and where the best liquidity is, there would most companies want to have their stocks listed. Competition has lead to numerous mergers and acquisitions between stock exchanges as it has become evident that size and volume matters. Our Nordic stock exchange operator OMX represents a good example of those operators which pursue winning competitive edge by purchasing other operators. Very recently intercontinental mergers of stock exchanges have become a reality; NYSE Euronext started 4th of April 2007 and there is currently an ongoing NASDAQ bid on OMX.

In Europe, the process towards European Economic and Monetary Union (EMU) has given a strong momentum to financial market integration. Capital market controls were completely eliminated in the course of the 1980s and 1990s. The introduction of the euro removed exchange rate risks among the EMU participants, and started a single monetary policy for the euro area. Thus the money market became integrated and inflation expectations declined across the EMU area. With no exchange rate risk and lesser inflation risk, capital investing within EMU has become more tempting. In fact, the degree of comovement i.e. correlation among European equity, that is stocks and bonds, markets seems to have increased Although EMU has clearly been an important driver for change, the financial market developments in Europe are part of a global phenomenon. Financial integration has been driven by advances in information technology, the global liberalization of cross-border financial flows, growing economic integration due to ever growing global trade and production. (Berben & Jansen 2005, 1.)

The Nordic countries have traditionally been closely inter-connected economies. As early as in 1952 a common labor market and social security system was introduced between these countries. However, the Nordic countries have chosen differently what comes to EU and EMU: only Finland is a member of both EU and EMU, Sweden and Denmark are members of EU but Norway and Iceland have chosen to stay out of both of the unions. Nevertheless, these economies are tightly connected by trade and, in recent years, by cross-border mergers of major companies. The Nordic stock market has become more integrated since the OMX purchase of Copenhagen, Helsinki, Iceland and Stockholm stock exchanges. The Nordic List, which comprises the lists of the before mentioned exchanges, was launched on the 2nd of October 2006. The Nordic list merger can be seen as part of the process of global financial integration.

Karolyi (1998) asks the question of why companies list their stocks abroad i.e. cross-list their stocks; what precisely are the company, and thereby investor, benefits that are sought by the more integrated stock market? In his survey study Karolyi (1998,1) finds that the benefits are: higher trading volume, better liquidity, higher level of valuation, larger investor base and a lower cost of raised capital through lowered level of risk premium.

Not only does the integration of financial markets provide benefits for investors and companies but also to common people. Integration of financial markets can contribute to higher European economic growth. A study of the European Commission shows that financial integration, defined as a convergence for European financial development toward the US standard, would imply a one percentage point gain in EU GDP growth. (ECB Report 2004, 7.)

The importance of the financial market in generating wealth and prosperity is unquestionable. Therefore, I believe, it is of great interest to explore the influence of the integration process on the Finnish stock market. The newly formed Nordic List offers a great research opportunity to study the effects of the stock market integration. The Nordic List is composed of Danish, Finnish and Swedish stocks listed on OMX exchanges in these countries. OMX motivates the formation of the Nordic List by willingness to increase liquidity and visibility of the listed stocks. This is consistent with the findings of Karolyi (1998). I also assume that OMX has to compete with other major stock exchanges in providing a world-class market place for its customers. I define my research problem as: to study whether a change in international visibility of Finnish stocks, introduced by the Nordic List, reflects to their foreign ownership and liquidity and subsequently into their prices.

Integration of the financial markets has been subject to a lot of research over the recent years. Berben and Jansen (2005) apply a time-varying GARCH method for studying stock, as well as bond market integration in Europe and in relation to the U.S.A. They exploit data covering the period from 1980 to 2003. Their data includes Germany, France, Italy, the Netherlands and Belgium from the euro area and Denmark, Sweden and the United Kingdom which are EU-members that have not adopted the euro and furthermore Switzerland and the United States. They find that the simple average of the 45 stock return correlations between these 10 countries went up from 0.19 in 1980 to 0.71 in 2003. Moreover, they find that the largest increase in stock market integration took place in the period from 1985 to 1995. In 2003, the average stock market correlation within the euro area was 0.79 and a whopping 0.97 for the government bond markets. In comparison, stock market correlations between euro area countries on the one hand, and Denmark, Sweden and the United Kingdom on the other were on average 0.70 and between the U.S.A and the European countries 0.72 on average. They conclude that opportunities for portfolio diversification within the industrialized world have greatly deteriorated over the past few decades. (Berben & Jansen 2005.)

Mangeloja (2001) studies integration of the Nordic stock market. He applies vector autoregression (VAR) and cointegration testing, which have gained a stable position in the research, for studying integration process between Sweden, Denmark, Norway and Finland. He points out that several studies examining the 1980s do not find cointegration in the Nordic stock markets. In his study, covering the period from January 1990 to February 1998, he finds the Nordic stock markets to be cointegrated as measured by aggregate national indices, which is the convention in the research. Uniquely, he also repeats the same test using sector-specific indices instead of the aggregate ones and finds that the Nordic markets are not cointegrated. In sum, the Nordic stock market seems to have become integrated in the 1990s when measured by aggregate stock indices but have remained non-integrated when measured by sector specific indices. A practical implication from Mangeloja's results is that an investor does benefit from diversifying to Nordic aggregate indices but he or she benefits from diversifying to Nordic sector-specific indices. (Mangeloja 2001.)

However, publicly available previous studies on list mergers are virtually non-existing. This is probably because such studies have not been carried out or because they are not disclosed. Fortunately, there is a huge population of other kind of research papers which study stock valuation in cases when the trading environment changes while the underlying firm fundamentals do not. What makes these studies interesting is that often stock prices change in a way that can not be explained by traditional finance and therefore these price changes are called anomalies. For instance, there are studies on index additions e.g. stocks traded in NYSE being added to S&P 500 index. Another example is studies on stock listings from an OTC market to an exchange market e.g. stocks from NASDAQ OTC being listed to NYSE. Yet another example is cross-listings of stocks meaning that stocks, while already domestically listed, are additionally listed to a foreign stock exchange e.g. a stock listed on OMX being also listed to NYSE. The previously mentioned studies provide a good analogy to a list merger like that of the Nordic List because it can be seen as a large-scale one go cross-listing of stocks. The Nordic List also brings along a multiple of new indices where the stocks are added to. Many of these studies apply a capital assets pricing model developed by Robert Merton (1987) for explaining changes in stock prices. Merton's model connects stock prices to the size of their investor base. I choose to use Merton's model as my theoretical backbone and as far as I know I am the first person to apply Merton's model for studying list mergers.

Chapter two presents OMX and the Nordic List. Chapter three presents the traditional approach to assets valuation called the Efficient Market Hypothesis and two extensions to fundamental based assets pricing models. The first of these extensions is the Merton's (1987) model and the second is a model by Amihud and Mendelson (1986). Furthermore, previous studies providing empirical test results on Merton's and Amihud and Mendelson's models are presented, as well as the basic theory of the regressions. Chapter four analyses the available data on the Nordic List and tries to find strengths and weaknesses in it. Chapter five introduces the regression models and presents and analyzes the results. Finally, chapter six draws the conclusions.

2. OMX AND THE NORDIC LIST

The Nordic List was launched on 2nd of October 2006. It is composed of the Copenhagen list, Helsinki Main, I- and NM-lists and Stockholm A- and O-lists. The list is divided into three size segments based on market value: small cap (<150MEUR), medium cap (150-1000MEUR) and large cap (>1000MEUR). Furthermore, within each size segment, a sector classification is applied according to Global Industry Classification Standard Sector (GICS). A large number of new indices were started according to the new classification but the old national indices are preserved on side. Two new tradable indices were introduced carrying the names OMX Nordic 40 Tradable and OMX Vinx. The list comprises about 590 companies together gathering c.a. 761 billion EUR of market value. The Swedish and Danish stocks are traded in local crowns but the Finnish stocks in euros. The Nordic List is the world wide number one market in forest industry stocks and the second in fashion stocks. The listing criteria have been harmonized but differences still exist for example in rules of disclosure. The OMX motivations for the launching of the Nordic List are increased visibility and liquidity. OMX operates the following exchanges: Copenhagen, Helsinki, Riga, Stockholm, Vilnius, Tallinn and the newly acquired Iceland exchange and its biggest owners are Investor (11.9%) and the Swedish government (6.7%). The Nordic List is comparable to Euronext, which was created by merging the Amsterdam, Bruxelles and Paris exchanges. Unfortunately, no research on Euronext has been disclosed. (OMX Homepage.)

OMX has several roots in history. One of the roots is a company named OM (Optionsmäklarna AB) which was founded in 1984 by Olof Stenhammar and started trading of options in 1985. In 1987, it was listed to the Stockholm Stock Exchange After changes in the Swedish capital markets legislation the Stockholm Stock Exchange was reorganized into a company form under the name Stockholms Fondbörs AB in 1993. In 1998, OM and Stockholms Fondbörs were merged. (Historiska Värdepapper, 2004.)

The other major roots of the current OMX are the venerable stock exchanges of Denmark, Finland and Sweden. Trading in the Stockholm Stock Exchange was initiated in 1863. Banks were admitted as trading members from 1907 and a “silent” electromechanical trading system was operational as early as 1918 which made the Stockholm Stock Exchange the most modern exchange in Europe. In 1990, the Stockholm Stock Exchange became fully electronic. Under legislation passed in 1993, the exchange monopoly was abolished and the Stockholm Stock Exchange was reorganized as a joint stock company with exchange members and issuers as its shareholders. Foreign remote members were also given access to trade in Stockholm from locations abroad. (OMX Homepage.)

The Helsinki Stock Exchange was founded in 1912. From 1935 the Helsinki Stock Exchange was a “silent” exchange with an electro-mechanical quotation board. The Helsinki Stock Exchange and the Finnish securities market underwent major changes in the 1980s with a complete re-organization, new improved set of rules and regulations, a fully automated trading system and legislation concerning the whole of the securities market. In 1998, Helsinki Exchanges and Finnish Central Securities Depository Ltd (Suomen Arvopaperikeskus Oy) merged into one group, the parent company of which was Helsinki Exchanges Group Oyj (HEX Group). In 2001, the HEX Group became a majority shareholder of the Tallinn Stock Exchange and the Estonian Central Securities Depository. In 2002, the HEX Group acquired a majority shareholding of the Riga Stock Exchange. In 2003, HEX merged with the Swedish OM to become OMX. (OMX Homepage.)

The history of the Copenhagen Stock Exchange in trading in securities dates back to the late 17th century, when merchants acted as brokers and bankers. The first proper stock exchange law was passed in 1919. Reforms were implemented in 1986, creating greater transparency and capacity in the market. Seven years after the first reform, work began on yet another reform, to take account of the fact that trading of securities was being liberalized throughout the EU As a result of the Danish Securities Trading Act in 1995, the Exchange was converted from a semi-public institution to a limited liability company. From May 1996, it officially became the Copenhagen Stock Exchange A/S. In 2005, Copenhagen Stock Exchange merged with OMX AB. (OMX Homepage.)

The Nordic Central Securities Depository (NCSD) plays a central role in the Nordic financial system. The NCSD Group currently includes Värdepapperscentralen AB (VPC) and Suomen Arvopaperikeskus Oy (APK), the Swedish and Finnish central securities depositories, to which all major actors on the Nordic capital markets are directly or indirectly affiliated. NCSD is responsible for providing long-term, secure and cost effective services to issuers, intermediaries and investors, as regards the issuance and administration of financial instruments, as well as clearing and settlement of trades on these markets. OMX was an active player in founding NCSD. (APK Homepage.)

3. LITERATURE AND THEORY

The first sub-chapter discusses the Efficient Markets Hypothesis (EMH), its assumptions and implications for an investor. The EMH is a conventional approach to assets pricing. The second sub-chapter presents an assets pricing model created by Merton (1987) and his concept of shadow cost. Furthermore, a model by Amihud and Mendelson (1986) is presented, which incorporates liquidity into stock pricing. The third sub-chapter presents empirical results obtained by previous studies. Finally the fourth sub-chapter presents the theory and assumptions of the regression models which I use in the regression tests in chapter five.

3.1. The Efficient Markets Hypothesis and Anomalies

The EMH assumes that in the financial markets, like in any competitive market, the equity prices are defined by supply and demand. Furthermore, investors are assumed to be rational and to be able to adopt all available information instantaneously and use it in the same way i.e. the investors are said to be homogenous. With these strong assumptions no one can make any abnormal profit in the market i.e. the future prices are unpredictable. To define the previous shortly one can say that the EMH equals to the same as to say: “The Price is Right”. (Cuthbertson & Nitzsche, 53-54.) The EMH defines three forms of efficiency: Weak Form: the investor’s information set contains only the past public information, Semi-Strong Form: the investor’s information set contains the past and current public information and Strong Form: the investor’s information set contain all possible information including “insider information”. In practice the Semi-Strong form of the EMH is assumed. (Cuthbertson & Nitzsche 2004, 64.)

As a practical implication for an investor the EMH means that it is impossible to pick “winner” stocks by using public information. An active strategy will not bring about any abnormal returns. On the contrary, the EMH implies that the investor should assume a passive “buy and hold” strategy and diversify his or her portfolio. This could mean, for example, that buying a share in a “market portfolio” index fund (e.g. S&P500) would be the best and also the most cost-efficient holding in stocks. (Cuthbertson & Nitzsche 2004, 57.)

However, it has been shown that sometimes the returns are predictable, which violates the EMH and puts the Capital Assets Pricing Model (CAPM) and other fundamental based assets pricing models under a question. The predictability phenomenon is called an anomaly.

A cross-listing provides one example of predictability, since it has been shown that when a stock is cross-listed it will have a positive impact on its price the first month after listing i.e. it is an anomaly (Karolyi 1998,1).

3.2. The Shadow Cost and Liquidity

Stock price anomalies contradicting the CAPM led Merton (1987) to develop a more general version of it. According to the CAPM asset returns are determined only by the systematic risk i.e. the market risk and it assumes that all investors, having homogenous expectations, hold all the risky assets in proportions given by the market (index) portfolio. Merton suggests a more general model for CAPM assuming that each investor has information only about a subset of available asset and composes his portfolio only of this subset. Thus the resulting portfolio differs from the CAPM portfolio. (Merton 1987.)

Merton explains how greater investor awareness increases equity values. He describes the lack of investor awareness as a “shadow cost”. According to him investors are only aware of a subset of stocks and compose their portfolios only of this subset and thus, hold some unsystematic risk. Shadow costs represent a premium that investors require as compensation for holding unsystematic risk. Kadlec & McConnell (1994, 615) define Merton’s shadow cost by

(1) $$\lambda_k = \frac{\delta\sigma_k^2 x_k (1 - q_k)}{q_k}$$, where

δ = coefficient of aggregate risk aversion

σ_k^2 = firm-specific component of security k's return variance

x_k = value of firm k relative to the aggregate market value of traded stocks

q_k = size of firm k's investor base relative to the total number of investors

The relation between the shadow cost and the incremental (in comparison to CAPM) expected return on stock k is given (Kadlec & McConnell 1994, 615) by

(2) $$E(R_k) - E(R_k^*) = \lambda_k \frac{E(R_k^*)}{R}$$, where

E(R_k) = expected return on security k for the incomplete information case (q_k < 1)

E(R_k^*) = expected rate of return for the complete information case (q_k = 1 i.e. CAPM)

R = return on the riskless security

The intuition behind Merton's model is simple and straightforward. The absence of a firm specific risk component in the CAPM comes about because such a risk can be eliminated through diversification and is therefore not priced, however, in Merton's model, in which investors invest only in those stocks of which they are aware of, complete diversification does not occur, The effect of this incomplete diversification on expected returns is greater the greater the firms specific risk and the greater the weight of the security in the investor's portfolio measured by market value per shareholder. (Kadlec & McConnell 1994, 615.)

A different perspective to price anomalies is provided by Amihud and Mendelson (1986). They developed a model in which returns are shown to be an increasing and concave function of liquidity. They proxy for liquidity by using the bid-ask spread. Thus the return required by investor i on asset j is (Foerster & Karolyi 1999, 1005):

(3) $E(R_j^*) = R_i^* + \mu_i S_j$, where

R_i^* = required spread-adjusted return

$\mu_i S_j$ = expected liquidation cost (i.e. the investor's liquidation probability, μ_i, times the asset's relative spread, S_j).

For instance, if the spread falls following a cross-listing, the lower expected returns should give rise to a higher present stock value.

3.3. Previous Studies

An interesting application of both Merton's and Amihud and Mendelson's assets price models is in Kadlec and McConnell paper (1994) which studies price changes related to NYSE exchange listings. Their sample includes 273 U.S. firms that listed from OTC to NYSE over the period from August 1980 to December 1989. They execute a joint test of Merton's shadow cost and Amihud and Mendelson's liquidity factor as explanatory variables for the change in stock price. They find support for both investor awareness and liquidity as sources of increasing stock price by exchange listings. (Kadlec & McConnell 1994.)

Kadlec and McConnell's work was to a large extent replicated in Foerster and Karolyi (1999) paper in which they study foreign cross-listings to the U.S stock exchanges NYSE, AMEX and NASDAQ over the period from 1976 to 1992. Their sample includes 153 listings from 11 countries covering Europe, Asia, Canada and Australia. They mention that they are the first researchers to apply Merton's model on cross-listings. They also test the hypothesis of market segmentation which due to investment barriers (e.g. regulatory barriers, taxes, and information constraints) creates an incentive for firms to adopt financial policies to reduce their negative effects. Theory suggests that stock prices for firms that cross-list from segmented markets are expected to rise and their subsequent expected returns should fall as an additional built-in risk premium compensating for these barriers dissipates. Their overall evidence is consistent with this hypothesis. However, they also find reduction in the Merton's shadow cost as a significant value increasing factor of cross-listing. Unlike Kadlec and McConnell they do not find support for liquidity hypothesis but their measure for liquidity was questionable as they pointed out themselves. (Karolyi 1999.)

Elliott, Van Ness, Walker and Warr (2006) provide a comprehensive study on the higher stock value associated with inclusion in the S&P 500 index. Their sample includes 147 index additions from 1993 to 2000. They examine S&P 500 index addition effects by surveying of a multiple of explanations for this phenomenon: price pressure, downward-sloping demand curves, improved liquidity, improved operating performance, and increased investor awareness i.e. reduced Merton's shadow cost. They refer Amihud and Mendelson (1986) to motivate the use of liquidity variable. (Elliott et al. 2006, 41.)

They begin by noting that previous studies use different terminology to describe similar effects which may be confusing. However, in recent studies, the term "price pressure" is the term most often used to describe the short-run effect of market liquidity constraints. Current studies also use the term "downward-sloping demand curves" to describe the longer run price effect due to investor preferences as will be explained later on. They follow this terminology. Market frictions can create short-run liquidity constraints, resulting in a price pressure effect. For example, if an investor submits a buy or sell order that is small relative to the float, they expect that trade to have little to no price impact. However, for large block trades, market frictions can cause short-run deviations from a stock's equilibrium price. (Elliott et al. 2006, 34.)

In a classical CAPM world, demand curves for stocks are horizontal, because prices reflect the market's perceptions of risk and expected return. In this framework, as long as no new information accompanies, a demand or supply shock will have no impact on the stock price. Investors can alter their portfolios using near-perfect substitutes in the form of other stocks or combinations of stocks. These substitutes allow an investor to occupy the same, or a similar, risk-return state space, resulting in horizontal demand curves for any individual security. If perfect substitutes for a stock are not available, then investor reaction to a large block trade can influence the price of an individual stock, as investors will demand compensation to adjust their portfolios. Therefore, the slope of the demand curve is a function of the availability of close substitutes. (Elliott et al. 2006, 35-36.)

Their tests indicate that the Merton's model of the shadow cost is the primary explanation for the observed cross-section of the increased stock valuation by index addition. They also find evidence of short-run price pressure in the pattern of post-addition day returns. They find no evidence that proxies for long-run downward-sloping demand curves or liquidity are related to the cross-section of abnormal returns associated with addition in index. (Elliott et al. 2006, 31.)

Chen, Noronha and Singal (2004) find an interesting asymmetric price effect around stock additions to and deletions from the S&P 500 index; there is a permanent increase in the price of added stocks but no permanent decline for deleted stocks. Their sample includes 760 additions and 235 deletions over the period from 1962 to 2000. They state that an asymmetric price response questions the validity of the downward sloping demand curve hypothesis, the information hypothesis, which holds that an index addition or deletion conveys information about the firm's prospects, and the liquidity hypothesis, since they all predict a symmetric response. Instead, they find that changes in awareness are asymmetric: there is an increased awareness for added stocks as investors learn about them, but a smaller drop in awareness for deleted stocks because it may be difficult for investors to all of a sudden become unaware of the deleted stocks. So, their evidence is more consistent with Merton's model of shadow cost than with the other explanations. (Chen et. al. 2004.)

All the four previous studies that I presented above are unanimous about the ability of the Merton's shadow cost to explain abnormal returns that arise by listings, cross-listings or index additions/deletions of stocks. Other explanatory variables gain mixed results. Kadlec and McConnell (1994) find support for the explanatory power of liquidity but Foerster and Karolyi (1999) do not, however, their method to proxy liquidity is questionable. In addition, Foerster and Karolyi find support for the market segmentation hypothesis. Along with the shadow cost Elliot el. al. (2006) find support for short-run price pressure but neither for liquidity nor downward-sloping demand curves. Chen et. al. (2004) do not find support for downward sloping curve, information or liquidity hypotheses. Based on this analysis of the earlier work I replicate the work of Kadlec and McConnell (and Foerster and Karolyi) and choose to use the shadow cost and liquidity to explain the abnormal returns of Finnish companies that may arise by the introduction of the Nordic List. Combining the liquidity and investor awareness approaches makes sense since they are correlated by nature. The larger investor base a company has, the more likely it is that its stock is regularly traded, thereby increasing its liquidity. (Kadlec & McConnell 1994, 612.)

3.4. Regressions

For my tests I apply linear regression models with ordinary least squares estimators (OLS) which are of the following type:

(4) $Y_i = \beta_0 + \beta_1 X_i + u_i$ (i = 0,…,n) where:

Y_i = the dependent variable

X_i = the independent variable or the regressor

β_0, β_1 = the population betas to be estimated with OLS regression

u_i = the error term

The two basic assumptions of OLS regressions are that the error term u_i has conditional mean zero given X_i i.e. $E(u_i \mid X_i) = 0$ and that the dependent variable (Y) and the independent variable (X) are independent and identically distributed (i.i.d) draws from their joint distribution. These assumptions facilitate a large sample normal distribution of estimators, as well as their unbiasedness and consistency (Stock & Watson 2003, 103-107.). It is essential to use appropriate standard errors. For a cross sectional regression as in (4) the choice has to be made between homoskedasticity-only standard errors and heteroskedasticity-robust standard errors. The definition is: the error term u_i is homoskedastic if the variance of the conditional distribution of u_i given X_i, $\mathrm{var}(u_i \mid X_i = x)$, is constant across the sample and does not depend on x. Otherwise the error term u_i is heteroskedastic (Stock & Watson 2003, 126). I use consistently heteroskedasticity-robust standard errors in my cross-sectional regressions since there seldom is any reason to believe that the errors are homoskedastic (Stock & Watson 2003, 128-129). Moreover, heteroskedasticity-robust standard errors lead to statistical inferences that are valid whether or not the errors u_i are heteroskedastic or not (Stock & Watson 2003, 128). So, the simplest thing is to use always heteroskedasticity-robust standard errors (Stock & Watson 2003, 129).

Furthermore, I apply an OLS regression on time-series data of daily stock (Y) and market index (X) returns of type:

(5) $$Y_t = \beta_0 + \beta_1 X_t + u_t$$

β_0, β_1 = the population betas to be estimated

u_t = the error term

The returns that I use in (5) are all logarithmic and are defined by formula:

(6) $$Y_t = X_t = \ln\left(\frac{P_t}{P_{t-1}}\right) = \ln P_t - \ln P_{t-1} = \Delta \ln P_t$$ where:

P_t = price of the current observation (e.g. stock/market index price today)

P_{t-1} = price of the previous observation (e.g. stock/market index price yesterday)

The model in (5) is a simple regression model (Stock & Watson 2003, 498). There are two basic assumptions for a time series model. First, that X_t is exogenous, that is, $E(u_t \mid X_t, X_{t-1}, X_{t-2}, ...) = 0$ which holds that u_t has conditional mean zero, given the regressor(s) and the lags (in this simple model there are none) beyond the lags included in the model (Stock & Watson 2003, 447 and 500). I take this assumption as given to my model since it is not an option for me to add any lags. Second, that Y_t and X_t have a stationary distribution and become independently distributed when the amount of time separating them becomes large (Stock & Watson 2003, 499-500). This second assumption for time-series regressions replaces the i.i.d. assumption for cross-sectional regressions (Stock & Watson 2003, 447).

The stationarity assumption is essential for obtaining an unbiased and consistent OLS regression. It holds that the probability distribution of Y_t and X_t may not change over time. In other words, stationarity necessitates the future to be like the past at least in a probabilistic sense (Stock & Watson 2003, 446-447.) Economic time series are likely to contain a stochastic trends rather than being stationary (Stock & Watson 2003, 458). Therefore, I assume that the time series data of daily stock prices that I use in this study contains stochastic trends. However, even if the time series contains a stochastic trend, its first difference does not (Stock & Watson 2003, 466). By inspecting (5) and (6) it is easy to see that my regression model is, in fact, a model of first differences on both side of the equation, that is, (5) equals to (7):

(7) $$\Delta \ln P_t = \alpha_j + \beta_j \Delta \ln P_{mt} + u_{jt}$$

Thereby, I make the assumption that my regression model (5) is stationary and that the OLS estimates are unbiased and consistent.

Time series regressions pose yet another potential problem. In a model like (5), it is typical for the error term u_{jt} to be serially correlated in other words, u_{jt} may contain autocorrelation (Stock & Watson 2003, 500). Autocorrelation in the error term does not introduce inconsistency or biasedness of OLS estimates but instead the usual homo- or heteroskedastic standard errors become inconsistent. The solution to this problem is to use heteroskedasticity- and autocorrelation-consistent (HAC) standard errors. (Stock & Watson 2003, 504-507.)

In the following, I shortly present the theory of HAC standard errors. All the formulas are from Stock and Watson (2003, 504-507). For a distributed lag regression model the HAC variance of beta estimate $\hat{\beta}_1$ is given by formula:

(8) $$\operatorname{var}\left(\hat{\beta}_1\right) = \left[\frac{\sigma_v^2}{\left(\sigma_X^2\right)^2 T}\right] f_T$$ where:

σ_v^2 = variance of $v_t = (X_T - \mu_X)u_t$

σ_X^2 = variance of X_T

f_T = a factor which adjusts for serial correlation

T = number of observations

The content of the right hand side brackets is the variance of $\hat{\beta}_1$ in the absence of serial correlation. Taking (8) are rewriting it we get:

(9) $$\tilde{\sigma}^2_{\hat{\beta}_1} = \hat{\sigma}^2_{\hat{\beta}_1}\, \hat{f}_T$$

The left hand term of (9) is so called Newey-West variance estimator. And then, $\hat{f}_T$ which is the estimator of f_T in (8), can be obtained from:

(10) $$\hat{f}_T = 1 + 2\sum_{j=1}^{m-1}\left(\frac{m-j}{m}\right)\left(\frac{\sum_{t=j+1}^{T}\hat{v}_t\,\hat{v}_{t-j}}{\sum_{t=1}^{T}\hat{v}_t^2}\right)$$ where

m = so called truncation parameter because, in practice, only m-1 autocorrelations are used instead of T-1

A guideline for choosing m is:

(11) $$m = 0.75T^{1/3}$$

For instance, if the number of observations (T) is 200, m would be 4.39 and rounded to 4. This would mean that 3 autocorrelations or lags would be used. Newey-West HAC (9) is implemented in Stata which allows me to use it for standard errors in (5).

4. DATA

This work builds on three kinds of data: returns data which was retrieved from DataStream for the Finnish companies of my sample, shareholder data which was retrieved from the Finnish central securities depository (Suomen Arvopaperikeskus Oy) and liquidity data which was retrieved from OMX.

To facilitate a study as free as possible of any informational interference unrelated to the list merger, a clean-up of the sample was carried out by removing companies that: were listed in multiple of stock exchanges before the list merger (e.g. Nokia), have undergone major mergers, acquisitions or other restructuring (e.g. Outokumpu), are under speculation of ownership (e.g. Finnlines), are completely owned by a foreigner (e.g. Silja Line) or do not have data available over the whole period (e.g. Suomen Helasto). The sample size is 106 after the clean-up. The sample is presented in Appendix 1.

4.1. Investor Base

The number of shareholders is retrieved from the monthly reports of the Finnish central securities depository, which maintains statistic of both domestic and foreign shareholders, for all of which the end of month numbers is provided. The number of shareholders is called the investor base (IB) from here on in the text.

One of challenges of the work is to try to exploit information contained in the monthly investor base data as much as possible. An obvious shortcoming with the investor base data is that it does not differentiate individual and institutional investors. Any single institutional investor naturally represents a large number of individuals so it would have been of interest to regress institutional data separately. Even bigger challenge is that a vast majority of the foreign investor base is hidden into nominee registrations. 45.8% of the total market value of Finnish stocks is held by nominee registrations. In fact, there is no way of finding out how many foreign investors are hiding in the nominee registrations. An additional 5.2% of market value is held by individual foreigners thus the foreign ownerships sums up to 51% of the total market value in February 2007. An overview summary of the foreign investor base of the sample is given in TABLE 1. The numbers show the relative, not the market value, foreign holding of stocks across the sample at the end of each month. The months that I use for pre-launch (the list started 2nd of October 2006) investor base are shaded with lighter grey and the months for post-launch investor base have a darker gray shade in TABLE 1 .

TABLE 1 Overview statistics of the foreign investor base across the sample

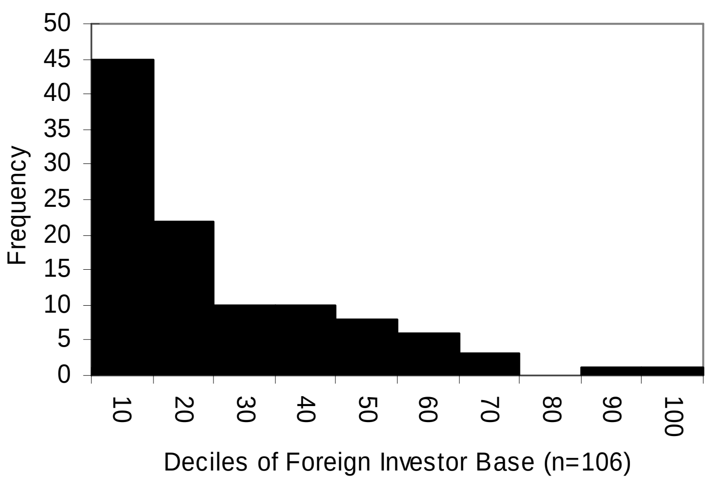
Time [year.month]	Mean [%]	Median [%]	Min. [%]	Max. [%]
2005.09	19.52	10.85	025	92.81
2005.10	19.46	10.86	.041	93.35
2005.11	19.34	11.32	.041	93.38
2005.12	19.46	11.56	.041	93.17
2006.01	19.49	11.83	.041	93.26
2006.02	19.82	11.82	.041	93.29
2006.03	19.84	11.52	.025	93.34
2006.04	20.08	12.12	.026	93.28
2006.05	20.16	11.86	.025	93.43
2006.06	20.44	11.95	.028	93.43
2006.07	20.29	11.89	.06	93.59
2006.08	20.17	11.93	.06	93.29
2006.09	19.93	11.69	.06	93.62
2006.10	20.04	11.88	.06	93.84
2006.11	20.10	11.88	.06	94.06
2006.12	20.21	12.42	.07	94.08
2007.01	20.48	12.28	.017	94.06
2007.02	20.77	12.44	.017	94.51

Sample size is 106. All numbers as percentage values relative to the total investor base. The pre-launch period is shaded with lighter and the post-launch period with darker grey.

It can be observed that the mean holding is about 20% and that a slight upward trend can be seen over the period. The median foreign holding is about 11-12% which tells that a typical foreign holding is relatively small and thereby there should be plenty of space for the foreign holding still to grow. It is interesting to observe that the median foreign holding has increased from 11.69% in September 2006 to 12.44% in February 2007.

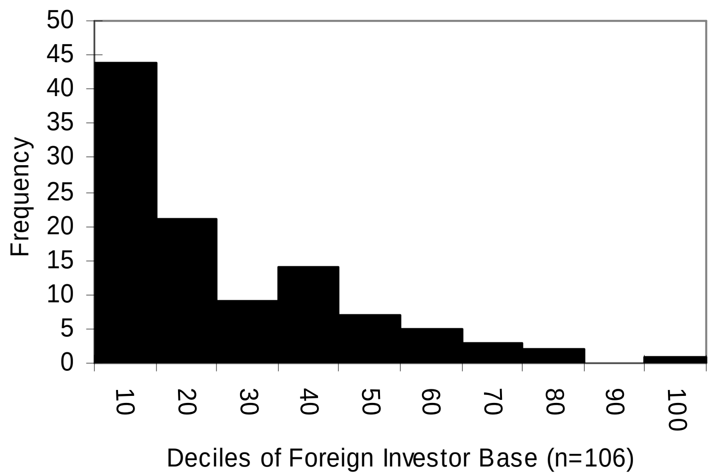
The two histograms below present a distribution of foreign ownership in September 2006 i.e. the month before the merger (FIGURE 1) and a distribution in February 2007 i.e. five months after the merger (FIGURE 2). The numbers are of the last trading day of each of the months

FIGURE 1 Frequency of companies per deciles of foreign investor base in September 2006



It can be observed that an interesting shift in foreign holding has occurred between the third and fourth deciles. This may indicate that the merger has contributed to improved international visibility and thereby increased the foreign ownership of some of the companies.

FIGURE 2 Frequency of companies per deciles of foreign investor base in February 2007



4.2. Liquidity

Liquidity data, that is, bid-ask spread data was retrieved from the OMX monthly reports providing the relative daily bid-ask spread over each month.

The OMX definition of relative spread is: “The average during the month in question, of bid and ask prices at the end of the day according to this formula (OMX Homepage)”:

$$(12) \qquad RelativeSpread = \frac{Bid - Ask}{(Bid + Ask)/2}$$

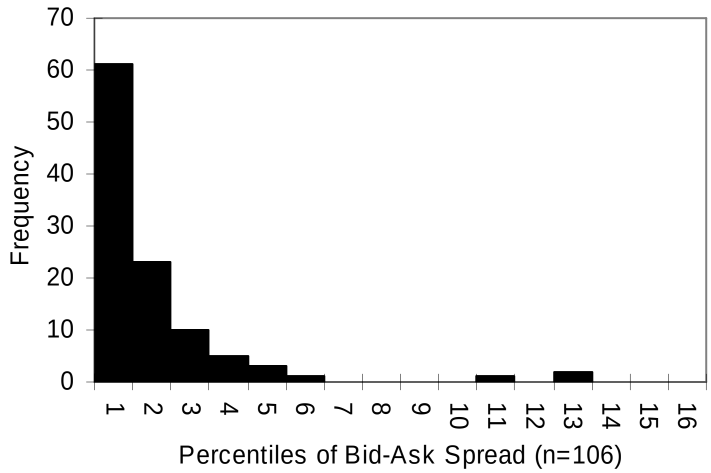
An overview summary statistics of the relative spread across the ample is provided in TABLE 2. A striking feature is this data is that the spread of June and July of both 2005 and 2006 is remarkably higher than that of the rest of these years. This is an indication of seasonal variation.

TABLE 2 Overview statistics of the relative bid-ask spread across the sample

Time [year.month]	Mean [%]	Median [%]	Min. [%]	Max. [%]
2005.09	1.50	0.81	0.15	15.38
2005.10	1.85	1.15	0.15	15.38
2005.11	1.76	1.00	0.15	13.89
2005.12	1.50	0.81	0.15	14.77
2006.01	1.49	0.82	0.11	15.37
2006.02	1.49	0.79	0.11	12.86
2006.03	1.39	0.79	0.12	13.36
2006.04	1.46	0.88	0.12	13.33
2006.05	1.97	1.21	0.12	14.60
2006.06	2.45	1.52	0.13	16.85
2006.07	2.47	1.43	0.15	15.78
2006.08	2.00	1.20	0.12	15.38
2006.09	1.92	1.05	0.12	15.38
2006.10	1.60	0.90	0.11	15.38
2006.11	1.50	0.93	0.10	15.38
2006.12	1.58	0.85	0.15	16.69
2007.01	1.56	0.87	0.10	15.39
2007.02	1.50	0.81	0.15	15.38
Sample size is 106. The pre-launch period is shaded with lighter and the post-launch period with darker grey.				

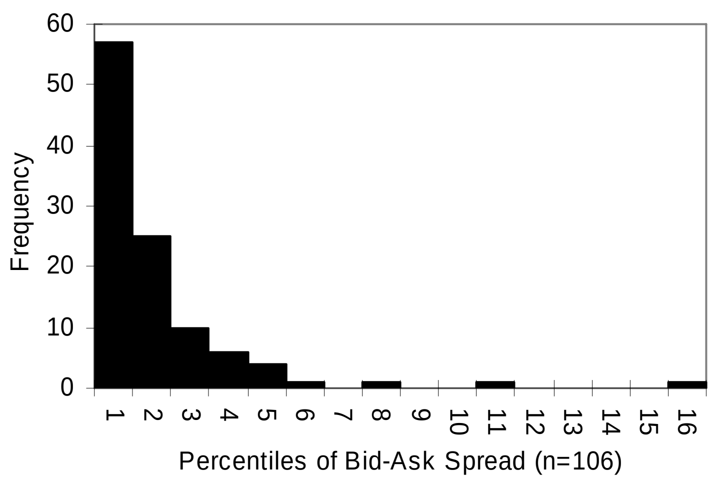
To overcome the problem of seasonality I use the months shaded with light gray for measuring the pre-launch spread and the months shaded in darker gray for measuring the post-launch spread. The two histograms below present a distribution spread as of February 2006 i.e. the month before the merger (FIGURE 3) and a distribution as of February 2007 i.e. five months after the merger (FIGURE 4).

FIGURE 3 Frequency of companies per percentile of bid-ask spread in February 2006



It can be observed that the bin of the first percentile in February 2006 is slightly higher than that of February 2007. One may suspect that liquidity has gone worse since the launch of the Nordic List. It is also noteworthy that a few companies do have a really bad liquidity. Bid-ask spread by company can be found in Appendix 1.

FIGURE 4 Frequency of companies per percentile of bid-ask spread in February 2007



The OMX monthly reports contain also a neat measure of trading volume in the form of turnover velocity. The definition turnover velocity and an overview of turnover velocity statistics over the research period can be seen in Appendix 2. By comparing liquidity and turnover velocity it is easy to see that both of them bear the same feature of seasonal variation. Also the conventional wisdom, that liquidity and volume move to opposite directions, can be confirmed; when the volume goes up the spread goes down and vice versa

5. TESTS AND RESULTS

5.1. The Abnormal Returns

The event study methodology is applied for measuring abnormal returns. The Nordic List was launched the 2nd of October 2006 which is thereby a natural choice for the event date. There is no general rule for choice of the length of the estimation window over which the "normal returns" are measured. I choose to use an estimation window of 200 trading days. The event window is the 106 trading days from the 2nd of October 2006 to the 28th of February 2007.

Company specific α and β are estimated over the estimation window using a market model. The market model differs from CAPM only by its exclusion of the risk-free rate (Cuthbertson & Nitzsche 2004, 206):

(13) $R_{jt} = \alpha_j + \beta_j R_{mt} + \varepsilon_{jt}$, where

R_{jt} = daily returns of company j (n=106)

R_{mt} = market portfolio return (OMX Helsinki Cap gain index which is the total return version where dividends are included)

α_j = the population constant returns to be estimated

β_j = the population beta to be estimated

Since (13) is a time-series regression, heteroskedasticity- and autocorrelation-consistent (HAC) standard errors are assumed as discussed before. Abnormal returns for the post-launch period are measured by (Foerster and Karolyi 1999, 990):

(14) $AR_{jt} = \varepsilon_{jt} = R_{jt} - [\alpha_j + \beta_j R_{mt}]$

The abnormal returns are cumulated across the event window. The cumulative abnormal returns (CAR) per company are collected to the table in Appendix 1. The null hypothesis of $\beta = 0$ of the estimated betas of 14 observations could not be rejected at 5% significance level and were consequently dropped from the sample thus reducing the sample from 106 down to 92 observations, which will be referred to as the sample (n=92) from now on in the text. The dropped companies can be found in Appendix 1.

5.2. Permutation Test

Permutation tests were done in order to filter out companies whose investor base has not significantly changed since the launch of the Nordic List. The sub-sample thereby obtained is used for an additional regression test on top of regression with the sample of 92. The sole purpose of using this sub-sample is to further investigate the results obtained by using the sample of 92, not to overrule it. To accomplish this, the average foreign investor base of each company, over five months before and over five months after the launch, were permuted and checked for significance. The companies at 5% significance level were dropped from the sample thereby reducing the sample of 92 to a sub-sample of 57. The dropped companies can be found in Appendix 1. The principle of the permutation test is simple:

1. The five-month average investor base before the launch is calculated.
2. The five-month average investor base after the launch is calculated.
3. Differential of the two averages is taken and saved.
4. A random sample of five months and another random sample of five months are taken from the ten months without replacement. The differential of the five-month investor base averages of the two samples is saved.
5. Step 5 is repeated a multiple of times (I used 1000) to generate a distribution of a sufficient accuracy.
6. The relative amount of differentials larger than the originally saved gives the significance level.

5.3. The Shadow Cost and Spread

Because Merton's asset pricing relation is derived from partial derivates only the investor base is allowed to change while keeping other variables constant. Merton's relation defines the investor base as relative to the total, market wide number of investors which would be tall order to obtain. Kadlec and McConnell (1994) simply use the number of investors without any reference to the total number of investors. Their proxy to model the change in Merton's shadow cost is:

(15) $$\Delta\lambda_j = \mathrm{Res\,var}_j * Mktval * \left(\frac{1}{PostInvBase_j} - \frac{1}{\mathrm{Pr}\,eInvBase_j} \right)$$, where

$\mathrm{Pr}\,eInvBase_j$	= pre-launch number of investors in company j
$PostInvBase_j$	= post-launch number of investors in company j
$\mathrm{Res\,var}_j$	= residual variance i.e. firm specific variance as measured by the market model (13) in company j
$Mktval_j$	= relative market value of company j on the 29th of September 2006

My choice of proxy differs from that of Kadlec and McConnell (1994) for the reason that there is no access to the number of foreign investors hiding in nominee registers. Nevertheless, the relative share of domestic and foreign investors per company is available. My choice for proxy is:

(16) $$\Delta\lambda_j^{Foreign} = \mathrm{Res\,var}_j * Mktval * \left(\frac{1 - PostInvBase_j^{Foreign}}{PostInvBase_j^{Foreign}} - \frac{1 - \mathrm{Pr}\,eInvBase_j^{Foreign}}{\mathrm{Pr}\,eInvBase_j^{Foreign}} \right)$$, where

$\mathrm{Pr}\,eInvBase_j^{Foreign}$	= pre-launch number of foreign investors in company j
$PostInvBase_j^{Foreign}$	= post-launch number of foreign investors in company j

$Re\,s\,var_j$ = residual variance i.e. firm specific variance as measured by the market model (13) in company j

$Mktval_j$ = relative market value of company j on the 29th of September 2006

The idea above is that the lower the foreign investor base is, the poorer the diversification of ownership risk is and therefore the higher the inflicted shadow cost becomes, and the other way around, the shadow cost would be smallest for companies with the largest foreign investor base. For instance, Nokia would be an extreme example with over 90% foreign investor base.

My model seems loyal to the original Merton's model (1). The only difference is that it does not incorporate the total (market wide) number of investors as such a number would be virtually impossible to obtain.

5.4. Regression on the Shadow Cost and Spread

Following the example of Kadlec and McConnell (1994) a regression of the cumulative abnormal returns is estimated on Merton's shadow cost or $\Delta\lambda$ over the cross-section of companies:

(17) $CAR_j = \beta_0 + \beta_1 \Delta\lambda_j + u_j$, where

CAR_j = cumulative abnormal return for company j over the event window

$\Delta\lambda_j$ = change in Merton's shadow cost in company j

β_0, β_1 = the population betas to be estimated

The null hypothesis is $\beta_1 = 0$. If the null hypothesis can not be rejected at 5% significance level then the Merton's shadow cost can not be shown to explain the cross-sectional cumulative abnormal returns. Since this is a cross-sectional regression the heteroskedasticity-robust standard errors are used as discussed before.

In the second regression the change in liquidity, that is, the change in relative spread or $\Delta Spread$ is added as a control variable since the shadow cost and the spread are assumed to be correlated:

(18) $CAR_j = \beta_0 + \beta_1 \Delta\lambda_j + \beta_2 \Delta Spread_j + \varepsilon_j$, where

$\Delta Spread_j$ = change in relative spread in stock price of company j

$\beta_0, \beta_1, \beta_2$ = the population betas to be estimated

The null hypothesis is that both $\beta_1 = 0$ and $\beta_2 = 0$. If the null hypothesis can not be rejected at 5% significance level then neither the Merton's shadow cost, nor spread, can not be shown to explain the cross-sectional cumulative abnormal returns. Since this is a cross-sectional regression the heteroskedasticity-robust standard errors are used as discussed before.

For a company with a positive CAR, the expected sign of $\Delta\lambda$ is negative which follows from the logic that an increased foreign investor base reduces the shadow cost which then give rise to a higher stock price and thus the expected sign of beta is negative as well to produce a positive CAR. In similar manner, for a company with a negative CAR the sign of $\Delta\lambda$ is positive (decreased foreign investor base -> increased shadow cost -> lower price) and beta remaining negative.

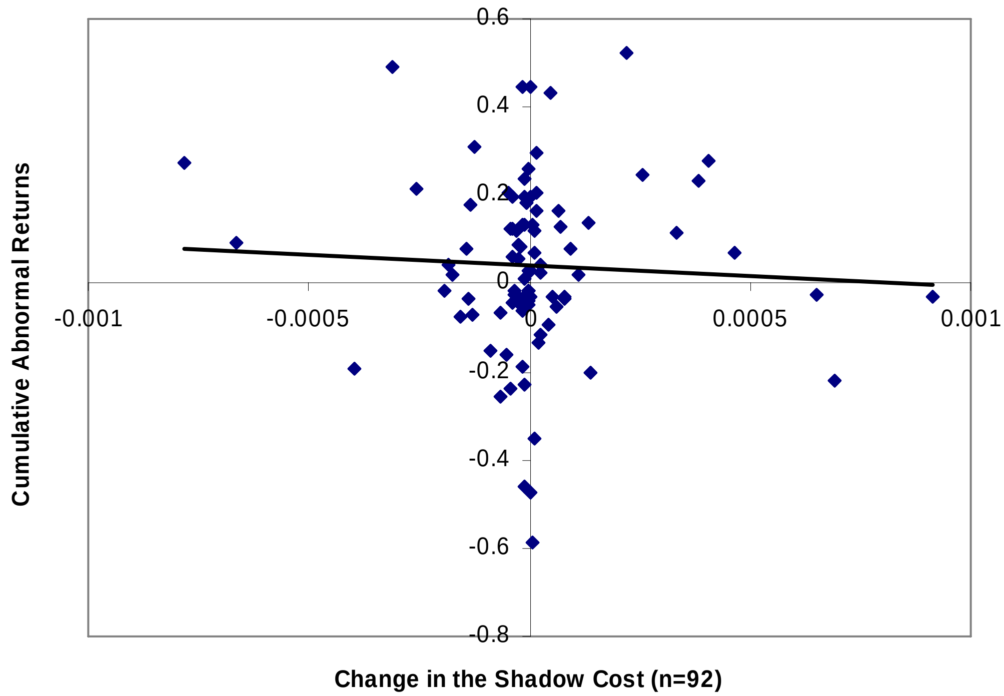
The regression results of the sample are presented in TABLE 3. Outcomes of regression (17) show a negative sign for the estimated beta of $\Delta\lambda$ as expected, but as can be seen from p-value (0.575 or 57.5%), the null hypothesis can not be rejected. Therefore, it can be stated that the shadow cost can not be shown to explain the cumulative abnormal returns. The joint regression of the shadow cost and liquidity (17) shows a negative sign for the estimated beta of shadow cost, as well as for the estimated beta for the change in liquidity ($\Delta Spread$ **)**, but again the null hypothesis can not be rejected as the p-values are very high. The conclusion at this point clearly is that neither the shadow cost, nor liquidity, can not be shown to explain CAR. R^2 is constantly very small in both (17) and (18) indicating that the regressors explain very little of the variation in CAR.

TABLE 3 Regressions of Cumulative Abnormal Returns on Change in the Shadow Cost and Liquidity

Variables	Regression (17)	Regression (18)
$\Delta\lambda$	-46.85073	-42.03828
Std. Error	83.24235	83.73323
p-value	0.575	0.617
$\Delta Spread$	-	-2.885446
Std. Error	-	3.528563
p-value	-	0.416
Constant	0.0413314	0.0386569
Std. Error	0.0206021	0.02086
p-value	0.048	0.067
R^2 -value	0.0026	0.0135
Sample size is 92		

The scatter plot in FIGURE 5 illustrates the results of (17). The sample contains a relatively large number of observations having a small value of $\Delta\lambda$ which shows as clustering along Y-axis and therefore the cross-sample variation is generally small along X-axis. Respectively, a smaller number of observations is scattered farther away from the Y-axis but they do not take on neither clearly upward nor clearly downward sloping shape. It is obvious that the regression line can not be anything but statistically horizontal ($\beta_1 = 0$).

FIGURE 5 Regression of Cumulative Abnormal Returns on Change in the Shadow Cost ($\Delta\lambda$)



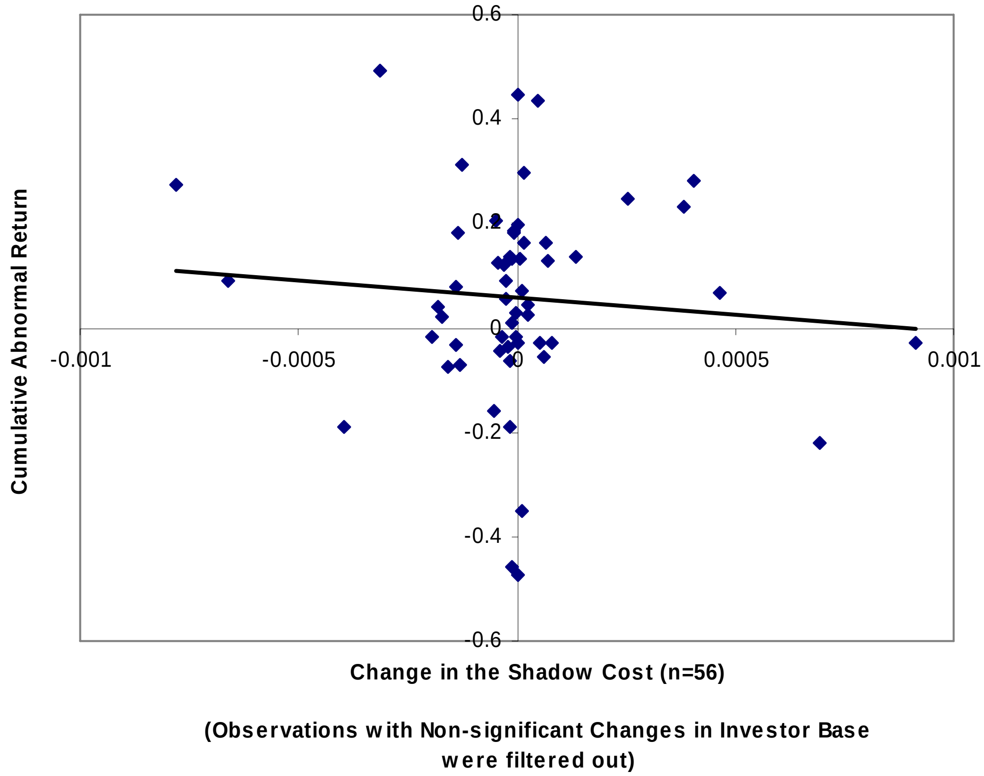
The regression results of the filtered sub-sample of 56 are presented in TABLE 4 The filtered sample contains only those observations or companies the investor base of which has significantly changed and can be considered "less noisy" that the original sample of 92 and is therefore interesting to regress. Filtering was done using the permutation method as explained before. Outcomes of regression (17) show a negative sign for the estimated beta of $\Delta\lambda$ as expected, but as can be seen from p-value (0.471 or 47.1%), the null hypothesis can not be rejected. Therefore it can be stated that the shadow cost does not explain the cumulative abnormal returns of the sub-sample. The joint regression of the shadow cost and liquidity (18) shows a negative sign for the estimated beta of the shadow cost but a positive sign for the estimated beta for liquidity ($\Delta Spread$), but again the null hypothesis can not be rejected as the p-values are very high. The final conclusion clearly is that neither the shadow cost, nor liquidity, can not be shown to explain CAR using the sample (n=92) and proxies that I have. Regression of the "less noisy" sub-sample (n=56) further strengthens this result.

TABLE 4 Regressions of Cumulative Abnormal Returns on Change in the Shadow Cost and Liquidity

Variables	Regression (17)	Regression (18)
$\Delta\lambda$	-65.23519	-66.59149
Std. Error	89.87668	92.77472
p-value	0.471	0.476
$\Delta Spread$	-	2.18281
Std. Error	-	6.990887
p-value	-	0.756
Constant	0.0574389	0.0584202
Std. Error	0.0257363	0.0254545
p-value	0.030	0.026
R^2 -value	0.0073	0.0090
Sample size is 56. Observations with Non-significant Changes in Investor Base are Filtered out.		

The scatter plot in FIGURE 6 illustrates the results of regression (17). The sub-sample contains a little less large number of observations having a small value of $\Delta\lambda$ and thereby clustering along Y-axis is less dominant. Nevertheless the observations do not take on neither upward nor downward sloping shape. It is, once again, obvious that the regression line can not be anything but statistically horizontal ($\beta_1 = 0$).

FIGURE 6 Regression of Cumulative Abnormal Returns on Change in the Shadow Cost ($\Delta\lambda$)



5.5. Analysis of the Results

I find that the null hypothesis that the shadow cost does not explain stock prices can not be rejected. This result prevails also after using liquidity as a control variable. Filtering of data in order to use a “less noisy” sub-sample further strengthens this conclusion even though regression with the filtered data produces slightly lower p-values. As can be seen in FIGURE 5 a large portion of companies have experienced only slight changes in their shadow cost which manifests itself as clustering along Y-axis, or put in other way, the influence of the Nordic List does not show up as a wide scale changes in the shadow costs across the sample of 92 Finnish companies and subsequently in their stock prices.

The result is consistent with the previous studies on global stock market integration which find evidence that the markets have become more integrated over the recent decades (Mangeloja 2001 and Berben & Jansen 2005). This implies that the Nordic list merger is perhaps not able to bring about any further integration. It is also obvious that the Nordic List has not provided any especially new source of information for stock analysts and fund managers of the major banks and investment firms that already have an established position in the Nordic countries and who already know the firms and stocks of the Nordic area throughout. On the other hand, the Nordic List may have had a role as a new channel of information for common people but their role in the market is limited as they probably prefer investing in the established Nordic funds rather than in investing directly to stocks in the other Nordic countries.

The result is, however, perhaps less consistent with the previous studies on (cross-)listings and stock index additions which report, usually positive, effect on stock prices which can be explained by Merton’s model. The conclusion that can be drawn in relation to these studies is that, in this case, the Nordic list merger did not bring about price changes that Merton’s model could explain. There is, however, a major principal difference between my study and the previous studies that I have referred. That is, the previous studies use event data that is more coherent, by which I mean that; for example, when an individual stock of a company is listed it will attract media attention that is typically not shared with any other company. By contrast, the event of the Nordic list merger obtained media attention which all the companies shared together so that no single company stood out. Therefore, its is natural to expect that when one regresses data, like that of listings, it will be more coherent in a way that each observation is equally treated what comes to media attention. By contrast again, the Nordic List most likely has generated media attention that is not so strong for individual stocks and, moreover, probably disturbed by other financial news data which then naturally reflects to regression results. This coherence factor perhaps plays a role in what comes to regression results and therefore the same proxy, like the one I used, may perform differently depending on how coherent the data is.

Liquidity or the relative spread that I have used as a control variable performs poorly as an explanatory variable and the null hypothesis that liquidity does not explain stock prices can not be rejected. The above given explanations obviously apply for liquidity too; the stock market has become well integrated and the major market players have had their strong position already before the Nordic List. But I also suspect that liquidity is not a very good explanatory variable to begin with. First of all, liquidity data suffers from seasonal variation which probably degrades its value as an explanatory variable even after corrections for seasonality. It is also obvious that liquidity, in general, is very sensitive to the sentiment of the market and therefore may vary from good to bad even if the companies in question were generally liquid under normal market conditions. Therefore, I doubt the usefulness of liquidity as a regression variable in this study. Some remedy might be provided by collecting liquidity data over a few years before and after the event so that any seasonal variation or sentiment effect could be evened out.

I am sure that my proxy captures the idea of the shadow cost in a proper manner, but that it can be true, that it is not the most effective of all the proxies one could come up with. A serious limitation is that most foreign ownership resides anonymously in the nominee registers. One has virtually no access to the real number of foreign investors. Moreover, it is not possible to tell apart foreign institutional owners from foreign individual owners. And then, even if one could identify and count the foreign institutional owners, one could still not access the number of investors that is represented by each individual institution. This, of course, would apply to Finnish institutional ownership as well. Merton’s (1987) model relies on availability of the number individual investors. Another problematic feature of Merton’s model is that it uses the number of investor as a parameter relative to the total, that is, the market wide investor base. It is perhaps impossible to obtain the number of Finnish investor as a total figure and, as we live in an open economy, the total investor base becomes even more of an abstraction.

6. CONCLUSIONS

In this study I set out to test whether the Nordic List has affected prices of Finnish stocks listed in Helsinki. My backbone model for testing this effect is the Merton's (1987) generalized CAPM model, which connects changes in a company's investor base to its stock price. Furthermore, I use a model of Amihud and Mendelson (1986), which connects changes in a stock's liquidity to its price. I assume a scenario where the Nordic List may improve the international visibility of at least some of the Finnish companies thereby causing foreign investors to increase their holding in these stocks which, in other words, means strengthening of their investor base. According to Merton (1987) this should lead to a lower shadow cost as the risk of the ownership in these companies becomes more diversified which subsequently reflects positively to their stock prices. I also assume that this scenario works the other way around so that those Finnish companies that suffer from the list merger by becoming internationally less visible will see their stock prices fall. Liquidity plays a role as a controlling variable of the shadow cost as these two variables are assumed to be correlated. My original sample consists of 106 Finnish companies and the final sample consists of 92 companies after removing companies for which a statistically significant beta could not be estimated using the market model.

I find that the Nordic List has not brought about changes in the foreign investor base of Finnish companies, by changing their international visibility, which would be reflected as corresponding changes in their shadow costs and subsequently as changes in stock prices across the sample. The result remains the same after applying liquidity as a controlling variable. The result is consistent with the previous studies on global stock market integration which find evidence that the markets have become more integrated over the recent decades (Mangeloja 2001 and Berben & Jansen 2005) which obviously imply that the Nordic List is perhaps not able to increase the level of integration any further. It is also obvious that the Nordic List has not provided any especially new source of information for stock analysts and fund managers of the established major banks and investment firms. On the other hand, the Nordic List may have had a role as a new channel of information for common people but their role in the market is limited.

The result is perhaps less consistent with previous studies on stock index additions and (cross-)listings which show price changes in these events which can be explained by Merton’s model. By contrast, The Nordic List did not bring price changes that could be explained by the model. However, there is a principal difference between a list merger and, for instance, a stock index addition which is that a list merger is an event that affects even hundreds of stocks simultaneously whereas, for instance, a stock index addition affects one individual stock at a time. Therefore the collected data and the regression results may differ.

At this point, the result is very reasonable, but looking forward, I suggest that a longer research period could be applied and this test could be re-run by the researches of tomorrow. It is possible that because of the short time frame that I was able to exploit, my tests did not capture the whole influence of the Nordic List on Finnish stocks. I suggest using a research period ranging from twelve months before the launch of the Nordic List up to twelve months after as was used by Foerster and Karolyi (1999) when studying cross-listings. This would allow for a longer time for information diffusion and a larger shift in investor base to occur. I think it is reasonable to believe that changes in investor’s behavior do not happen overnight and that a longer period of time is necessitated for diffusion of information among investors and that the adopted information transforms into investment decisions beyond investors’ current holdings. I have to point out though that using a longer timeframe may run a risk that many other events other than the Nordic list merger may interfere the test.

I also welcome improvements to the proxy of Merton’s shadow cost that I have used. Moreover, the usage of liquidity as controlling variable should be scrutinized, since my impression is that the liquidity data and/or proxy I have used did not contribute anything to my regression tests.

As the previous studies that I have referred to are carried out in the U.S. stock markets, I can not see why these studies shouldn’t get replicated on a wider spectrum on the Nordic stock market. Especially, I encourage future researches to apply the Merton’s model for studies of listing effects of Nordic stocks. Unlike in Finland, the listing activity has been very high in Sweden and

Denmark in recent years. Listings could provide more coherent data than a list merger and therefore there should be potential for interesting results.

I believe that further studies on list mergers are very important, since mergers and acquisitions between major stock exchange operators are becoming ever more commonplace and because the financial market plays a crucial role in the generation of, not only investor's prosperity, but the common wealth as well. Integration of the financial market will go on and perhaps in the future, on a day not so distant, we will see a global stock exchange that runs 24 hours a day seven days a week. It is essential to test empirically whether these larger, even giant, exchanges with their long lists of stocks really provide the investor and company benefits that are used as arguments for such merging activity.

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APPENDICES

Appendix 1. The list of the companies included in the study.

See the bottom of table for explanations

Name	Code	MKt.Val. (MEUR)	Avg. pre-IB [%]	Avg. post-IB [%]	Change of IB [%-points]	Shadow cost [%]	Abnorm. Returns [%]	Avg. pre-Bid-Ask [%]	Avg. post-Bid-Ask [%]	Change of Bid-Ask [%]
AffectoGenimap Oyj	1	62	27.62	22.84	-4.78**	0.0025	2.44	1.38	1.58	0.2
Aldata Solution Oyj	2	133	58.71	54.21	-4.50***	0.0011	-34.99	1.21	0.96	-0.25
Alma Media 2	3	533	17.78	15.29	-2.49**	0.0067	16.33	0.78	0.81	0.03
Amer Sports Oyj	4	1 134	54.8	57.1	2.31***	-0.0017	-18.84	0.42	0.22	-0.2***
Aspocomp Grp Oyj	5	82	3.87	2.16	-1.71**	0.0693	-21.98	0.8	0.88	0.08
Aspo Oyj	6	186	7.99	6.83	-1.16	0.0092	7.92	0.67	0.65	-0.02
Atria Yhtymä Oyj A	7	205	14.84	15.89	1.05**	-0.0028	12.16	0.6	0.72	0.12
Basware Oyj	8	113	11.56	12.81	1.25***	-0.0033	-1.79	0.85	0.94	0.09
Beltton-Yhtiöt Oyj[1]	9	30	1.72	2.8	1.08**	-0.0399	20.61	2.4	2.72	0.32
Benefon S	10	46	64.45	64.24	-0.21	0.0001	3.02	3.41	4.66	1.26**
Biohit Oyj B[1]	11	23	0.69	0.56	-0.13***	0.0429	14.03	2.19	1.98	-0.21
CapMan Oyj B	12	215	29.33	30.73	1.40**	-0.0009	18.17	1	1.14	0.14
Cargotec	13	1 361	41.34	43.15	1.81***	-0.0044	12.38	0.33	0.19	-0.14***
Cencorp Oyj	14	52	1.33	1.27	-0.06	0.0111	1.86	1.22	2.38	1.16***
Citycon Oyj	15	435	93.47	94.11	0.64***	-0.0002	2.73	0.91	0.91	0
Componenta Oyj	16	68	40.78	39.49	-1.29***	0.0002	44.74	0.78*	0.96	0.18
Comptel Oyj	17	187	6.99	7.26	0.27	-0.004	19.82	0.82	0.95	0.13
Done Solutions Oyj	18	8	3.16	3.02	-0.15	0.0021	-13.22	5.02	3.59	-1.42
Efore Oyj	19	77	12.13	10.96	-1.17***	0.0054	-3.02	0.92	1.04	0.12
Elcoteq A	20	375	21.22	24.53	3.31***	-0.014	-3.42	0.35	0.38	0.04
Elecster Oyj A	21	12	1.26	1.43	0.17**	-0.0048	20.4	4.00	2.58	-1.41*
Elektrobit Grp Oyj	22	326	3.54	4.06	0.52**	-0.0398	-19.11	0.71	0.79	0.07
Elisa Oyj	23	2 041	47.64	46.94	-0.7	0.0012	12.05	0.22	0.17	-0.06**
eQ	24	71	50.45	50	-0.45***	~0	19.69	0.87	0.59	-0.28**
Etteplan Oyj	25	55	8.53	9.07	0.55	-0.001	-3.1	1.09	0.95	-0.14
Evia Oyj[1]	26	5	0.06	0.2	0.14	-0.3795	-15.36	3.2	3.63	0.43
Evox Rifa Grp Oyj[1]	27	17	39.05	39.04	-0.01	~0	19.43	12.59	11.92	-0.67
Exel Oyj	28	159	33.75	33.22	-0.53**	0.0003	-2.87	0.77	1.45	0.69***
Finnair Oyj	29	923	34.38	32.96	-1.42**	0.006	-5.37	0.62	0.62	0
Fiskars Oyj Abp A	30	629	2.39	2.83	0.44**	-0.0663	9.13	0.96	0.5	-0.46**
Fortum Oyj	31	14 578	34.95	35.2	0.25	-0.0067	-25.68	0.18	0.14	-0.05**
F-Secure Oyj	32	277	17.61	15.81	-1.80*	0.0138	-20.15	0.69	0.8	0.11*
Honkarakenne B	33	18	10.19	10.34	0.15***	-0.0001	-1.68	1.61	2.35	0.74***
Huhtamäki Oyj	34	1 368	22.63	23.98	1.35**	-0.0054	-16.06	0.30	0.18	-0.13***
Ilkka-Yhtymä 2	35	100	0.42	0.5	0.08**	-0.078	27.37	0.85	0.69	-0.16
Incap Oyj	36	23	10.76	12.81	2.06***	-0.0011	-45.9	1.53	1.49	-0.03
Interavanti Oyj[1]	37	43	0.16	0.16	0	-0.0035	65.57	8.77	9.54	0.77
KCI Konecranes Oyj	38	552	66.89	69.39	2.51***	-0.0012	13.25	0.54	0.22	-0.33***

Kemira GHow Oyj	39	381	13.84	25.47	11.63***	-0.0312	49.32	0.42	0.5	0.08
Kemira Oyj	40	1 469	19	21.69	2.70***	-0.0183	4.11	0.38	0.22	-0.16**
Keskisuomalainen A[1]	41	126	0.67	0.67	-0.01	0.0102	12.31	2.65	1.51	-1.13**
Kesko Oyj B	42	1 489	30.3	33.44	3.13***	-0.0158	-7.57	0.32	0.18	-0.13***
Kesla A	43	16	1.51	1.53	0.01	-0.001	23.88	2.25	1.13	-1.12
KONE	44	3 067	43.26	43.33	0.07	-0.0002	-4.07	0.24	0.14	-0.1***
Kyro Oyj Abp	45	341	6.43	6.55	0.13	-0.0035	-2.64	1.17	1.01	-0.15
Larox B	46	37	4.65	5.34	0.69**	-0.0039	-4.49	2.03	1.41	-0.62***
Lassila&Tikanoja	47	607	9.84	10.93	1.09***	-0.0125	31.06	0.65	0.69	0.05
Lemminkäinen Oyj	48	468	10.59	9.09	-1.50**	0.0255	24.77	0.88	0.77	-0.1
Lännen Tehtaat Oyj	49	102	23.37	26.21	2.84***	-0.0014	-6.36	1.03	1.37	0.34
Marimekko Oyj	50	134	22.55	19.46	-3.10***	0.0018	29.52	0.65	0.64	-0.01
Martela A	51	23	7.34	8.67	1.33***	-0.0017	13.47	2.19	2.34	0.16
M-real Oyj B	52	1 316	33.4	36.81	3.42**	-0.0133	18.08	0.33	0.29	-0.04*
Neomarkka Oyj B	53	43	1.68	1.72	0.04**	-0.0025	5.48	2.17	1.73	-0.44
Neste Oil Oyj	54	7 904	32.67	29.43	-3.24**	0.0912	-2.91	0.14	0.12	-0.02
Nokian Renkaat Oyj	55	2 381	57.68	63.56	5.88	-0.0173	1.92	0.16	0.18	0.02
Nordic Aluminium Oyj	56	66	1.02	0.82	-0.2	0.0649	-2.62	2.52	2.64	0.11
Norvestia Oyj	57	106	33.19	38.66	5.47	-0.0008	-2.52	0.6	0.47	-0.13
Okmetic Oyj	58	32	7.26	8.39	1.13*	-0.0041	-23.71	1.40	0.93	-0.47*
OKO A	59	1 074	16.27	15.7	-0.57	0.0044	-9.44	0.23	0.19	-0.03
Olvi Oyj A	60	72	18.54	18.76	0.22	-0.0002	-1.59	1.12	0.76	-0.37**
Panostaja Oyj B[1]	61	9	0.11	0.11	0	-0.0231	23.97	4.13	2.79	-1.34**
Perlos Oyj	62	375	24.67	22.97	-1.70**	0.0136	13.71	0.33	0.41	0.08
PKC Group Oyj	63	213	27.3	29.59	2.29	-0.0025	-4.17	0.65	0.54	-0.11
Pohj-K.Kirjap. A	64	62	1.61	0.97	-0.64	0.0221	52.46	3.95	5.09	1.14
Ponsse 1	65	266	3.47	3.59	0.13	-0.009	-15.11	0.71	0.63	-0.09
Proha Oyj	66	25	22.07	12.64	-9.43***	0.0081	-3.01	2.82	2.65	-0.18
Jaakko Pöyry Group Oyj	67	418	59.97	58.16	-1.81**	0.0005	13.29	0.72	0.7	-0.02
QPR Software Oyj	68	7	11.84	11.62	-0.22***	0.0002	-47.25	3.47	2.94	-0.53**
Raisio Oyj Vaihto.	69	302	16.93	15.81	-1.13**	0.0048	43.35	0.70	0.84	0.14**
Ramirent Oyj	70	526	68.4	69.92	1.53**	-0.0008	18.52	0.63	0.5	-0.13
Rapala VMC	71	224	79.28	80.16	0.88	-0.0001	-1.58	0.87	0.91	0.04
Rautaruukki Oyj K	72	2 595	40.69	40.45	-0.24	0.0015	20.42	0.25	0.18	-0.08
Raute Oyj A	73	43	2.45	2.71	0.25	-0.0039	6.01	1.39	0.96	-0.43***
Rocla Oyj[1]	74	43	44.51	44.88	0.37***	~0	-1.75	3.24	2.72	-0.52
Ruukki Group Oyj	75	58	14.85	16.12	1.27	-0.0015	44.42	6.96	1.42	-5.54**
SanomaWSOY B	76	2 783	10.41	11.04	0.63**	-0.0194	-1.69	0.26	0.19	-0.07**
Satama Interactive	77	39	12.17	4.49	-7.68**	0.0464	6.8	1.33	1.33	0.01
Scanfil Oyj	78	271	6.18	6.5	0.32**	-0.0131	-7.09	0.83	0.88	0.05
Solteq Oyj	79	22	0.77	0.72	-0.05**	0.0071	12.89	1.10	1.56	0.46**
Sponda Oyj	80	698	54.9	55.07	0.17	-0.0001	26.08	0.72	0.55	-0.17
SSH Communications	81	27	2.18	2.18	0	-0.0002	-4.98	1.33	1.58	0.24**
Stockmann Oyj Abp B	82	992	11.53	11.94	0.41	-0.0066	-6.43	0.41	0.34	-0.06
Stonesoft Oyj	83	33	11.03	12.6	1.56**	-0.0025	8.96	2.39	2.66	0.27
Stromsdal Oyj B	84	4 281	3.72	1.15	-2.57**	0.0405	28.02	3.16	2.35	-0.81

Suominen Yhtymä Oyj	85	84	3.55	2.62	-0.93*	0.0334	11.56	1.04	1.14	0.1
SysOpen Digia Oyj	86	76	11.19	4.63	-6.55**	0.0382	23.25	0.88	0.78	-0.09
Talentum Oyj	87	162	10.57	9.84	-0.73*	0.0023	-11.71	0.77	0.81	0.04
Tamfelt Etu	88	142	5.3	5.09	-0.21**	0.0018	16.37	0.61	1.5	0.89***
Technopolis Oyj	89	164	45.46	50.51	5.05**	-0.0021	-3.58	0.95	0.96	0.01
Tecnomen Oyj	90	136	11.4	10.7	-0.70*	0.0077	-3.64	0.89	0.87	-0.02
Tekla Oyj	91	76	19.79	17.55	-2.24**	0.0027	4.22	1.20	0.74	-0.46***
Teleste Oyj	92	142	19.45	20.25	0.80***	-0.0012	1.01	0.54	0.61	0.07
Tieto-X Oyj	93	25	5.3	4.95	-0.34**	0.001	7.17	1.28	0.85	-0.43*
TJ Group Oyj[1]	94	17	6.49	6.51	0.02	-0.0011	-21.51	13.62	15.64	2.02**
Tulikivi Oyj A	95	55	7.33	7.21	-0.12	0.0007	-58.71	0.96	1	0.04
Turkistuottajat C[1]	96	21	11.53	11.74	0.21**	-0.0001	-14	1.4	1.02	-0.38
Turvatiimi Oyj	97	27	0.94	1.09	0.15	-0.0256	21.67	2.46	3.33	0.87***
Uponor Oyj	98	1 431	33.53	33.99	0.47	-0.002	8.4	0.53	0.23	-0.3***
Vacon Oyj	99	260	28.17	28.94	0.77	-0.001	-22.75	0.77	0.71	-0.06
Vaisala Oyj A	100	346	9.16	10.75	1.59**	-0.0141	7.84	0.83	0.84	0
Viking Line Abp[1]	101	6	5.11	5.1	-0.01	~0	13.31	2.91	1.82	-1.09**
Vaahto Group A[1]	102	228	2.03	2.11	0.08***	-0.0149	49.46	3.04	5.43	2.4**
Wärtsilä Oyj Abp B	103	1 849	28.59	29.28	0.69	-0.0039	12.42	0.22	0.17	-0.05
YIT-Yhtymä Oyj	104	2 193	46.12	46.56	0.43	-0.001	19.6	0.30	0.16	-0.14***
Yleiselektroniikka E[1]	105	6	0.09	0.1	0	-0.0043	4.49	3.38	4.4	1.02
Ålandsbanken B[1]	106	120	5.38	5.58	0.20***	-0.004	3.96	1.68*	1.19	-0.5
Explanations:										
Name: Name of the traded stock. If a company has two listings the mostly traded is chosen										
Code: Code of an observation										
Mkt. Val.: Market value of a company										
Avg. pre-IB: Five-month average investor base before the event (2006.05-2006.09)										
Avg. post-IB: Five-month average investor base after the event (2006.10-2007.02)										
Change of IB = Avg. post-IB minus Avg. pre-IB										
Shadow cost: Merton's shadow cost										
Abnorm. Returns: Cumulative abnormal returns over the event window (2006.10-2007.02)										
Avg. pre-Bid-Ask: Five-month relative Bid-Ask spread of the previous year before the event (2005.10-2006.02)										
Avg. post-Bid-Ask: Five-month relative Bid-Ask spread of the after the event (2006.10-2007.02)										
Change of Bid-Ask = Avg. post-Bid-Ask minus Avg. pre-Bid-Ask										
1) A stock for which the estimated beta is not significant at 95% confidence level										
*) A change in average investor base/ Bid-Ask spread is significant at 90% confidence level										
**) A change in average investor base/ Bid-Ask spread is significant at 95% confidence level										
***) A change in average investor base/ Bid-Ask spread is significant at 99% confidence level										

Appendix 2. An overview summary statistics of turnover velocity

The OMX definition for calculating turnover velocity for a period of one month but scaled to the annual level is:

$$(5) \quad TurnoverVelocity = \frac{TurnoverOfTheMonth}{AvgMktCapOfTheMonth} * \frac{250}{NumOfTradingDaysOfTheMonth} * 100$$

The number simply tells how much of a company's market value is traded on an annual level e.g. if turnover velocity is 100% for a certain month the whole market value of the company will be traded in one year if this velocity is maintained for 12 consecutive months. An overview summary statistics of the turnover velocity across the sample is provided in the table below. Turnover velocity in June and July stands out by being much slower than that of the rest of the months. This again can be interpreted as an indication of seasonal variation. In comparison to the previously presented liquidity data of June and July is can be noticed that volume and liquidity move to the opposite directions; when the volume goes up the spread goes down and vice versa. This complies with conventional wisdom.

Time [year.month]	Mean	Median	Min.	Max.
2005.09	62.57	38	1	804
2005.10	54.88	31	1	498
2005.11	62.62	33	1	630
2005.12	56.34	38.5	0	325
2006.01	66.66	50.5	1	285
2006.02	71.87	55	1	457
2006.03	77.19	49	0	547
2006.04	65.44	54.5	0	270
2006.05	65.25	40.5	0	438
2006.06	39.52	22.5	0	194
2006.07	28.01	13	0	151
2006.08	45.80	25	0	283
2006.09	50.05	24.5	0	340
2006.10	53.95	36.5	0	248
2006.11	58.42	40	0	215
2006.12	64.48	44.5	0	537
2007.01	66.43	42.5	0	247
2007.02	76.05	53.5	1	403