Valuation Effects of Index Inclusions
- Evidence from Sweden

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Abstract

This paper studies the volume and share price effects on Swedish stocks added to a domestic as well as an overseas market index over the sample period 1987 to 2006. Contrary to the vast majority of previous research, we document a mildly negative impact on stock prices, particularly for Swedish stocks added to overseas indices. Attempts to explain this finding, by linking it to an explanatory variable, point to a negative relationship with performance during the six months preceding index inclusion. Our findings thus indicate that index inclusion can be an indirect trigger of price reversal, when the index selection criteria themselves are an indication of strong trading activity in the period *ex ante* index inclusion.

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1. Introduction

What are the price and volume implications when a stock is added to a market index? Modern financial theory suggests that demand curves for stocks are infinitely elastic (nearly horizontal), since the price at any point in time reflects all information available about the stock. Thus, traders should be able to buy and sell blocks of equity at the prevailing market price, without causing any price pressure on the underlying asset (given, of course, that the trade in question does not reflect any new information about the price of the security). Furthermore, should there be a temporary imbalance in the demand and supply for the given stock, a price increase or decrease would instantly be adjusted by arbitrageurs, recognising and exploiting the mispricing. Therefore, index inclusions that do not incorporate any new information about the stock added should have no impact on its price, regardless of whether institutional market structures give rise to high trading volumes around the date of inclusion into the index, e.g. caused by index tracker fund managers automatically reweighting their portfolios to include the newly added stock in the fund.

The primary objective with our study is to examine the announcement effects when Swedish firms are added to a market index. Since index inclusions are generally thought of as containing no additional firm specific information, their impact on stock prices should be zero. Interestingly, a number of authors (Shleifer, 1986; Jain, 1987; Dhillon and Johnson, 1991; Beneish and Whaley, 1996; Denis, McConnell, Ovtchinnikov and Yu 2003; Chen, Noronha and Singal, 2004) have observed significant abnormal returns immediately after announcement of a stock's addition to the S&P 500, followed by at least a partial reversal of the initial price increase. Several hypotheses have been put forth to explain this phenomenon, the details of which we will address in chapter 3. Thus, the challenge for financial economists has been to reconcile this phenomenon with financial theory and to understand these patterns of abnormal returns better. Much of the research produced to date on the subject has focused mainly on U.S. data, in particular additions to the S&P 500 market index. To the best of our knowledge, this is the first study using data from a Swedish index. In addition to the event study, we provide a brief descriptive overview of the Swedish fund market as well as the re-weighting policies of market participants when firms are added to indices.

In our opinion, our study contributes to and extends our knowledge of market efficiency, by applying the established methodology for studies of price effects of index additions on the Swedish market. As will become apparent from the institutional market description, index funds are much less prevalent in the Swedish market than in the U.S, where the majority of previous studies have been performed. It will be interesting therefore to see, whether other institutional factors give rise to previously unidentified effects.

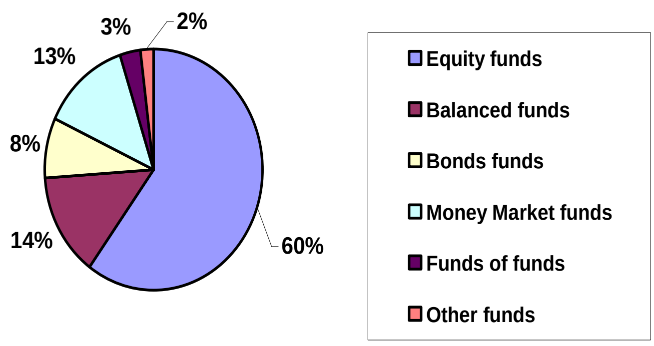
The paper is organized as follows: Section 2 provides a descriptive overview of the Swedish fund market with a particular emphasis on index funds. Related literature is reviewed in section 3. Section 4 provides an overview of the data used in the study together with the characteristics of our dataset. Section 5 describes the methodology used. In section 6 we put forth hypotheses which are then tested in section 7, where we discuss the empirical results of the study and relate it to previous studies. Section 8 concludes our study and provides suggestions for further research.

2. An overview of the mutual fund market in Sweden

Total assets under management (AuM) by registered mutual funds in Sweden were 1,527 billion SEK by the end of 2006. The market is comprised of equity funds, balanced funds, bonds funds, money market funds, funds of funds and other funds. The division of managed assets according to these categories is depicted in Figure 1.

Figure 1
Share of fund market wealth by category

This chart represents the fund market wealth in Sweden (as per 2006.12.31) broken down by category (source "Fondbolagens förening")



Another category, of which estimating the size is more difficult is hedge funds, which have seen strong growth in recent years. In addition, a substantial proportion of savings capital is also managed by private wealth managers and various foundations. The mutual funds market in Sweden positively exploded after the pension funds reform in 1999, when a defined contribution (DC) system was introduced, and propelled an increase in the number of fund styles. This was due mainly to the fact that each individual was allowed to allocate part of her own pension into a so called *PPM fund,* causing increased competition among fund managers to cater to varying degrees of risk appetite and differing investor styles. The growth of corporate pensions (Pillar II of the pensions reform) and private pensions (Pillar III) savings has also contributed to the aforementioned effect.

Traditionally, discretionary fund management has formed an important part of the market in Sweden. Perhaps this is because the notion of stock market efficiency (and hence, the benefits of a low-fee, diversified index portfolio) is not particularly well-spread among Swedes, so that they typically believe more in the abilities of wiz-kid fund managers to outperform the market. The question whether an actively managed portfolio really can achieve excess returns has been the focus of much study. The classical study is Jensen (1968), which concluded that the prediction of individual fund performance was not very different from that predicted by mere random chance – in other words, actively managed funds did not outperform their benchmarks.

Total AuM by index funds in Sweden was SEK 25 billion by the end of 2004, or 2.5% of the total mutual funds market at the time. Only 6 out of 23 index funds registered in Sweden have AuM in excess of 1 billion SEK.[1] This figure is small compared to the US market, where index funds represent about half of the total capital managed by equity funds (compare for instance with Shleifer, 1986). The first Swedish index funds appeared around the time of the DC reform – as their low management fees constituted an appealing alternative to investors - and have thus existed for no longer than half a decade. Considering this, Swedish index funds have managed to gain a considerable market share during their brief history.

The market for index funds is dominated by one single institution, *Svenska Handelsbanken* (SHB). Previously, a few large competitors existed, but they have been acquired successively, leaving *Erik Penser Fondkommission (EP)* the second largest remaining independent index fund. In the statistics, the funds acquired by SHB retain their original brand names (SPP, Xact). Furthermore, they are managed by different managers, which, given that quite a few are structured on the same index, also leaves room for speculation about future rationalisation. Generally, the index funds have management fees that are half or even less than those of discretionary funds. (Two years ago, the Swedish fund, Avanza even announced the creation of an index fund without fees. The company is hoping that the fund, which is based on the *OMXS30* index, will stimulate growth in other business areas as well, making up for the shortfall in fees for the index fund.[2]) During the bull period until mid-2000, they also displayed performance superior to most discretionary funds. However, during the recent market decline they have fared worse, given the custom of discretionary funds to increase the proportion of bonds and fixed income securities in their portfolios during bear periods.

2.1 Interviews with fund managers

This section contains a brief summary of the results of our interviews with Swedish fund managers. For a full qualitative account of the interviews, please see the Appendix.

We conducted interviews with both

1. Managers of traditional discretionary funds
2. Managers of index funds.

[1] Source : Fondbolagens Förening.
[2] Dagens Industri 08.05.05

The interviews in the former category were conducted with managers of some of the largest mutual funds, to determine the extent to which it is common practice for managers of discretionary funds to increase their weights of stocks newly added to the OMXS30, following a rebalancing of the same index. Thus, while the proportion of “proper” index funds may be small in Sweden, compared to the total AUM of managed equity funds, there may be several funds that are allegedly managed according to a discretionary “style”, which in reality behave in the same way as index tracker funds, giving rise to similar purchase patterns following index additions. The results of the interviews are:

- None of the interviewed managers claimed to pay any attention to changes in the composition of indices.
- Some argued that if they would, these trades would not coincide with the effective index inclusion dates, but rather form part of some clever arbitrage strategy (the exact structure of which they would not divulge).

The extent to which discretionary fund managers bother about index inclusions was thus left unanswered, but we believe that there might be a certain effect, due to the seemingly passive management of some funds.

The purpose of interviewing index fund managers was twofold, first, to find out which date to use as the effective date for our study and second, to see whether index fund managers are aware of any price impact caused when they rebalance their portfolios and whether they try to avoid this in any way. As a first step, we needed to identify the day when the index provider announces the index inclusion – the announcement date. For the *OMXS30* the index provider OM Stockholmsbörsen AB reported only one such possible date, with announcement date and effective date both being the first trading day of January and July respectively. The results of the interviews were:

- 1 manager claimed to rebalance his portfolio on the effective date, in one single block purchase.
- All remaining interviewed managers seemed to believe that this could drive prices, and they therefore break the purchase up in smaller trades, spread out over time. Furthermore, they were unwilling to provide information on the procedure used, arguing that it could cause people to profit from them were they to become known. Another stated reason was that they

changed this procedure each time, in order to avoid creating a price pattern that other market participants could take advantage of.

- On the whole, no manager seemed to believe that index inclusion causes abnormal returns, mainly because of the limited size of the Swedish index fund market. This could seem a little surprising given that some of them previously claimed that they took caution not to drive prices when rebalancing their portfolios.

3. Related literature

The Efficient Market Hypothesis, EMH, classifies market efficiency into three forms: weak, semi-strong and strong. The weak form exists when security prices reflect all information contained in past prices, the semi-strong when prices incorporate all publicly available information at any point in time. Finally, the strong level is evident when all existing information (i.e. including insider information) is incorporated into market prices..

Common to the approach to classify a market as efficient is a methodological dilemma called "the joint hypothesis problem"[3]. It states that as there is no adopted equilibrium pricing model for securities, any test for market efficiency would be a joint test of a "bad" equilibrium model. While this is irrefutable, any equilibrium model based on the EMH must have a demand curve that is infinitely elastic at least in the long term, since prices are not allowed to react to non-information events, regardless of how great a change in volume is generated. Hence, It would seem feasible to test for the elasticity or slope of the demand curve as a proxy for market efficiency, while leaving the question of the equilibrium pricing model unanswered.

Before we begin to address the abundance of research that has been performed on the topic we will address the various explanations that have been used to explain the stock price effects following from index inclusions.

[3] Fama (1969)

Four hypotheses have been suggested as ways to explain these effects (at the end of this section is an overview of the research undertaken in the field as well as the respective hypothesis that the each of the findings lends its weight to).

First, the *information signaling* hypotheses (Mikkelson, 1981; Harris and Raviv, 1985; Smith, 1986) states that a stock that is added to an index is by definition good news (with the contrary being true for deletions). There are many reasons as to why one could argue that this is the case: some indices, like the S&P 500, are decided upon by a committee operating according to loose criteria – being added to the index hence reflects something positive about the stock. Another reason is the fact that belonging to the top echelon of stocks allows for more attention from investors, analysts and the media. According to this hypothesis, a stock price effect would be expected to be permanent.

Second, the *price pressure and imperfect substitutes* hypothesis (Scholes, 1972; Kraus and Stoll, 1972; Hess and Frost, 1982) posits that adding a stock to an index can lead to an increase in demand for that stock. Reasons for this include the fact that index inclusion attracts increased buying both from index funds needing to replicate the index as well as from active portfolio managers who benchmark themselves to the index and investors hedging bets in the options and futures markets. Also, investing in the major indices is an easy way for foreigners to gain exposure to a market, which further contributes to increased demand. Depending on the nature of the stock price effect (whether it is merely temporary or actually permanent) we arrive at either the *price pressur*e hypothesis or the *imperfect substitutes* (also known as *downward sloping demand curves*) hypothesis.

Third, the *information costs/liquidity* (Van Horne, 1970; Arbel and Strebel, 1982; Barry and Brown, 1984; Beneish and Gardner, 1995) hypothesis states that index inclusion can increase the amount of information available in the public domain about the stock as well as lower the cost of acquiring more information. A reason for this is the scrutiny and attention that journalists and analysts typically devote to companies in the major indices. Another possible effect of this increased information flow may be the narrowing of bid-ask spreads and, as a corollary, a lowering of total transaction costs. According to this hypothesis, index inclusion should lead to lower costs of trading and hence to a permanent price increase for the stock.

The final explanation, *selection bias*, (Chan, Jegadeesh and Lakonishok, 1995; Bechmann, 2002) holds that some of the stock price effects can be better understood by looking at the selection criteria for the index in question. As we will see later, this will be particularly relevant in our discussion about the *OMXS30*. A selection bias can for example occur if only stocks that feature high returns in the period preceding the change are added. The end result is that a message about the stock is conveyed by the inclusion.

Much scholarly attention has been devoted to understanding and explaining stock price effects following index inclusions – albeit with a primary focus on the S&P 500. The following is a brief overview of the findings to date (a descriptive overview can also be found in Table II below).

Shleifer (1986) studied the S&P 500 and found a permanent stock price increase and claimed this reinforced the imperfect substitutes hypothesis. Other scholars that argue for the same phenomenon include Pruitt and Wei (1989). They find a distinct connection between changes in institutional ownership and changes in the composition of the S&P 500. Similar to Shleifer, Dhillon and Johnson (1991) report a permanent stock price effect as well as a permanent increase in trading volume for stocks added to the S&P 500. Moreover, they find that the prices of call options increase while those of put options decrease, which they take as evidence that an increase in liquidity and a lowering of bid-ask spreads are a partial cause of the stock price effect. They also find that prices of the bonds issued by firms which are not tracked by index funds do increase on the announcement date. Unlike these examples, Harris and Gurel (1986) report that price increases are temporary and fully reversed within two weeks. Seeing that they also observe a significant increase in trading volume in conjunction with the announcement of an index change, they take this as evidence for temporary price pressure. Erwin and Miller (1998) also state that one of the subsets in their S&P 500 sample features a full reversal. Jain (1987) however, found that stocks which are added to supplementary market indices (not tracked by fund managers) do not show any statistically significant abnormal returns surrounding the announcement date.

Before 1989 changes to the S&P 500 were announced and became effective on the same date. At that point this procedure was reviewed so that now changes are announced about a week before they become effective. Beneish and Whaley (1996) claim that one reason for this change was to avoid buying pressure around announcement dates. Moreover, Beneish and Whaley (1996) and Lynch and Mendenhall (1997) both show that after this change in the announcement procedure a positive stock price effect can still be observed from index inclusion to the S&P 500. The main difference in their findings however, is that the reported effect is most pronounced around the announcement date and only prevalent in the time period from announcement date to effective date. Both Beneish and Whaley (1996) and Lynch and Mendenhall (1997) also come to the conclusion that the trading around index changes in the S&P 500 gives rise to the so called 'S&P game', where arbitrageurs buy the added stock around announcement date only to sell it one week later at effective date to investors committed to tracking the index. Chen, Noronha and Singal (2004) report a positive permanent price effect for index inclusions to the S&P 500 but not for deletions. One explanation for this could be that investors become more aware of a stock following index inclusion but that the opposite does not hold for a deletion. Hedge and McDermott (2003) analyze bid-ask spreads of 74 stocks added to the S&P 500 during the years of 1993 through 1998, discovering a correlation between abnormal returns initiated by the index addition and a reduction of bid-ask spreads. Taking a somewhat different approach, Strömqvist (2006) studied stocks added to the S&P 500 from an asymmetric information viewpoint and found that for the average firm the asymmetric information decreases after inclusion – which is consistent with theory. However, for some firms, notably high-tech firms, she notes that inclusion into the S&P 500 generated higher information asymmetry, which in turn had a negative effect on liquidity.

Even though most attention has been focused on the S&P 500 a score of researchers have turned their attention to other indices, often with the intention of trying to further isolate stock price effects. The fact that the composition of the S&P 500 is determined by a committee leaves room for speculation whether another index would be less prone to a certification effect. This is one of the reasons why we consider the *OMXS30* index, the composition of which is purely determined by market capitalization, a suitable choice for this study.

Mase (forthcoming) studies the FTSE 100 (which is determined quarterly by market capitalization) and finds evidence supporting the existence of short-term downward sloping demand curves, but no evidence of permanent price effects. Bechmann (2002), in a study of the Danish blue-chip KFX index, finds an average abnormal return of 5% in stocks added to the index, and interprets his findings as support for either the imperfect substitutes hypothesis or the information costs/liquidity hypothesis. Pape and Schmidt-Tank (2004) looks at the pan-European Stoxx 50 and find ‘medium term price effects’ but no liquidity effects (which is what they were really looking for).

Moreover, there seems to be a difference between the S&P 500 and small cap indices such as the S&P 600 or the Russell 2000, in that studies of the latter clearly show a subsequent reversal of price effects (Biktimirov, Cowan and Jordan, 2004; Shankar and Miller, 2006).

Denis, McConnell, Ovtchinnikov and Yu (2003) point to another way of defining what an ‘information-free event’ is, lending support to the information signalling hypothesis. Instead of presuming that information is relevant merely if it causes inclusion, they set out to prove that inclusion itself leads to improvement in future performance for the newly included firms. This could occur, for example, because index inclusion leads to greater scrutiny of management by investors, possibly leading to a greater effort on the part of the management. Moreover, it could be that management is more sensitive to failure at the helm of an S&P 500 company than they would have been otherwise. They find that, relative to benchmark companies, additions of companies to the index (in this case, the S&P 500) are accompanied by improvements in expectations about the future earnings of the newly added companies. Furthermore, relative to benchmark companies, earnings improvements are realized by newly added companies. They emphasize that their findings are not inconsistent with the imperfect substitutes hypothesis; they simply find that index changes are not information-free events and that index inclusion signals favourable information about the firm to the market (hence using their arguments, we cannot completely rule out a possible information effect in our study).

On the other hand, Kaul, Mehrotra and Morck (1999), studied a unique event at the Toronto Stock Exchange (TSE) which did not involve index inclusions at all. The TSE redefined the float and brought its definition in line with that of the regulator, increasing the float for 31 stocks in the TSE 300 index. As this event would not bring additional scrutiny in the sense that Denis et al. (2003) proposed, it is interesting to note that Kaul et al (1999) find excess returns of 2.34 percent for the 31 stocks in the week the revised weights became effective.

Wurgler and Zhuravskaya (2002) test directly the reasons for the sloped demand curve and their results suggest that demand curves go from flat to sloped due to the risk dynamics involved in the arbitrage process. They claim that the risks associated with arbitrage consist mainly of the inability of arbitrageurs to find close substitutes to the stocks in question. Hence, the closer substitutes one finds to the stock, the greater are the opportunities for arbitrage activities, leading to a flatter demand curve.

What general conclusion can be drawn from previous studies? As reported, the literature indicates that:

- Index inclusions in general lead to a positive stock price effect, though it should be noted that the majority of research thus far has been performed on US data (in particular the S&P 500).
- Researchers are ambiguous on whether that change is permanent or merely temporary, differing evidence has been found using
    1. Different size of event windows.
    2. Different indices
- Researchers disagree on the causes for the noted effect, whether it is because:
    1. The positive impact is natural, since new (positive) information is contained in an index addition (the *information signalling hypothesis*)
    2. The positive impact rhymes falsely with the tenets of the EMH. Stocks cannot be traded freely in large blocks without generating *price pressure*, since one stock is not a perfect substitute for another (the *imperfect substitutes* or *downward sloping demand curves hypothesis*).
    3. Index inclusion reduces the transactions costs of trading in a stock, by causing increased trading volume leading to a reduction in bid/ask spreads. Lower transaction costs lead to a higher valuation, meaning that the observed price impact is natural and fits in well with the EMH (the *information costs/liquidity hypothesis*)
    4. There is a *selection bias* when stocks are added to an index, meaning that index inclusion signals an underlying source of information about the stock, which thus explains the observed price impact.

Table II
Overview of previous research

This table provides an indicative overview of the research performed to date in the area of stock price effects in conjunction with index changes. Columns 3, 4 and 5 represent the studied time periods, the specific topic investigated as well the supported hypothesis that arises from the study, respectively.

Author(s)	**Indices**	**Period**	**Object of investigation**	**Supported hypothesis**
Shleifer (1986)	S & P 500 (USA)	1966-1983	Price and volume effects of additions to the index	*Imperfect substitutes*
Harris / Gurel (1986)	S & P 500 (USA)	1973-1983	Price and volume effects of additions and deletions to the index	*Price pressure*
Jain (1987)	S & P 500 (USA)	1977-1983	Price effects of additions and deletions to the index	*Information signaling*
Pruitt / Wei (1989)	S & P 500 (USA)	1973-1986	Changes in institutional holdings after additions and deletions to the index	*Imperfect substitutes* or *Price pressure*
Dhillon / Johnson (1991)	S & P 500 (USA)	1978-1988	Price (stocks and options) and volume effects of additions to the index	*Information signaling*
Beneish & Whaley (1996)	S & P 500 (USA)	1986-1994	Price effects of additions to the index	*Price pressure*
Lynch / Mendenhall (1997)	S & P 500 (USA)	1990-1995	Price and volume effects of announcements and realization of changes in index composition	*Imperfect substitutes* and *price pressure*
Erwin / Miller (1998)	S & P 500 (USA)	1984-1988	Price and volume effects of additions to the index	*Price pressure*
Liu (2000)	Nikkei 500 (Japan)	1991-1999	Price and volume effects of announcement of changes in the index composition	*Imperfect substitutes*
Bechmann (2002)	KFX (Denmark)	1989-2000	Price and volume effects of announcements and realization of changes in index composition	*Imperfect substitutes* and *information costs/liquidity*
Wurgler / Zhuravskaya (2002)	S & P 500 (USA)	1976-1989	Price effects of realization of additions to the index	*Imperfect substitutes*
Denis et al (2003)	S & P 500 (USA)	1987-1999	Price effects of announcement and realization of additions to the index	*Information signaling*
Hedge / McDermott (2003)	S & P 500 (USA)	1993-1998	Price and volume effects of additions to the index	*Information costs/Liquidity*
Gerke / Fleischer (2003)	MDAX (Germany)	1996-2002	Price effects of announcement and realization of changes in the index composition	*Price pressure*
Biktimirov / Cowan / Jordan (2004)	Russell 2000 (USA)	1991-2000	Price and volume effects of realization of changes in the index composition	*Price pressure*
Chen / Noronha / Singal (2004)	S & P 500 (USA)	1962-2000	Price and volume effects of announcement and realization of changes in the index composition	Unclear
Pape / Schmidt-Tank	STOXX 50 (Europe)	1998-2003	Price and liquidity effects of announcement and realization of	Unclear – no support for

(2004)			changes in the index composition	liquidity hypothesis
Chakrabarti et al. (2004)	MSCI Country Indices (29 countries)	1998-2001	Price effects of announcement and realization of additions to the index	*Imperfect substitutes* and mild *liquidity effects* in some countries
Shankar / Miller (2006)	S & P 600 (USA)	1995-2002	Price effects of announcement and realization of additions to the index	*Price pressure*
Mase (forthcoming)	FTSE 100 (UK)	1992-2005	Price and volume effects of announcements and realization of changes in index composition	*Price pressure*

4. Sample Selection, Data and Definition of Variables

In this study we examine the price effects of stocks which are included in a broad market index reflecting the overall return on the Stockholm Stock Exchange. The *OMXS30*, produced and compiled by OM Stockholmsbörsen AB, is a capital-weighted index, comprised of the 30 stocks on the Stockholm Stock Exchange with the highest market capitalization and hence, the highest liquidity. The composition of the index is based not on qualitative judgements of a committee or the like, but on a straightforward selection process based entirely on information accessible in the public domain. Due to this, we have little reason to believe that inclusion into the *OMXS30* should constitute an information event. There are other indices replicated by index funds on the Stockholm Stock Exchange (e.g. the SBX), but the *OMXS30* is the one which most index funds choose to replicate, and no other index has existed for as long as the *OMXS30*. In order to maximize sample size, the *OMXS30* was therefore an easy choice.

What follows is an example of what an index inclusion could look like: Securitas, a Swedish security company, was added to the FTSE Eurotop 300 index on March 22nd 1999. During the six month period leading up to the inclusion its share price increased from SEK 59,09 to SEK 90,37 (53%). During the same time period the value of the market index AFGX increased by 19,4%. Securitas had been on a spending spree starting in 1992 with a series of acquisitions in Spain, Germany, France, Great Britain, Austria and Switzerland. As a result the market had become skeptical about whether the company was in over its head financially. In the autumn of 1998 broker Carnegie claimed that "Securitas is among the most expensive service companies worldwide whichever way we look at it"[4]. Three months later however, the same broker upgraded Securitas from "Match" to "Outperform", saying that the company had a "impressive track record of value adding acquisitions"[5]. During the six month period leading up to the index inclusion the strong development of the stock was accompanied by "Buy" or "Outperform" recommendations from Carnegie, Handelsbanken, Nordiska and Warburg. During the twenty days leading up to the announcement date the stock decreased in value by -3,71%. On the announcement date, the stock bounced up slightly by 0,39%, only to continue its downward trend during the three subsequent days of trading. On the closing of the third day after the announcement data, Securitas AB had lost more than 5% of its value since announcing its addition to the FTSE Eurotop 300 (from a share price of 90.37 to 85.85). During the same period, the broad market index AFGX had gained about 1% (from 194.6 to 196.4). During the remainder of the twenty days following addition, Securitas recovered some of the lost ground and managed to climb back to just below its market value on the effective date. For this individual case, we are therefore able to note a counterintuitive effect, compared to the results of similar studies in the US. Securitas seemed to lose value on the trading days immediately following its addition to an international index, following a longer period of abnormally high returns and outperforming the market. In this instance, we are able to observe how index addition can coincide with a price reversal following a preceding period of high momentum returns.

For the purpose of this study, we believe that the limited size and brief history of the Swedish index fund market may render the data sample too small and the results insignificant, so we have also chosen to study effects associated with the inclusion of Swedish stocks in European indices. Since these are often denominated in local currency, index funds wishing to replicate their composition will have to purchase added stocks on their local exchanges. Hence, in addition to the *OMXS30*, we have chosen to study inclusions in four additional indices: the *S&P Euro+, FTSE Nordic 30, Eurostoxx 600* and the FTSE *EuroTop300*. These were chosen because they had the highest number of Swedish stocks added during our sample period, which means we could obtain a significant sample size. Table III

[4] Carnegie analyst report, 11.11.1998
[5] Carnegie analyst report, 06.01.1999

summarizes the key characteristics of the indices used in our study (for more information on the specifications of each index please refer to the Appendix):

Table III
Overview of studied indices

This table provides an overview of the indices used in our study. It also features a description of each index's selection criteria, how often it is revised, whether it is sector weighted, or has a weighting cap or liquidity hurdle.

Index	Selection criteria	Revisions	Sector-weighted	Weight Cap	Liquidity hurdle
OMXS30	Based on the 30 most traded stocks on the Stockholm Stock Exchange, market-weighted	Semi-annually	No	No	By definition
EuroStoxx 600	Comprises Large, Mid and Small indices of 200 components each, market-weighted	Quarterly	No	20%	No
FTSE Nordic 30	Based on the 30 biggest (by market cap) stocks from the FTSE All-World Index – Nordic region.	Semi-Annually	No	10%	Min. velocity 40%
S&P Euro+	Part of the S&P Europe 350, based on 17 major European exchanges. Includes all European constituents except the UK.	By discretion	Yes	No	Min. velocity 30%
FTSE Eurotop 300	Includes the 300 biggest companies (by market cap) in the FTSE Developed European Index	Quarterly	No	No	At least 0,5% turnover of outstanding shares for 10 out of 12 last months

5. Methodology

In this study we examine the impact of an addition of a stock to several market indices. Specifically, a classical event-study methodology is adopted. Specifically, we mimic the approach set forth by MacKinlay (1997). We obtained a list of all announcement dates from 1987 to 2006 from the OM website.[6] Furthermore, announcement dates for the overseas indices were obtained from the

[6] www.omxgroup.com

corresponding websites. Our sample period runs from 1987 until 2006. Due to data restrictions we exclude some of our initial sample firms as we do not have sufficient data. For instance, for some stocks that are included in *OMXS30* the announcement date is the same as the first trading day. This means that we will face a problem in obtaining a time series "prior" to the inclusion date. Thus, we decided to exclude some firms due to: a) the short trading history of these stocks, b) performing an event study on these observations would be tantamount to examining the abnormal returns of an initial public offering (IPO), which forfeits the purpose of this study, c) some stocks are re-included in *OMX* as the result of a name change following upon a merger or an acquisition, e.g. Astra was excluded from the OMXS30 on the effective date of the merger with Zeneca, only to be included 2 days subsequently under the name of AstraZeneca, d) we did not find enough price data for some of the stocks in the sample, because of limitations in the historical data provided by TRUST. Because of our choice of estimation period, we also had to have price data available for a stock at least 200 days prior to the announcement date, which ruled out a number of firms in the sample. In this study, our initial data set of 264 observations (*OMXS30* and overseas indices) had to be narrowed down to 194.

5.1 Volume study

In our analysis, we first examine changes in trading volume. To determine whether trading activity increases after a firm is added to the OMX index, trading volumes are analyzed in event time. Cross-sectional means are calculated as follows:

$$MVR = 1/N\sum(VR_{it}) \qquad (1)$$

$$VR_{it} = V_{it}/V_i, \qquad (2)$$

where V_{it} is defined as the trading volumes of security i in event time period *t* and V_i as the average trading volume of security *i* in the 180 days preceding the event window. The volume ratio VR_{it} is a standardized measure of period *t* trading volume in security *i*, adjusted for market variation. If the ratio is not significantly different from unity, then there is no change in volume during event period t relative to the control period. In order to test for the significance changes in the trading volume we perform a *t*-test (double-sided).

5.2 Event study

Two models are generally considered when calculating the normal return of a given security. If we assume that asset returns are jointly multivariate normal and independently distributed through time, then the *constant mean return model* and the *market model* are both correctly specified. Although the *constant mean return model* is perhaps the simpler of the two, Brown and Warner (1980, 1985) find that in many cases the results are more or less as robust as those of more sophisticated models. If μ_i is the mean return for asset *i*, then the constant mean return model is defined as

$$R_{it} = \mu_i + \xi_{it} \quad (3)$$

$$E(\xi_{it}) = 0 \qquad \text{var}(\xi_{it}) = \sigma_{\xi i}{}^2 \quad (4)$$

where R_{it} is the period-*t* return on security *i* and ξ_{it} is the time period *t* disturbance term for security *i* with an expectation of zero and variance $\sigma_{\xi i}{}^2$.

The *market model* on the other hand relates the return of any given security to the return of the market portfolio. For any security *i* it is given by

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (5)$$

$$E(\varepsilon_{it} = 0) \qquad \text{var}(\varepsilon_{it}) = \sigma^2{}_{\varepsilon_i} \quad (6)$$

where R_{it} and R_{mt} are the period-*t* returns on security *i* and the market portfolio, respectively. ε_{it} is the zero mean disturbance term and α_i, β_i and $\sigma^2{}_{\varepsilon_i}$ are the parameters of the market model. As we have already seen, much of the initial research in this field used the S&P 500 as the market portfolio. In our study, the overall return on the market is approximated by the AFGX return (Affärsvärldens Generalindex) on the same day.

The market model can be seen as the stronger model compared with the constant mean return model as it allows us to get rid of the return component related to variations in the market return, thereby reducing the variance of the abnormal returns. This is the main reason we decided to use the *market model* in this study.

We estimate the firm specific parameters ($\hat{\alpha}_i$ and $\hat{\beta}_i$) in the time period 180 days preceding the event date. Our event window is 2 days before and 20 days after the announcement date. Our choice of 20 days after the inclusion is in line with previous studies, e.g. Harris and Gurel (1986) who conclude that the stock price of securities in their study reverts to its initial value after twenty days. Shleifer (1986) chose to use an interval of only 10 days ex post, concluding that the price reaction is sustained over time. To avoid drawing similarly hasty conclusions, we chose to use a longer event period. For each sample observation, calendar time is converted into event time τ by taking the announcement date as event day 0. In order to test for the significance of the results we perform a *t*-test using the variance of each stock in the estimation period, and averaging them across stocks.

When general conditions apply, ordinary least squares (OLS) constitutes a consistent estimation procedure for the market model parameters. For the *i*th firm in event time, the OLS estimators of the market model are

$$\hat{\beta}_i = \frac{\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\mu}_i)(R_{m\tau} - \hat{\mu}_m)}{\sum_{\tau=T_0+1}^{T_1}(R_{m\tau} - \hat{\mu}_m)^2} \quad (7)$$

$$\hat{\alpha}_i = \hat{\mu}_i - \hat{\beta}_i \hat{\mu}_m \quad (8)$$

$$\hat{\sigma}^2_{\varepsilon_i} = \frac{1}{L_1 - 2}\sum_{\tau=T_0+1}^{T_1}(R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau})^2 \quad (9)$$

where

$$\hat{\mu}_i = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{i\tau} \quad (10)$$

and

$$\hat{\mu}_m = \frac{1}{L_1}\sum_{\tau=T_0+1}^{T_1} R_{m\tau} \quad (11)$$

$R_{i\tau}$ and $R_{m\tau}$ are the returns in event time τ for security *i* and the market respectively. L_1 is the length of the estimation window.

Now we focus our attention on how to use the OLS estimators to measure abnormal returns. Using the market model to calculate abnormal returns, we arrive at

$$AR_{i\tau} = R_{i\tau} - \hat{\alpha}_i - \hat{\beta}_i R_{m\tau} \quad (12)$$

The abnormal return constitutes the disturbance term of the market model. Until now we have discussed individual abnormal returns of a stock on one particular trading day. In order to distinguish systematic effects the individual abnormal returns AR_{it} of all stocks in the sample are added. By way of the arithmetic mean of the *N* different abnormal stock returns it is possible to calculate the mean abnormal return MAR_t for one day:

$$MAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{i\tau} \quad (13)$$

Should we want to extend the focus from one day to a longer time period the mean abnormal returns for day *v* to day *w* are added and produces the cumulative abnormal return $CAR_{v,w}$ (MacKinlay, 1997):

$$CAR_{v,w} = \sum_{t=v}^{w} MAR_t \quad (14)$$

To distinguish whether an observed deviation in the stock return from the expected value is merely random or actually due to the index inclusion the results are examined for their statistical significance using suitable hypothesis tests that follow in the next section.

5.3 Regression study

In order to test whether individual cumulative abnormal returns are correlated with other explanatory variables, we also perform an OLS regression model to our sample firms. Theoretical insights can result from examining the association between the magnitude of the abnormal and/or cumulative abnormal return and characteristics specific to the event observation. Often such an exercise can be helpful when multiple hypotheses exist for the source of the abnormal return, as indeed is the case for our study. A cross-sectional regression model is an appropriate tool to investigate this potential association. The basic approach is to run a cross-sectional regression of the (cumulative) abnormal returns on the characteristics of interest. Given a sample of N (cumulative) abnormal return observations and M characteristics, the regression model is:

$$(C)AR_j = \delta_0 + \delta_1 x_{1j} + ... + \delta_M x_{Mj} + \eta_j \quad (15)$$

$$E(\eta_j) = 0 \quad (16)$$

where $(C)AR_j$ is the j-th (cumulative) abnormal return observation,

x_{mj},rn = 1, . . . , M, are M characteristics for the j-th observation and η_j is the zero mean disturbance term that is uncorrelated with the x's. δ_m, m = 0, . . . ,M are the regression coefficients. The regression model can be estimated using OLS (MacKinlay, 1997). We have assumed the η_j to be cross-sectionally uncorrelated and homoskedastic, which means that inferences can be conducted using the usual OLS standard errors. To determine which variables would be most fruitful to test against we initially performed a qualitative examination of the cumulative abnormal returns, and compared them with potential explanatory factors.

5.4 Testing the significance of our results

In order to test the significance of the results we will perform t-tests for the volume study, event study and multivariate regression study separately. For the event study, we use the cross sectional approach to estimating the variance, applied to the average abnormal ($AR(\tau)$) and cumulative abnormal return ($CAR(\tau_1, \tau_2)$).Using the cross-section to form an estimator of the variance (of the CAR in this case) gives:

$$\text{var}(CAR(\tau_1, \tau_2)) = \frac{1}{N^2} \sum_{i=1}^{N} \overline{CAR(\tau_1, \tau 2)} - CAR(\tau_1, \tau 2) \quad (17)$$

For this estimator of the variance to be consistent, the abnormal returns need to be uncorrelated in the cross-section. An absence of clustering is sufficient for this requirement. Note that cross-sectional homoskedasticity is not required (MacKinlay, 1997). Given this variance estimator, the null hypothesis that the cumulative abnormal returns are zero can then be tested using the standard student's t-test methodology.

For the volume study, we use the standard deviation of volume ratios during the estimation period, and apply the standard student's t-test methodology. For the multivariate regression study, the t-statistic is generated automatically and displayed in the SPSS regression table. We choose a double-sided significance level of 5% with n-1 degrees of freedom. Due to different sample sizes for each test, the t-statistic differs somewhat between the volume study, event study and multivariate regression study. We choose a double-sided significance, since we want to remain open to the possibility that index inclusions yield lower volume ratios than unity, potentially yield negative abnormal returns and can have both a positive and negative correlation with the test variables in the regression study.

6. Hypotheses

Conclusions from the study will be made through the use of hypothetical deduction, with hypotheses and decision rule detailed below.

6.1 Null and alternative hypotheses for the volume study

H_0: Index inclusion in the domestic or overseas indices will not yield volume ratios significantly different from unity during the event window of index inclusion for the stock being included.

H_1: Index inclusion in the domestic or overseas indices will yield volume ratios significantly higher or lower than unity during the event window of index inclusion for the stock being included.

Decision rules for the volume study

Reject H_0 if the (absolute value of the) t-statistic of the observation goes above the critical t-value.

6.2 Null and alternative hypotheses for the event study

H_0: Index inclusion in the domestic or overseas indices will yield no abnormal or cumulative abnormal returns during the event window of index inclusion for the stock being included.

H_1: Index inclusion in the domestic or overseas indices will yield abnormal or cumulative abnormal returns during the event window of index inclusion for the stock being included.

Decision rules for the event study

Reject H_0 if the (absolute value of the) t-statistic of the observation goes above the critical t-value.

6.3 Null and alternative hypotheses for the regression study

H_0: Cumulative Abnormal Returns for stocks in the domestic or overseas indices have no correlation with the explanatory variable tested.

H_1: Cumulative Abnormal Returns for stocks in the domestic or overseas indices have a significant correlation with the explanatory variable tested.

Decision rules for the event study

Reject H_0 if the (absolute value of the) t-statistic of the observation goes above the critical t-value.

7. Results

Table IV shows the distribution of index inclusions for our sample firms over the sample period. From January 1987 to September 2006, our sample includes inclusions totalling 194 firms. The table indicates that the inclusions are, roughly speaking, evenly distributed in time even if a significant number of index inclusions occur in the three first sample years (1987-1989).

Columns two and three show the distribution of index inclusions for domestic and overseas market indices. It can be noted from the table that the majority of events over our sample period are related to domestic inclusions, 66.5 percent.

Table IV
Description of Sample

This table presents the sample firms which have been added to a domestic or overseas market index over the sample period 1987 to 2006 (September 18th). We use the market index *OMXS30* as a proxy for the domestic index and *S&P Euro+*, *FTSE Nordic 30*, *Eurostoxx 600* and *FTSE Eurotop 300* as proxies for the overseas market index.

Year	Domestic Index	Overseas Index	Total
1987	23	0	23
1988	25	0	25
1989	22	0	22
1990	14	0	14
1991	11	0	11
1992	7	11	18
1993	7	0	7
1994	1	2	3
1995	3	3	6
1996	2	13	15
1997	2	3	5
1998	1	1	2
1999	0	6	6
2000	4	6	10
2001	3	4	7
2002	0	2	2
2003	1	6	7
2004	1	2	3
2005	0	4	4
2006	2	2	4
All	129	65	194

7.1 Volume Effects

Table V shows the results of the study of the trading volume surrounding the event day. We examine the trading volume around three different event windows: (t=1), (-20 to 0) and (-3 to +20). For the overall sample period we are unable to detect any statistically significant change in the standardized trading volume on the inclusion date. However, when our window is reduced to '-20 to 0' (-3 to +20) we observe a small increase in the trading volume. More specifically, trading volumes are 8 (6) per cent higher, respectively, compared to the standardized volume. 44 (48) percent of the observations have a ratio greater than unity.

The last row in Table V reports the trading volume for the sub period 1999 to 2006. The table indicates a much higher trading volume for this period. The measures of the standardized trading volume (1.31, 1.23 and 1.11 respectively) are also statistically significant.

Table V
Volume Changes around Index Inclusions

This table reports volume changes around the inclusion of a stock in a market index. The ratio is defined as trading volume divided by the average trading volume in the pre-period (day -180 to -1).

Year	N	Ratio of Trading Volume								
		t=0			-20 to 0			-2 to +20		
		Mean	% > 1	t-statistic	Mean	% > 1	t-statistic	Mean	% > 1	t-statistic
1987	17	0,45	24%	-9.9432	1,06	36%	0.3333	0,90	42%	-0.9468
1988	25	0,40	56%	-7.8546	0,85	37%	-1.3455	0,65	45%	-3.8006
1989	21	0,36	48%	-10.2695	0,72	46%	-2.9528	0,61	44%	-3.5073
1990	12	1,04	50%	0.2731	0,97	50%	-0.1892	0,72	47%	-1.2302
1991	12	1,50	75%	1.9985	1,35	59%	1.7713	1,57	50%	0.6200
1992	15	1,02	53%	0.1858	1,06	53%	0.2764	0,84	61%	-0.9126
1993	7	0,07	86%	-61.6103	1,33	64%	2.3621	1,98	71%	3.0988
1994	3	1,27	33%	2.5915	1,33	63%	2.9409	1,14	50%	1.3540
1995	5	0,73	0%	-4.9482	0,87	35%	-1.7540	0,62	19%	-6.4754
1996	11	0,87	36%	-1.4959	0,75	24%	-2.9806	1,12	47%	1.0125
1997	5	1,12	20%	1.2169	0,75	23%	-3.2397	1,00	34%	-0.0200
1998	2	1,49	100%	4.3336	1,01	40%	0.1236	1,37	65%	2.5536
1999	6	0,99	33%	-0.1286	1,34	43%	2.3159	0,93	43%	-0.6991
2000	9	1,18	56%	1.9043	1,10	43%	0.9167	1,18	59%	1.4817
2001	6	2,48	83%	6.2592	1,46	62%	2.6120	1,62	51%	1.7937
2002	2	1,20	50%	2.1372	1,25	43%	2.2002	1,15	75%	1.3773
2003	7	0,53	14%	-10.2631	1,15	43%	1.1463	0,81	48%	-2.5748
2004	0									
2005	0									
2006	2	1,14	100%	1.5970	1,17	65%	1.6524	0,80	18%	-3.6922
1987-2006	167	0,99	49%	-0.3718	1,08	44%	2.8234	1,06	48%	1.3125
1987-1999	141	0,87	48%	-4.9391	1,03	44%	0.8295	1,04	47%	0.6501
1999-2006	26	1,31	62%	6.2550	1,23	59%	4.0509	1,11	62%	1.7365

As the table indicates, there appears to be no conclusive evidence of either positive or negative abnormal volumes around the announcement dates. The overall volume ratio (0,99) for the event day (t=0) is close to what would be the expected value (1) if there were no abnormal trading volumes to be observed. Looking at the overall volume ratio for the entire event window (t-2 to t+20), the estimate is not statistically significantly different from unity either. We also include observations for an event window ranging from 20 days prior to the index addition, up to the event day. The reason for doing this is that the decision rule for index additions to the *OMXS30* is fairly simplistic (30 most traded stocks during a 6-month time interval). One could argue that astute traders might be able to exploit any price effects of index additions, by figuring out which stock is going to be added to the index in advance of the actual addition. Looking at the results for this time period however, we do observe a statistically significant deviation from unity (t-statistic exceeds critical t-value of 1,97), and therefore are able to reject H_0. As will be found in the next paragraph, these results are driven mainly by recent observations.

Another split of the data has been made, due to potential bias towards recent observations. As noted earlier, the Swedish fund market grew exponentially after the introduction of the DC system in the Swedish pensions system, and the presence of index funds in the Swedish market was only really established after this date. Hence, the traditional argument of price and volume pressure being associated with index fund managers mechanically reweighting their portfolios after index changes could really only be applied to Sweden after this date. As noted before however, there could potentially be an effect associated with the actions of discretionary fund managers, who in reality track market indices fairly closely. Looking at the recent data (1999-2006), we do indeed note a positive volume ratio significantly above 1 on the event day, and so we are able to reject H_0. The observation is also significant for the time period of 20 days preceding the event date, but not for the total event window. The data indicates that the recent growth of index funds has indeed contributed to volume pressure prior to and around the addition of stocks to the indices studied. Looking at the data for the period 1987-1999, we can observe no such significant results, seemingly refuting the hypothesis that discretionary fund managers contribute to volume pressure by reweighting their portfolios in association with index changes. We would then expect to observe price effects coming out of the event study, for the period 1999-2006 in particular. It should be noted at this stage however, that the results should be treated with some caution: the number of data points for the period 1999-2006 is only 26, meaning that the sample size is not really statistically large enough to draw any conclusive evidence. Moreover, looking at the drivers of the results, we can see that they appear to stem from 6 highly positive volume ratios observed in 2001, with the only other significantly positive observation in 2002, based on 2 data points. The 2001 data points occurred at a time of great market unrest, and could thus potentially be outliers to be treated with caution.

7.2 Return Effects

We summarize our analysis of price effects surrounding the inclusion dates in Figures 2 and 3. In Figure 2 we show the mean Abnormal Returns (ARs) for domestic as well as overseas indices for our sample firms. In Figure 3 we show the mean Cumulative Abnormal Returns (CARs) for the same sample.

Figure 2

Mean Abnormal Returns for inclusions into domestic and overseas indices

This figure shows the mean abnormal returns for inclusions in domestic and overseas indices, as well as the total, from two days before the event to twenty days past.

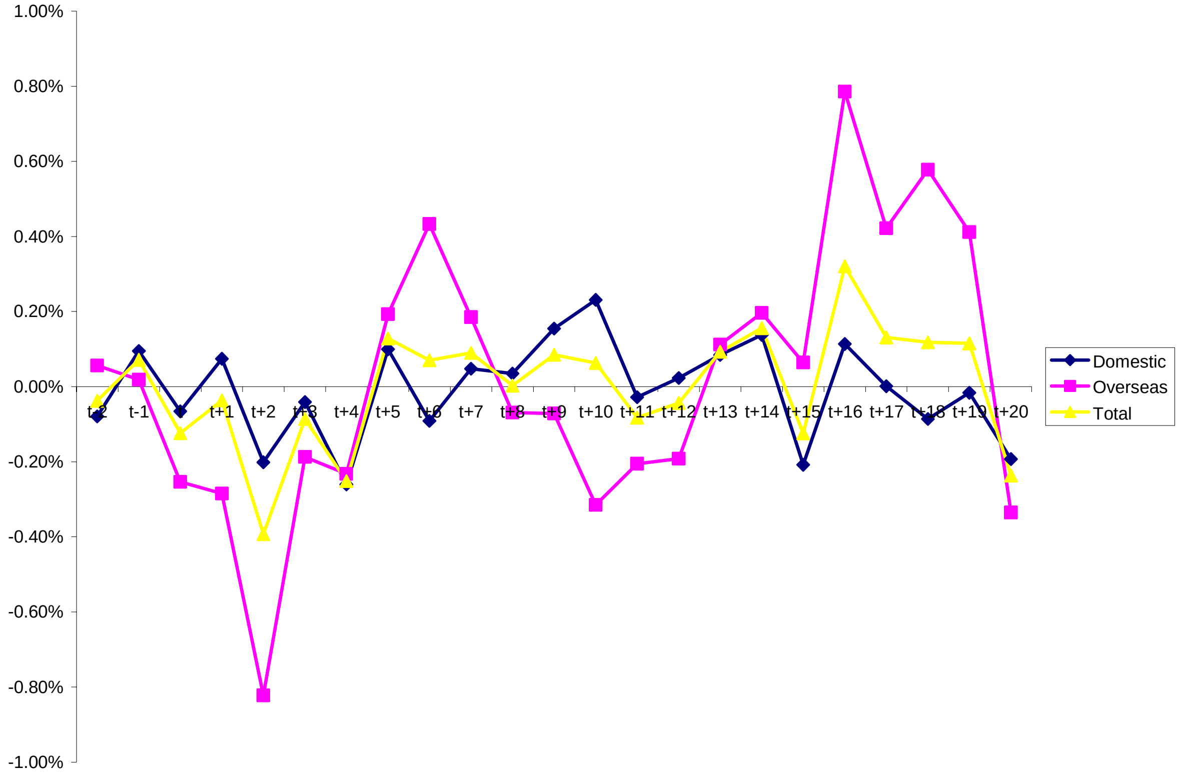
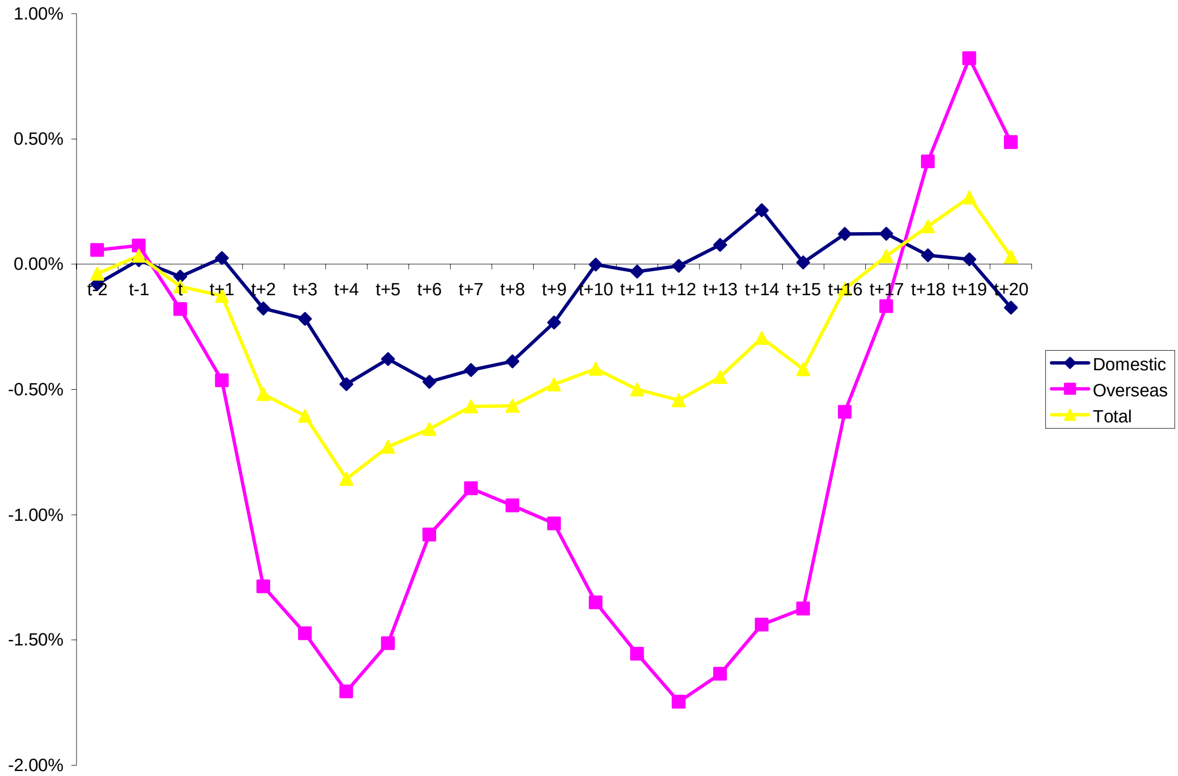


Figure 3
Mean Cumulative Abnormal Returns for inclusions into domestic and overseas indices

This figure shows the mean cumulative abnormal returns for inclusions in domestic and overseas indices, as well as the total, from two days before the event to twenty days past.



In Table VI we present the main results of the event study applied to our sample firms over the sample period 1987 to September 2006. Columns two to five show the results applied to domestic index additions and columns six to nine show the results for overseas market index additions. One important finding indicated in this table is that the announcement of an addition to a broad market index, irrespective of whether it is a domestic or overseas market index, on average is negative. For domestic (overseas) additions the announcement day effect is -0,07 (-0,25) percent. However, neither of the estimates are statistically significant different from zero, with a *t*-statistic of -0,43 (-1,31). In fact, the t-statistic for the AR-values does not breach the critical t-value during any of the days in the event window, and thus we can not reject the null hypothesis of no abnormal returns during the event window. The closest observation is a positive average AR of 0.42% for the overseas indices, reaching a *t*-value of 2.01 on t=17.

Table VI
Announcement Effects of an Index Inclusion

This table presents the announcement effects surrounding the announcement date for an index inclusion for Swedish firms listed on the Stockholm Stock Exchange. The abnormal return is the difference between the actual and the expected return. The expected return for a stock is estimated by the market model and over the 180 days pre announcement date.

Day	Inclusion to a Domestic Index (129 observations)				Inclusion to an Overseas Index (65 observations)			
	Average Abnormal Return	**t-statistic (AR)**	**Average Cumulative Abnormal Return**	**t-statistic (CAR)**	**Average Abnormal Return**	**t-statistic (AR)**	**Average Cumulative Abnormal Return**	**t-statistic (CAR)**
-2	-0.08%	-0.63	-0.08%	-0.45	0.06%	0.24	0.06%	0.24
-1	0.10%	0.74	0.02%	0.06	0.02%	0.10	0.07%	0.26
0	-0.07%	-0.43	-0.05%	-0.15	-0.25%	-1.31	-0.18%	-0.52
1	0.07%	0.47	0.02%	0.07	-0.28%	-1.34	-0.46%	-1.18
2	-0.20%	-1.82	-0.18%	-0.48	-0.82%	-1.60	-1.29%	-1.90
3	-0.04%	-0.28	-0.22%	-0.56	-0.19%	-0.59	-1.47%	-1.88
4	-0.26%	-1.47	-0.48%	-1.03	-0.23%	-1.21	-1.71%	-2.08
5	0.10%	0.72	-0.38%	-0.75	0.19%	0.58	-1.51%	-1.54
6	-0.09%	-0.61	-0.47%	-0.81	0.43%	1.50	-1.08%	-1.12
7	0.05%	0.36	-0.42%	-0.75	0.19%	0.76	-0.89%	-0.94
8	0.03%	0.20	-0.39%	-0.62	-0.07%	-0.26	-0.96%	-0.94
9	0.15%	0.99	-0.23%	-0.35	-0.07%	-0.30	-1.04%	-0.99
10	0.23%	1.21	0.00%	-0.00	-0.31%	-1.11	-1.35%	-1.27
11	-0.03%	-0.19	-0.03%	-0.04	-0.21%	-0.66	-1.56%	-1.28
12	0.02%	0.15	-0.01%	-0.01	-0.19%	-0.72	-1.75%	-1.35
13	0.08%	0.53	0.08%	0.10	0.11%	0.51	-1.64%	-1.27
14	0.14%	0.86	0.22%	0.26	0.20%	0.82	-1.44%	-1.12
15	-0.21%	-1.22	0.01%	0.01	0.06%	0.28	-1.37%	-1.09
16	0.11%	0.75	0.12%	0.13	0.79%	1.73	-0.59%	-0.51
17	0.00%	0.01	0.12%	0.13	0.42%	2.01	-0.17%	-0.14
18	-0.09%	-0.65	0.04%	0.04	0.58%	1.95	0.41%	0.32
19	-0.02%	-0.11	0.02%	0.02	0.41%	1.46	0.82%	0.67
20	-0.19%	-1.48	-0.17%	-0.17	-0.34%	-1.34	0.49%	0.39

Looking at the CAR values we find a similar story for the domestic indices. Although the CAR values are consistently negative between t=2 and t=9, reaching a climax of -0.48 on t=4, none of these values are significantly different from 0. However, turning to the overseas indices, we observe a stronger negative effect, based on the previously identified 5 days of consecutive negative returns. The CAR in the overseas indices is negative from day 0 to day 17 with values ranging between -0.17 and -1.71%. Moreover, on t=4, the absolute *t*-statistic is above the critical *t*-value (1,97) , and we can therefore reject H_0. Furthermore, as illustrated in Figure 3, the market seems to overreact around the announcement date and thereafter recovers the entire loss, from t=12 onward. This is contrary to what the EMH would predict; any adjustment to a new equilibrium price should be fast and consistent.

Turning to the period 1999-2006, which, as we saw in the volume study, is one during which volumes appeared abnormally high on and around index additions, the results again contradict our expectations. The high volumes observed around this period actually seem to have been associated with downward price pressure, i.e. that trading volumes were indeed high after stocks were added to the *OMXS30*, but that these were caused by market agents shorting the stock in questions. One thing to remember here is that the highest volume ratio was observed during 2001 – indeed this data point seems to have driven the results for the entire period 1999-2006 – which was a time of significant market unrest. There may well have been other reasons for why the stocks added to the *OMXS30* were sold short this year. One plausible such explanation is the argument that hedge funds were contributing to downward price pressure during the bear years 2000-2002. Hedge fund traders who would hold large short positions in the most traded stocks at this time may well have increased short positions in stocks that were added to major indices.

The expectations of the volume study were that no volume pressure would be observed during the period 1987-1999. Indeed, this is confirmed by the data. Looking first at the announcement day itself, no clear evidence can be drawn. The ARs in general appear to be mildly negative, but none of the domestic or overseas observations are statistically significant at our chosen confidence interval. However, for the overseas indices, we can note a clear negative trend with 5 consecutive negative return values from the event day t=0 through to t=4 (the most negative being t=2 with -0.82%). Since the total result is a combination of the domestic and overseas results, we get aggregate results similar to *OMXS30*, but with a slightly more negative trend. To conclude, there is only one individual value that can be said to be statistically significant at the 5% level.

Taken together, these findings indicate that the market on average interprets an addition to stock indices as a negative signal, although the results are only significant for overseas indices. One possible explanation for this finding can be that the firms in the sample are overvalued. Indeed, if we recall the selection criteria for the *OMXS30*, being the 30 most traded stocks on the Stockholm Stock Exchange over a 6 month period, the fact that the stock in question has been heavily traded during the preceding

6 months may well be a sign that it has rallied, causing a subsequent price reversal. This hypothesis is consistent in principle with the findings of De Bondt and Thaler (1985), who showed that the best performing stocks over a 3-year period ("Winner portfolios") would perform worse during the subsequent 5 years compared to stocks that had performed extremely badly ("Loser portfolios)" in the same preceding period. Similarly, Jeegadesh and Titman (1993) found that stocks that perform well over a short-term horizon (6-12 months) tend to continue to do so, findings that point to the presence of momentum in international equity markets. In other words, inclusion into the *OMXS30* index may be a signal that the stock in question has reached the climax of a period of overreaction. An important finding of this study could therefore be that index inclusions do not generate positive abnormal returns as a rule, but that this depends more on the institutional market context. In a market environment with a low presence of index funds, and where the main domestic index selection criteria may be a signal that the stock is overvalued, the opposite phenomenon might be observed. The overseas indices partly exhibit different selection criteria than the *OMXS30* (i.e. not based on the most traded stocks during the preceding 6 month period) however it may well be the case that the stocks in our sample have been overvalued in a domestic context, hence following index inclusion, asymmetric information will be reduced as more investors will recognize the stock. Consequently, informed traders will sell the shares, thereby causing a price decline. A useful test would be to check whether the results differ by index (Stoxx600, FTSE Nordic 30, S&P Euro + and FTSE Eurotop 300).

Indeed, these results may not be as surprising as they would appear at first glance, given that it may not be reasonable to expect the buying behaviour of a number of fairly small index funds to drive stock prices to any greater extent in a trading environment like that of Sweden. The studies quoted in the review of previous research refer almost exclusively to the US market, where index funds have an incommensurably greater market presence than in Sweden.

Comparing our findings with previous research in this area, most researchers have indeed observed a positive and significant price effect associated with index additions. Both Shleifer (1986) and Harris and Gurel (1986) for example, credit the buying activity of index funds, as well as other institutional investors, for the increase in stock prices. Even previous Scandinavian studies have noted positive effects, such as Bechmann (2002) who in his study of the Copenhagen Stock Exchange and the KFX index observed a 9% announcement day effect in one case.

Our results on the other hand are mildly negative, meaning that market agents actually seem to short sell the stock around and during the period after the addition date, contributing to downwardsprice pressure. One possible explanation (other than the hypotheses laid out above) is that the results are driven to a large extent by outliers in the data.

A way to control for outliers is to compare the median returns to the mean returns. When doing so, it would indeed appear as if the negative results are driven to some extent by a small number of extreme outliers, as illustrated in figures 4 and 5, which shows us the mean and median abnormal returns by index type and event day. Looking at the overseas indices for example, at event day t+7 the difference between mean and median abnormal return is almost 0.5% - at t+16 the difference is over 0.8%.

Figure 4
Mean and Median Cumulative Abnormal Returns for inclusions into the domestic *OMXS30* index

This figure shows the mean as well as the median cumulative abnormal returns for inclusions in the domestic index from two days before the event to twenty days past.

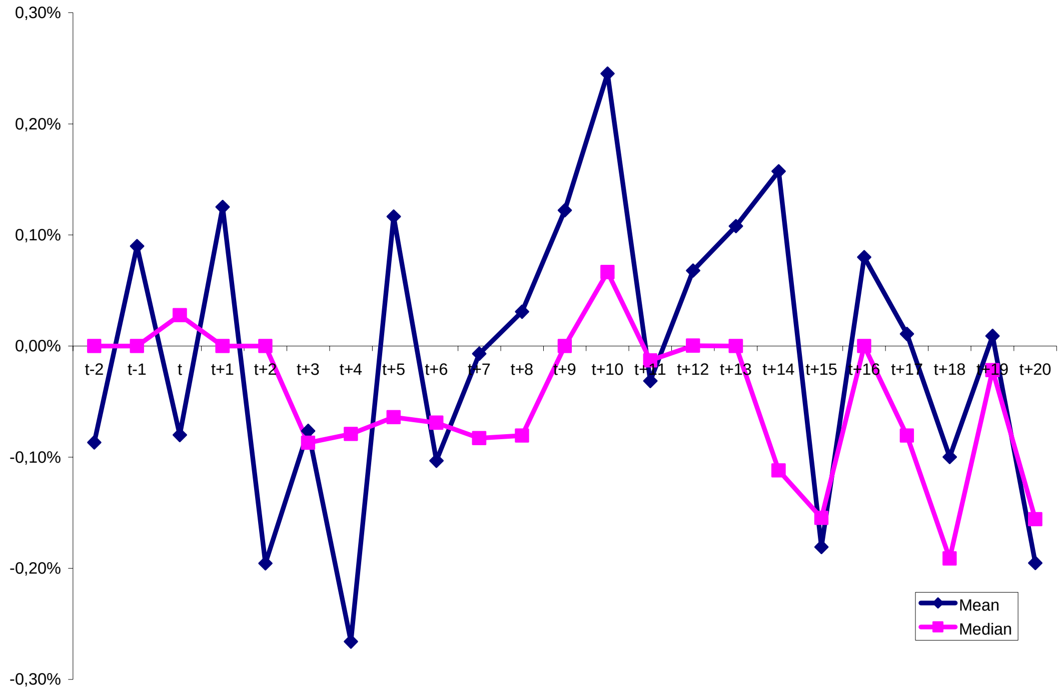
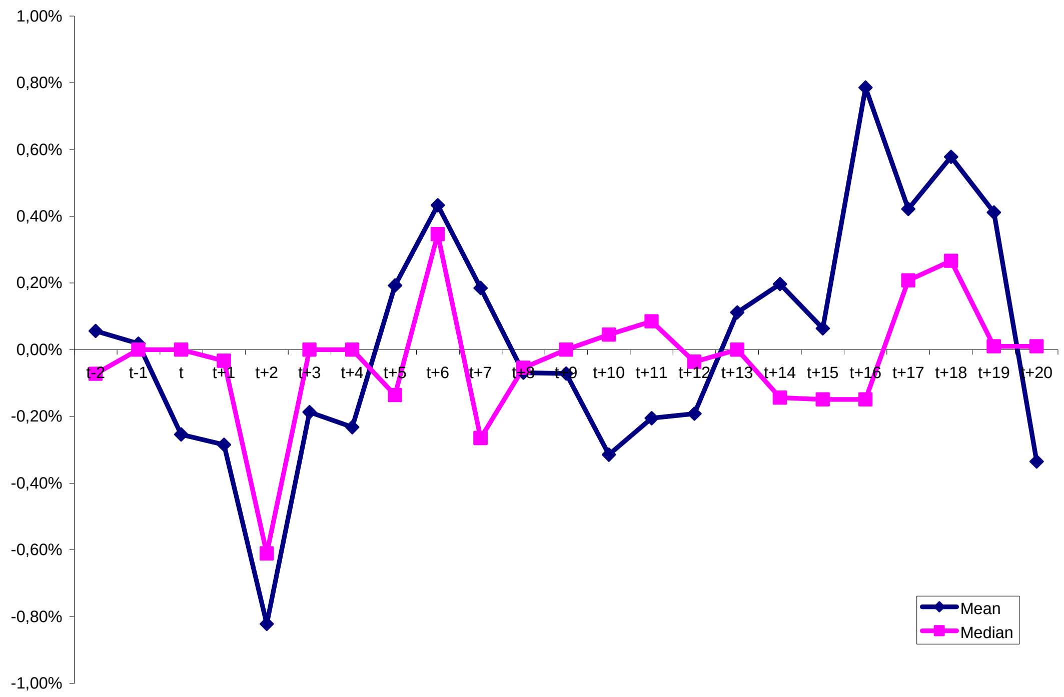


Figure 5
Mean and Median Cumulative Abnormal Returns for inclusions into the overseas indices

This figure shows the mean as well as the median cumulative abnormal returns for inclusions into the overseas indices from two days before the event to twenty days past.



Trying to put the above observation into perspective, we need to take some factors into consideration. One obvious factor to highlight at this point is the size of the sample: 129 data points for the *OMXS30* and 65 data points for the overseas indices (after 45 data points (*OMXS30*) and 25 data points (*overseas*) had been omitted for reasons stated above). It is clear that this could jeopardize the reliability, especially of the overseas sample – where we have also observed the strongest results.

Moreover, we believe that it is possible that the timing of the inclusions may further factor into the reliability of our results, as since 1990 reweighting of the OMXS30 is done only bi-annually – on January 2nd and July 2nd. January 2nd is a time of year when the financial markets are arguably in a bit of unrest. There is generally not much volume to speak of, save for mutual fund activity. Also, it is close to the beginning of the financial reporting season, causing 'noise' in the market. The situation in July is similarly a time when markets tend to be 'shallow' with little volume compared to other times of the year. One result of this timing issue could be that there is a great deal of noise in the trading that we have observed, providing us with less reliable results.

In order to test whether any of our above hypotheses are true, we will perform a multivariate analysis, to see whether the negative CARs can be explained by any of the factors discussed. Prior to running a multivariate analysis, attempting to link the cumulative abnormal returns observed in the event study with some explanatory factor, we will examine whether any patterns can be observed by examining descriptive data of the highest and lowest individual CARs. Table VII shows descriptive data of the 20 highest and 20 lowest CARs observed in the domestic sample, while Table VIII shows the same for the overseas sample (please see the Appendix).

7.3 Multivariate Analysis

Looking at the descriptive data in tables VII and VIII, we are able to make a couple of key observations:

1. The average Sharpe ratio of the 20 highest CARs in the domestic (overseas) samples are 0.2857 (0.1647), whereas the average Sharpe ratio for the 20 lowest CARs is 1.0804 (0.3060), thus providing some confirmation for our hypothesis of mean reversion
2. There appears to be no date pattern among the CAR observations, indicating that high/low CARs are not related to the month of index inclusion
3. Among the 20 highest CARs in the domestic sample, Sydkraft appears on 4 occasions of index inclusion, skewing the sample of highest CARs towards Energy companies. Other than that, there appears to be no Industry/Sector-related pattern
4. In the overseas sample, the average market value of the 20 lowest CARs is almost 4 times higher than the average market value of the 20 highest CARs. There is no such pattern in the domestic sample.

Based on the above observations, we formulate the following stylized facts regarding index inclusion on the Swedish stock market:

- Contrary to observations in other markets, index inclusions cause mildly negative, statistically insignificant ARs on the Stockholm Stock Exchange.

- The negative effect is more pronounced for inclusions in overseas indices (such as S&P+ or Eurostoxx600), where we indeed observe statistically significant CARs on day 4 of the event window
- The most pronounced negative CARs are experienced by firms who have experienced high returns per unit of risk (as measured by the Sharpe ratio) during the 6 months preceding index inclusion, independent of whether inclusion was into a domestic or overseas index
- The lowest CARs related to inclusion into a overseas index were companies with significantly higher market values than the sample mean (as well as high Sharpe ratios)

In order to verify the above observations and stylized facts, we test two regression models, for the domestic and overseas samples separately. In both models we use the cumulative abnormal return (CAR) as the dependent variable. As the control variable for the domestic model we use the Sharpe ratio, together with a dummy variable that takes the value 1 if the observation is post 1999, and 0 otherwise. This is to test for the impact of the Swedish pensions reform, and the appearance of index funds on the Swedish market shortly thereafter. For the overseas model, we use the Sharpe ratio, the natural logarithm of market value and a post-1993 dummy variable. This is to test for the effect of overseas trading, as overseas trading was not allowed on the Stockholm Stock Exchange prior to 1993. Furthermore we introduce a dummy variable for each of the overseas indices, to see whether the effect is more pronounced for e.g. Nordic 30 inclusions than Eurostoxx600 inclusions. Our models are thus

$$CAR_{domestic} = \alpha + \beta_1 S + \beta_2 D_{post-1999} + \varepsilon \qquad (18)$$

$$CAR_{foreign} = \alpha + \beta_1 S + \beta_2 LMV + \beta_3 D_{post-1993} + \beta_4 D_{Stoxx\,600} + \beta_5 D_{Nordic\,30} + \beta_6 D_{S\&P+} + \varepsilon \qquad (19)$$

As can be seen in table IX, there exists indeed a statistically significant (t-statistic exceeding the critical t-value of 1,97 for the domestic sample) negative relationship between cumulative abnormal returns on t=4, and the Sharpe ratio of the stocks during the 6 month-period preceding index inclusion, for the stocks in the domestic sample. We are thus able to reject H_0 for the Sharpe ratio variable in model 13. None of the other tested variables have a t-statistic above or below our critical t-value, and so we are unable to conclude neither any significant effect associated with observations post 1993, nor any impact of firm size on the CARs in the overseas sample, nor any significant difference between the different overseas indices in terms of magnitude of the CARs.

Table IX
OLS-Regression Results

This table reports the regression results for our models. The dependent variable for OLS is the cumulative abnormal return on t=4. Our control variables for the domestic sample (model 1) are Sharpe ratio and a dummy variable indicating whether inclusion occurred before 1999 or after. Our control variables for the overseas sample (model 2) are Sharpe ratio, firm size (approximated by the market capitalisation of equity, and dummy variables for post 1993 inclusion, EuroStoxx600, S&P+ and Nordic 30. To overcome problems with skewness firm size is transformed by the logarithm. (Values within parenthesis are t-statistics)

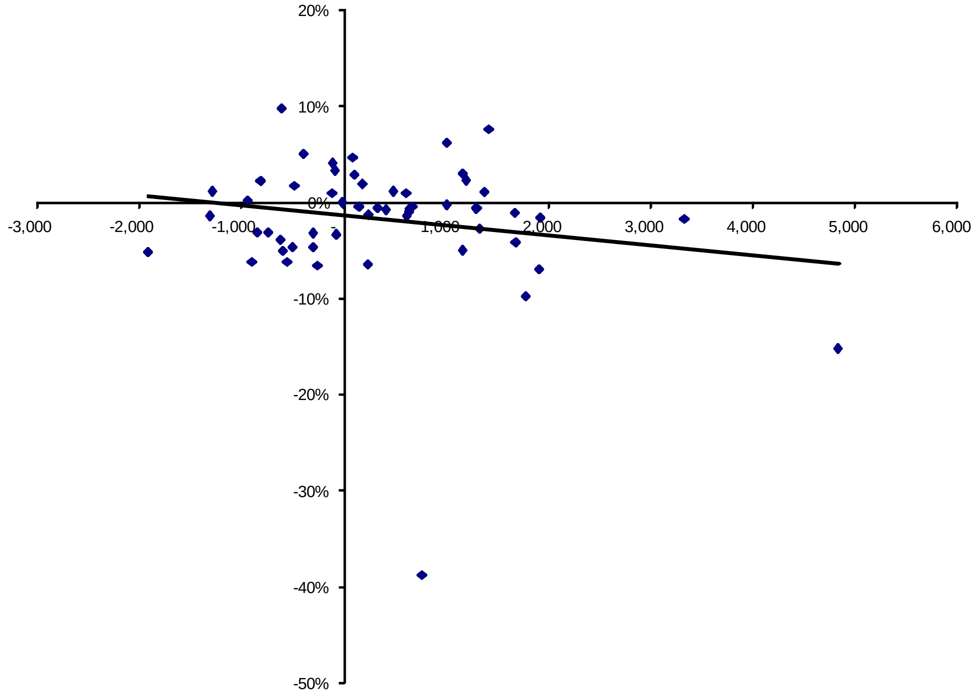
Model	(1)	(2)
Constant	0.007 (1,168)	0,016 (0,168)
Sharpe ratio	-0,011 (-3,202)	-0,008 (-0,937)
Firm Size		0.002 (0,178)
Post -1993/1999	-0,011 (-1,148)	-0,014 (-0,463)
Eurostoxx600		-0,040 (-1,142)
S&P+		-0,007 (-0,161)
Nordic 30		-0,046 (-1,000)
F-stat	6,667	0,713
R^2	0.100	0.079

The results confirm that our hypothesis of reversion is correct for the domestic data sample. We are thus able to formulate an important conclusion regarding *OMXS30* index inclusions on the Stockholm Stock Exchange: *the cumulative abnormal return of a stock on day 4 after index inclusion in the OMXS30 is negatively correlated with the return per unit of risk during the period 6 months prior to inclusion.* This is likely to be linked with the presence of momentum and over-reaction in international equity markets, which give rise to the phenomenon of stocks trending in the short- to medium term, followed by a period of price-reversal. The selection criteria for inclusion in the *OMXS30* (30 most traded stocks during the preceding 6 month period) is an indicator of high volumes or extreme trading activity associated with a certain stock, an activity which may imply that the stock has performed extremely well, or extremely bad – or in some cases just changed hands very often without significant valuation impact. In those cases where there has been a significant valuation impact (as measured by the Sharpe ratio), there is a significant negative relationship between this and the CAR on day 4 after the stock has been added to the *OMXS30*. In other words, index inclusion in the *OMXS30*, while perhaps not causing any abnormal returns in or by itself, may however be an indicator of an underlying cause: that the stock in question has reached the climax of a period of either excessively low or excessively high momentum returns, and is now bound for a period of reversion.

We are unable to link the negative CARs on day 4 in the overseas sample, with any of the explanatory variables tested. As can be seen in Figure 6 though, the average CAR on t=4 does seem to be driven to a large extent by a number of outliers.

Figure 6
Scatterplot

This figure shows the cumulative abnormal returns on t=4 against the Sharpe ration of the sample stocks during the 6 month-period preceding index inclusion, for the stocks in the overseas sample

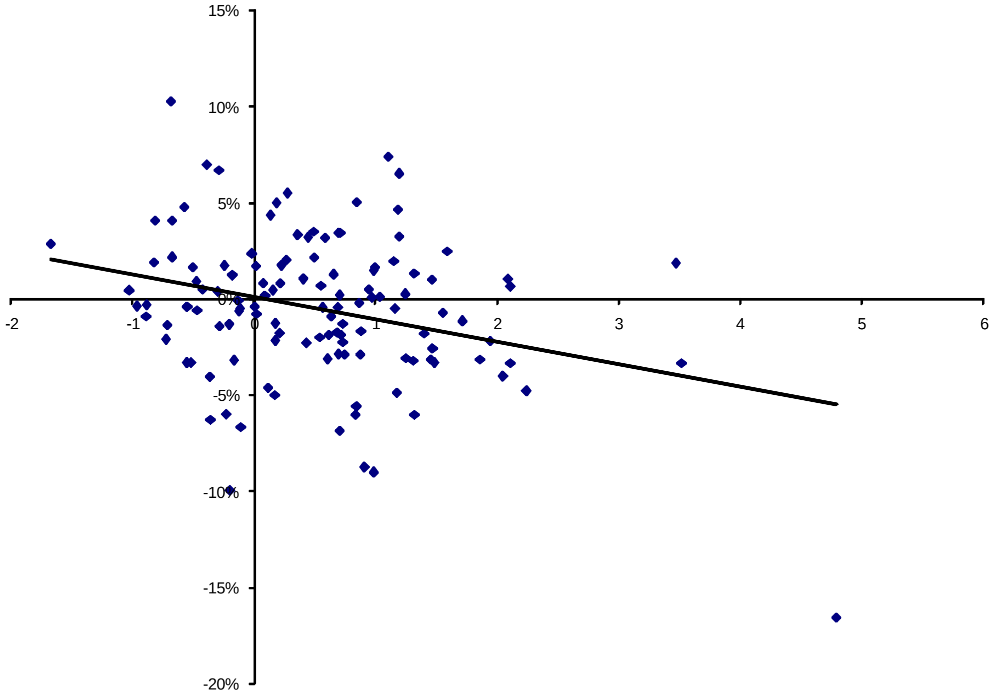


The most extreme outlier in the sample represents Holmen B, which noted a -38,8% CAR on t=4, after having been added to the index on 2001-03-19. The company had not outperformed the market significantly during the 6 months previous to inclusion, with a Sharpe ratio of merely 0,764. The extreme price reaction was caused by a profit warning released by Holmen on 2001-03-21, in advance of its quarterly earnings statement. Another extreme outlier is OM-Gruppen, the holding company that owns the Stockholm Stock Exchange, along with other Nordic exchanges. It was added to the OMXS30 index on 2000-03-20. During the preceding 6 months, the stock had gone up by about 390%, representing a Sharpe ratio of 4,84. The price rally was largely due to rumours and speculations that OM would launch a bid on the London Stock Exchange, which it also did during the subsequent year, in the fall of 2000. The sharp price drop in March 2000 coincided with the burst of the IT-bubble, and may also have been further fuelled by negative news about Jiway, an unsuccessful virtual European stock exchange launched by OM earlier in the late 90s. The project was eventually abandoned and cancelled in October 2002.

Figure 7 illustrates the relationship between cumulative abnormal returns on day 4 of the event window, and the Sharpe ratio of the stocks during the 6 month-period preceding index inclusion, for the stocks in the domestic sample.

Figure 7
Scatterplot

This figure shows the cumulative abnormal returns on t=4 against the Sharpe ration of the sample stocks during the 6 month-period preceding index inclusion, for the stocks in the OMXS30 sample



8. Conclusion

This study set out to examine the effects of index inclusions into the Swedish *OMXS30* index and a number of overseas indices. We wanted to investigate whether stock price effects in conjunction with index changes – in particular, the phenomenon of downward sloping demand curves – is present in Swedish data.

Having reviewed data from the *OMXS30*, the *FTSE Nordic 30*, the *Eurostoxx 600, the FTSE Eurotop 300* as well as the *S&P Euro+*, our results do not suggest the existence of downward sloping demand curves. On the contrary, we observe negative cumulative abnormal returns reaching a climax on day 4 after index inclusion, though only statistically significant for the overseas indices. This is a startling result, in complete contrast to the vast majority of research done in the area. We are able to formulate a number of stylized facts about the effects of index inclusions on the Stockholm Stock Exchange.

- Contrary to observations in other markets, index inclusions do not cause statistically significant higher trading volumes on or around the event day of index inclusions.
- Contrary to observations in other markets, index inclusions cause mildly negative, statistically insignificant ARs on the Stockholm Stock Exchange.
- The negative effect is more pronounced for inclusions in overseas indices (such as S&P+ or Eurostoxx600), where we indeed observe statistically significant CARs on day 4 of the event window. No statistically significant CARs are observed in the OMXS30 sample.
- There is a statistically significant relationship between firms who have experienced high returns per unit of risk (as measured by the Sharpe ratio) during the 6 months preceding index inclusion into the OMXS30.

As initially suggested in our market background section, the relative size of the index fund market in Sweden is only a fraction of that in the U.S, where the majority of previous research in the area has been performed. We believe this explains why the trade volumes associated with index fund portfolio rebalancing are too small to cause any volume or price effects. It furthermore appears as if other institutional investors do not rebalance their portfolios towards greater weight on *OMXS30* stocks following inclusions, to generate any statistically significant impact. Instead, it appears as if index inclusion may be a signal of an altogether different phenomenon, namely that the high trading volumes in the 6 months prior to index inclusion (the criteria for *OMXS30* inclusion) are an indicator that the stock in question may have reached the climax of a period of either excessively low or excessively high momentum returns, and is now bound for a period of reversion. It would be interesting to repeat this study after some time has passed, if the index fund market continues to grow in Sweden, to see whether the effect diminishes or even reverses over time.

Another part of the explanation may lie in the fact that the sample was fairly small. While not refuting the above observed relationship between *OMXS30* inclusion and mean reversion, the negative CARs for the overseas sample appear indeed to be driven by a small number of large outliers. Also, the timing of the index inclusions may be a contributing factor, happening at times when markets are 'noisy'.

8.1 Implications of our findings

Our findings have implications both for investors and for corporate finance. If *OMXS30* inclusion generally coincides with the climax of a period of momentum returns, followed by a subsequent price reversion, it may be possible to devise trading strategies that exploit this phenomenon. The trading strategy would need to include at least two decision criteria:

1) *OMXS30* inclusion
2) Sharpe ratio during the 6 months preceding index inclusion

The first criterion is a pre-requisite, whereas the second criterion determines whether to go long or short the stock. Further research would have to be conducted to determine how long the price reaction is sustained. Our event study showed that the cumulative average (negative) return reversed back to zero towards the end of the event window. However, the sample was a mix of negative and positive CARs, which means that we are unable to say anything about how sustained the price reactions were for these separately.

For corporate finance, there are similar implications. If inclusion in the *OMXS30* follows a period of excessive positive returns, it may be a signal that your stock is overvalued. This is generally a good time to finance investment projects with equity, to avoid more expensive cost of funds in a subsequent period of underperformance. If the opposite is true, it may be a good opportunity to buy back stock on the market, especially if there are no other investment alternatives with higher expected return.

6.2 Suggestions for further research

The topic of this study is one which has over the course of some 20 years received significant scholarly attention, albeit mainly in the US market. As this market is increasingly well understood there is a need to relate the phenomena observed there to other financial markets. Our evidence suggests that index inclusions do not need to be associated with positive abnormal and cumulative abnormal returns as a rule, but that it may depend on the institutional market structure in the geography of study, and the selection criteria for index inclusion. While previous researchers have studied index selection criteria and strived to ensure that index inclusion is a non-information event, containing no new information about the stock, our research suggests that it might nevertheless be associated with other, underlying behavioural finance phenomena, leading to market anomalies not necessarily caused by index inclusions *per se*, but nevertheless coinciding with them in time. Because of this, we believe the field of study should be extended further to other markets, so as to be able to nuance a conclusion about financial markets, which has almost become an accepted fact: that index inclusions cause positive abnormal returns via price pressure inflicted by index fund flows.

Our findings about the negative relationship between CARs on day 4 upon *OMXS30* inclusion and the Sharpe ratio observed during the 6 months prior inclusion are an indication of an altogether different, underlying phenomenon on the Swedish stock market: the presence of momentum. We therefore believe it would be worthwhile to replicate the study of De Bondt and Thaler (1985) as well as that of Jeegadesh and Titman (1993), to determine the exact nature and dynamics of momentum on the Stockholm Stock Exchange. For instance: for how long do stocks, which have performed well (badly) over a short- to medium term horizon, continue to perform well (badly)? What is the impact of price reversion after the initial period of momentum? For how long does the price reversion period continue?

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Appendices

Table I
Data Description

This table provides an overview of the stocks that comprise our sample. They are listed in the chronological order that they were included in the market indices.

Domestic			Overseas		
Share	Inclusion date	Index	Share	Inclusion date	Index
ALFA B	1987-01-02	OMX30	ASEA 'A'	1992-01-01	STOXX600
BILSPED B	1987-01-02	OMX30	CARDO	1992-01-01	STOXX600
INDUSTRI	1987-01-02	OMX30	ESSELTE AB 'A'	1992-01-01	STOXX600
SHB	1987-01-02	OMX30	INCENTIVE AB 'A'	1992-01-01	STOXX600
AGA B	1987-04-01	OMX30	NCC 'A'	1992-01-01	STOXX600
ASEA B	1987-04-01	OMX30	S.K.F. AB 'A'	1992-01-01	STOXX600
ASTRA	1987-04-01	OMX30	SHB 'B'	1992-01-01	STOXX600
VOLVO A	1987-04-01	OMX30	SVEDALA INDUSTRI	1992-01-01	STOXX600
SANDVIK B	1987-04-01	OMX30	SYDKRAFT 'A'	1992-01-01	STOXX600
SYDKRAFT C	1987-04-01	OMX30	ASEA AB 'A'	1992-01-01	NORDIC 30
AGA A	1987-07-01	OMX30	ABB A	1992-09-21	S&PEURO+
STORA	1987-07-01	OMX30	PROCORDIA AB 'A'	1992-09-21	NORDIC 30
LUNDBERG B	1987-07-01	OMX30	SYDKRAFT	1992-09-21	NORDIC 30
MODO B	1987-07-01	OMX30	INVESTOR AB 'B'	1994-12-01	STOXX600
MUNKSJÖ A	1987-07-01	OMX30	TRELLEBORG AB 'B'	1994-12-01	STOXX600
TRELLEBORG B	1987-07-01	OMX30	INVESTOR AB 'B'	1994-12-01	NORDIC 30
INDUSTRI	1987-07-01	OMX30	HOLMEN B	1995-03-20	S&PEURO+
ASEA B	1987-10-01	OMX30	SHB A	1995-03-20	S&PEURO+
ARITMOS	1987-10-01	OMX30	SEB A	1995-03-20	S&PEURO+
PROVENTUS B	1987-10-01	OMX30	NORDEA	1995-12-18	S&PEURO+
SANDVIK A	1987-10-01	OMX30	ASSI DOMAN	1996-09-04	STOXX600
SYDKRAFT C	1987-10-01	OMX30	AUTOLIV AB	1996-09-04	STOXX600
NORDBANK	1987-10-01	OMX30	AVESTA SHEFFIELD AB	1996-09-04	STOXX600
SCA B	1988-01-04	OMX30	HENNES & MAURITZ AB 'B'	1996-09-04	STOXX600
SAAB B	1988-01-04	OMX30	MO OCH DOMSJO AB 'B'	1996-09-04	STOXX600
ARCONA A	1988-01-04	OMX30	SECURITAS AB 'B'	1996-09-04	STOXX600
MUNKSJÖ A	1988-01-04	OMX30	SSAB SVENSKT STAL AB 'A'	1996-09-04	STOXX600
SKÅNE GR B	1988-01-04	OMX30	NORDBANKEN AB	1996-09-04	STOXX600
INDUSTRI	1988-01-04	OMX30	SPARBANKEN SVERIGE AB	1996-09-04	STOXX600
ASEA B	1988-04-05	OMX30	STADSHYPOTEK AB	1996-09-04	STOXX600
ASTRA B	1988-04-05	OMX30	SCANIA AB 'B'	1996-09-04	STOXX600
PHARMACIA B	1988-04-05	OMX30	HENNES & MAURITZ AB 'B'	1996-09-04	NORDIC 30
AGA B	1988-04-05	OMX30	NORDBANKEN AB	1996-09-04	NORDIC 30
AGA B	1988-04-05	OMX30	SPARBANKEN SVERIGE AB	1996-09-04	NORDIC 30
MARIEBERG A	1988-04-05	OMX30	SCANIA AB 'B'	1996-09-04	NORDIC 30
PROCORDIA A	1988-04-05	OMX30	ASSI DOMAN	1997-09-22	NORDIC 30
SCA B	1988-07-01	OMX30	SECURITAS AB 'B'	1997-09-22	NORDIC 30
ALFA B	1988-07-01	OMX30	SCANIA AB 'A'	1997-09-26	STOXX600
CARNEGIE A	1988-07-01	OMX30	EUROPOLITAN HLDGS	1998-09-21	STOXX600

CARNEGIE B	1988-07-01	OMX30
LUNDBERG B	1988-07-01	OMX30
SYDKRAFT A	1988-07-01	OMX30
PROVIDEN A	1988-07-01	OMX30
PKBANKEN	1988-07-01	OMX30
TRELLEBORG B	1988-10-03	OMX30
AVESTA	1988-10-03	OMX30
BILSPED B	1988-10-03	OMX30
ESSELTE B	1988-10-03	OMX30
MUNKSJÖ A	1988-10-03	OMX30
SANDVIK B	1988-10-03	OMX30
INDUSTRI A	1988-10-03	OMX30
NORDBANK	1988-10-03	OMX30
ASTRA B	1989-01-02	OMX30
PHARMACIA B	1989-01-02	OMX30
ALFA B	1989-01-02	OMX30
BGB	1989-01-02	OMX30
NOBEL	1989-01-02	OMX30
SANDVIK B	1989-01-02	OMX30
AGA A	1989-04-03	OMX30
SAAB B	1989-04-03	OMX30
STORA B	1989-04-03	OMX30
HENNES B	1989-04-03	OMX30
MARIEBERG A	1989-04-03	OMX30
INVESTOR A	1989-04-03	OMX30
ASEA B	1989-07-03	OMX30
ALFA B	1989-07-03	OMX30
BILSPED B	1989-07-03	OMX30
SKÅNE-GR B	1989-07-03	OMX30
SYDKRAFT A	1989-07-03	OMX30
SYDKRAFT C	1989-07-03	OMX30
AGA A	1989-09-25	OMX30
TRELLEBORG B	1989-09-25	OMX30
BGB	1989-09-25	OMX30
SANDVIK A	1989-09-25	OMX30
INVESTOR A	1989-09-25	OMX30
AGA B	1990-01-02	OMX30
ASEA B	1990-01-02	OMX30
PHARMACIA B	1990-01-02	OMX30
NOBEL	1990-01-02	OMX30
SANDVIK B	1990-01-02	OMX30
SSAB A	1990-01-02	OMX30
SYDKRAFT C	1990-01-02	OMX30
ASTRA A	1990-07-02	OMX30
ASTRA B	1990-07-02	OMX30
ARGONAUT B	1990-07-02	OMX30
BILSPED B	1990-07-02	OMX30
LUNDBERG B	1990-07-02	OMX30
SANDVIK A	1990-07-02	OMX30
INVESTOR A	1990-07-02	OMX30
GOTA A	1990-07-02	OMX30

AB		
SECURITAS B	1999-03-22	EUROTOP3 00
SCA B SHARES	1999-06-14	S&PEURO+
ASSA ABLOY	1999-06-21	STOXX600
ASSA ABLOY	1999-06-21	NORDIC 30
EUROPOLITAN	1999-12-20	EUROTOP3 00
NETCOM B	1999-12-20	EUROTOP3 00
INDUSTRIVARDEN AB	1999-12-20	STOXX600
SWEDISH MATCH CO	1999-12-20	STOXX600
NETCOM SYSTEMS AB	1999-12-20	STOXX600
NETCOM SYSTEMS AB	2000-01-31	NORDIC 30
OM GRUPPEN	2000-03-20	STOXX600
MODERN TIMES GR -B-	2000-03-20	STOXX600
FRAMTIDSFABRIKEN	2000-03-20	STOXX600
SANDVIK AB	2000-06-06	NORDIC 30
KINNEVIK INVESTMENT AB	2000-06-19	STOXX600
WM-DATA AB	2000-06-19	STOXX600
TELE1 EUROPE AB	2000-06-19	STOXX600
SWEDISH MATCH CO	2000-09-18	STOXX600
TELIA AB	2000-09-18	STOXX600
DROTT AB	2000-09-18	STOXX600
HOLMEN B	2001-03-19	STOXX600
WM-DATA	2001-03-19	STOXX600
SCANIA B	2001-06-18	STOXX600
ENIRO	2001-06-18	STOXX600
NOBEL BIOCARE	2001-09-24	STOXX600
SWEDISH MATCH	2002-09-23	NORDIC30
GETINGE AB	2002-12-23	STOXX600
SSAB A	2003-03-24	STOXX600
TELIASONERA AB	2003-06-16	NORDIC30
ALFALAVAL	2003-06-16	STOXX600
BILLERUD	2003-06-23	STOXX600
TRELLEBORG AB B	2003-09-22	STOXX600
KINNEVIK INVESTMENT	2003-12-17	STOXX600
OM HEX AB	2004-03-22	STOXX600
BOSTADS AB DROTT	2004-03-31	STOXX600
INV AB KINNEVIK B	2004-09-20	STOXX600
MTG B	2005-05-12	STOXX600
CASTELLUM	2005-06-20	STOXX600
FABEGE	2005-06-20	STOXX600
INVIK B	2005-08-26	STOXX600
LUNDIN PETROLEUM	2005-09-19	STOXX600
BOLIDEN	2006-03-20	STOXX600
HUSQVARNA B	2006-06-08	STOXX600
HEXAGON B	2006-09-18	STOXX600

ATLAS B	1991-01-02	OMX30
PROCORDIA B	1991-01-02	OMX30
PROCORDIA B	1991-01-02	OMX30
PROVENTUS B	1991-01-02	OMX30
SYDKRAFT C	1991-01-02	OMX30
TRYGGHANSA B	1991-01-02	OMX30
INVESTOR B	1991-07-01	OMX30
SCA B	1991-07-01	OMX30
STORA A	1991-07-01	OMX30
TRELLEBORG B	1991-07-01	OMX30
AGA B	1991-07-01	OMX30
LUNDBERG B	1991-07-01	OMX30
PROVIDEN A	1991-07-01	OMX30
PROCORDIA B	1992-01-02	OMX30
PROCORDIA B	1992-01-02	OMX30
SANDVIK A	1992-01-02	OMX30
SANDVIK B	1992-01-02	OMX30
ARGONAUT B	1992-01-02	OMX30
NOBEL B	1992-07-01	OMX30
HENNES B	1992-07-01	OMX30
INCENTIV B	1992-07-01	OMX30
AGA B	1993-01-04	OMX30
GAMBRO B	1993-01-04	OMX30
INVESTOR A	1993-01-04	OMX30
SEB A	1993-01-04	OMX30
SKANSKA B	1993-01-04	OMX30
SHB A	1993-01-04	OMX30
SYDKRAFT C	1993-01-04	OMX30
ESSELTE B	1993-01-04	OMX30
TRYGGHANSA B	1994-01-03	OMX30
CELSIUS B	1994-01-03	OMX30
AVESTA	1995-07-03	OMX30
MODO B	1995-07-03	OMX30
PHARMACIA A	1995-07-03	OMX30
AUTOLIV	1996-01-02	OMX30
SPARBANKEN A	1996-01-02	OMX30
KINNEVIK B	1996-01-02	OMX30
PHARMACIA UPJOHN	1996-07-01	OMX30
NOKIA-SDB	1997-07-01	OMX30
SCANIA B	1997-07-01	OMX30
AUTOLIV	1998-01-02	OMX30
NBH	1998-07-01	OMX30
AZN	1999-04-07	OMX30
ABB-TDBA	1999-06-16	OMX30
ABB-TDBB	1999-06-16	OMX30
ABB	1999-06-23	OMX30
NETCOM	1999-07-01	OMX30
SECU-B	2000-01-03	OMX30
WM-B	2000-01-03	OMX30
ICON-B	2000-01-03	OMX30
PHA	2000-04-04	OMX30
SAND	2000-05-11	OMX30
TLIA	2000-06-14	OMX30
FTID	2000-07-03	OMX30
ASSA-B	2001-01-02	OMX30

ENRO	2001-07-02	OMX30
EURO	2001-07-02	OMX30
ALFA	2003-01-02	OMX30
SWMA	2003-01-02	OMX30
DROT-B	2003-07-01	OMX30
WIHL	2004-10-14	OMX30
BOLIDEN	2006-07-03	OMX30
VOSTOK	2006-07-03	OMX30

Table VII
Description of the 20 highest and 20 lowest cumulative abnormal return observations in the domestic sample

This table presents descriptive data for the 20 highest and 20 lowest observed CARs in the domestic OMX sample. For each observation, we show the name of the company, the CAR observed during the event period, the date of index inclusion, the sector and market value of the company, and finally the Sharpe ratio of the company during the 6 months prior to indec inclusion. The Sharpe ratio is a standardized measure of over/underperformance relative to risk. We define the Sharpe ratio, using the simplified form defined by William Forsythe Sharpe prior to his 1994 revision, i.e:

$$S = \frac{E[R] - R_f}{\sigma}$$

As a proxy for the 6 month risk-free rate, we use 2,5 percent. The reason for choosing 2.5% as a proxy was due to poor availability of historical 6-month interest rate data. STIBOR 6 month rates and equivalent treasury rates do not go so far back in time as required, using the data sources we had available. Furthermore, 5% represents approximately the average annual interest rate observed during the sample period.

Highest CARs						Lowest CARs					
Name	CAR	Sharpe ratio	Date	Sector	Market value	Name	CAR	Sharpe ratio	Date	Sector	Market value
SYDKRAFT C fr	0.1030	-0.6832	1/4/1993	Energy	6641.39	ICON-B	-0.1654	4.7914	1/3/2000	Services	10920
ASEA B fr	0.0742	1.1069	1/2/1990	Industrial Manufacturing	15526.7	AUTOLIV	-0.0991	-0.1960	1/2/1996	Automotive and parts	9377.5
EURO	0.0700	-0.3854	7/2/2001	Telecoms	29256.5	SANDVIK A	-0.0897	0.9878	10/1/1987	Industrial machinery and equipment	11599.0
SYDKRAFT C	0.0672	-0.2863	1/2/1990	Energy	N/A	SAAB B fr	-0.0870	0.9095	4/3/1989	Aerospace and defense	17529.8
CARNEGIE A	0.0655	1.1955	7/1/1988	Financials	2522.52	BGB	-0.0680	0.7045	1/2/1989	Services	2044.75
SYDKRAFT A	0.0553	0.2788	7/3/1989	Energy	513.64	SKÅNE GR B	-0.0664	-0.1069	1/4/1988	Holding companies	200.77
MODO B	0.0504	0.8476	7/3/1995	Paper and Pulp Producers	5119.17	SWMA	-0.0627	-0.3564	1/2/2003	Tobacco	25130.9
PROCORDIA B	0.0503	0.1850	1/2/1992	Holding companies	10687.84	NOBEL B fr	-0.0601	1.3200	7/1/1992	Chemicals	6632.7
SAAB B fr	0.0495		1/4/1988	Aerospace and Defence	648	PROVIDEN A	-0.0598	0.8342	7/1/1991	Financials	3527.28
ARGONAUT B	0.0478	-0.5737	1/2/1992	Shipyards	3607.3	SAND	-0.0596	-0.2266	5/11/2000	Industrial machinery and equipment	50316.4
NORDBANK	0.0467	1.1852	10/1/1987	Financials	9420.0	PROVENTUS B	-0.0555	0.8429	10/1/1987	Financials	2083.0
INVESTOR A	0.0438	0.1380	7/2/1990	Financials	2619.54	INDUSTRI	-0.0499	0.1726	1/2/1987	Financials	4775.4
NOBEL	0.0412	-0.8119	1/2/1990	Chemicals	4912.45	ARITMOS	-0.0485	1.1787	10/1/1987	Consumer goods	2851.0
ASTRA B fr	0.0411	-0.6739	4/5/1988	Pharmaceuticals	2311.1	HENNES B fr	-0.0475	2.2403	7/1/1992	Consumer goods	3446.59
SYDKRAFT A	0.0354	0.4919	7/1/1988	Energy	11820.9	SHB	-0.0460	0.1171	1/2/1987	Financials	10968.4
AGA B fr	0.0348	0.6959	1/4/1993	Industrial Manufacturing	7283.48	SKANSKA B fr	-0.0402	-0.3604	1/4/1993	Constructions	11386.63
SECU-B	0.0346	0.7108	1/3/2000	Services	84454.75	ALFA B fr	-0.0398	2.0475	7/3/1989	Industrial Machinery and Equipment	166.5
AGA A	0.0336	0.3605	7/1/1987	Industrial Manufacturing	387.36	TRELLEBORG B	-0.0333	2.1100	7/1/1987	Industrial Manufacturing	4055.6
BILSPED B	0.0328	1.1980	10/3/1988	Transportation	2738.73	SYDKRAFT C	-0.0332	3.5169	10/1/1987	Energy	6203.4
ALFA B fr	0.0324	0.4481	1/2/1989	Industrial machinery and equipment	193.5	STORA B fr	-0.0329		4/3/1989	Paper and pulp producers	#N/A

Table VIII
Description of the 20 highest and 20 lowest cumulative abnormal return observations in the overseas sample

This table presents descriptive data for the 20 highest and 20 lowest observed CARs in the overseas sample. For each observation, we show the name of the company, the CAR observed during the event period, the date of index inclusion, the sector and market value of the company, and finally the Sharpe ratio of the company during the 6 months prior to indec inclusion. The Sharpe ratio is a standardized measure of over/underperformance relative to risk. We define the Sharpe ratio, using the simplified form defined by William Forsythe Sharpe prior to his 1994 revision, i.e:

$$S = \frac{E[R] - R_f}{\sigma}$$

As a proxy for the 6 month risk-free rate, we use 2,5 percent. The reason for choosing 2.5% as a proxy was due to poor availability of historical 6-month interest rate data. STIBOR 6 month rates and equivalent treasury rates do not go so far back in time as required, using the data sources we had available. Furthermore, 5% represents approximately the average annual interest rate observed during the sample period.

Highest CARs						Lowest CARs					
Name	CAR	Sharpe ratio	Date	Sector	Market value	Name	CAR	Sharpe ratio	Date	Sector	Market value
S.K.F. Ab 'A' Free	0.0982	-0.6061	1/1/1992	Industrial Manufacturing	507.15	Holmen B	-0.3883	0.7638	3/19/2001	Paper and pulp producers	242713.8
Europolitan	0.0766	1.4193	12/20/1999	Telecom	26898.7	Om Gruppen	-0.1521	4.8410	12/24/1999	Financials	#N/A
Ssab Svenskt Stal Ab 'A'	0.0623	1.0105	9/4/1996	Industrial Manufacturing	7898.04	Modern Times Gr -B-	-0.0975	1.7817	3/20/2000	Media	#N/A
Abb A	0.0504	-0.3925	9/21/1992	Industrial Manufacturing	7803.7	Trelleborg AB B	-0.0694	1.9125	9/22/2003	Industrial Manufacturing	8431.2
Getinge AB	0.0467	0.0868	12/23/2002	Healthcare	7119.1	Swedish Match Co	-0.0654	-0.2578	12/20/1999	Tobacco	#N/A
Teliasonera AB	0.0412	-0.1083	6/16/2003	Telecom	8476.7	Swedish Match Co	-0.0642	0.2376	9/18/2000	Tobacco	14915.0
Trelleborg Ab 'B'	0.0335	-0.0857	12/1/1994	Industrial Manufacturing	8342.4	Nobel Biocare	-0.0622	-0.5547	9/24/2001	Pharmaceuticals	46600.0
Assi Doman	0.0299	1.1641	9/22/1997	Paper and Pulp Producers	23089.0	Svenska Handelsbanken 'B'	-0.0615	-0.9002	1/1/1992	Financials	1307.67
Avesta Sheffield Ab	0.0293	0.1020	9/4/1996	Industrial Manufacturing	11139	Sydkraft(Sydsvenska Kraftiebolaget)	-0.0516	-1.9179	9/21/1992	Energy	24894.6
Sca - Svenska Cellulosa Ab - B Shares	0.0231	1.1965	6/14/1999	Paper and Pulp Producers	27380.2	Scania B	-0.0503	-0.5945	6/18/2001	Automotive and parts	14817.8
Seb A	0.0224	-0.8146	3/20/1995	Financials	14817.8	Securitas B	-0.0496	1.1660	3/22/1999	Services	47000.0
Kinnevik Investment Ab	0.0193	0.1834	6/19/2000	Media	#N/A	Billerud	-0.0466	-0.3007	6/23/2003	Paper and pulp producers	242713.8
Shb A	0.0171	-0.4826	3/20/1995	Financials	29442.4	Wm-Data	-0.0465	-0.4984	3/19/2001	Services	#N/A
Nordbanken Ab	0.0116	0.4875	9/4/1996	Financials	22682.5	Europolitan Hldgs Ab	-0.0416	1.6830	9/21/1998	Telecom	11236.0
Nordbanken Ab	0.0116	0.4875	9/4/1996	Financials	22682.5	Securitas Ab 'B'	-0.0392	-0.6190	9/22/1997	Services	#N/A
Asea Ab 'A' Free	0.0115	-1.2833	1/1/1992	Industrial Manufacturing	18588.85	Svedala Industri Free	-0.0333	-0.0736	1/1/1992	Industrial Manufacturing	293.36
Autoliv Ab	0.0110	1.3761	9/4/1996	Automotive and parts	#N/A	Holmen B	-0.0319	-0.2974	3/20/1995	Paper and pulp producers	10560.6
Investment Ab Kinnevik B	0.0098	-0.1164	9/20/2004	Media	4289.1	Sandvik AB	-0.0314	-0.7396	6/6/2000	Industrial machinery and equipment	30317.8
Om Hex Ab	0.0095	0.6109	3/22/2004	Financials	24685.9	WM-Data AB	-0.0310	-0.8426	6/19/2000	Services	52127.2
Esselte Ab 'A' Free	0.0018	-0.9412	1/1/1992	Office supplies	13.25	Stadshypotek Ab	-0.0271	1.3312	9/4/1996	Financials	28702.50

Appendix: Detailed account of interviews with Swedish fund managers

We conducted interviews with both

1. Managers of traditional discretionary funds
2. Managers of index funds.

The interviews of the former category were conducted with managers of some of the largest mutual funds, to determine what would cause them to re-weight their portfolios. The interview questions were open-ended initially, but the purpose was to figure out to what extent it would be common practice for managers of discretionary funds to increase their weights of stocks newly added to the OMXS30, following a rebalancing of the same index. Thus, while the proportion of "proper" index funds may be small in Sweden, compared to the total AUM of managed equity funds, there may be several funds that are allegedly managed according to a discretionary "style", which in reality behave in the same way as index tracker funds, thus giving rise to similar purchase patterns following index additions.

The issue is more contentious than it may seem at first glance, since fund managers have been said to attempt to increase revenues by rebalancing their portfolios more often than required, charging a transaction cost for each trade (also known as 'churning').[7] This even caused a regulation change, effected 1 July 1999, since which mutual funds must report each individual trade in their annual report, in order to increase client monitoring of "unnecessary" trades, along with a measure called TKA ("Totalkostnadsandel"), representing total costs (including taxes and transaction costs) to portfolio balance. Moreover, discretionary fund managers have an interest in maintaining the impression that they contribute value through superior asset managing abilities, so that they may be unwilling to reveal exactly how they form their portfolios and why. This reaction may be particularly pronounced due to recent debates in the media, where discretionary fund managers have been blamed for constructing portfolios almost identical in composition to major indices, in order to avoid underperforming their benchmarks. In essence, the media criticism amounted to an accusation of

[7] Dagens Industri, 2003.03.16

charging higher management fees than index funds, while constructing portfolios little different from these.[8] Confronted with the direct question if they pay any attention to changes in the composition of indices, most of the interviewees responded negatively however, further arguing that if they would, these trades would not coincide with the effective index inclusion dates, but rather form part of some clever arbitrage strategy (the exact structure of which they would not divulge). The extent to which discretionary fund managers bother about index inclusions was thus left unanswered, but we believe that there might be a certain effect, due to the seemingly passive management of some funds.

The purpose of interviewing index fund managers was twofold, to find out which date to use as the effective date for our study and secondly whether index fund managers are aware of any price impact caused when they rebalance their portfolios and whether they try to avoid this in any way. First, we needed to identify the day when the index producer announce that the firm will be included in the index – the announcement date. For the *OMXS30* the index provider OM Stockholmsbörsen AB reported only one such possible date, with announcement date and effective date both being the first trading day of January and July respectively. With this information in hand we asked several market participants which date they will react on and use to rebalance the composition in their funds. The evidence was somewhat mixed. The manager at EP said that they rebalanced their portfolio on the effective date, in one single block purchase. At SHB the managers of the different funds seemed to believe that this could drive prices, and they therefore break the purchase up in smaller trades, spread out over time. Furthermore, they were unwilling to provide information on the procedure used, arguing that it could cause people to profit from them were they to become known. Another stated reason was that they changed this procedure each time, in order to avoid creating a price pattern that other market participants could take advantage of. On the whole, no manager seemed to believe that index inclusion causes abnormal returns, mainly because of the limited size of the Swedish index fund market. This could seem a little surprising given that some of them previously claimed that they took caution not to drive prices when rebalancing their portfolios.

Finally – as we believe that the limited size and brief history of the Swedish index fund market may render the data sample too small and the results insignificant, we have chosen to also study effects

[8] Morningstar, 2003.03.12

associated with the inclusion of Swedish stocks in European indices. Since these are often denominated in local currency, index funds wishing to replicate their composition will have to purchase added stocks on their local exchanges. Hence, in addition to the *OMXS30*, we have chosen to study inclusions in four additional indices: the *S&P Euro+, FTSE Nordic 30, Eurostoxx 600* and the FTSE *EuroTop300*. These were chosen because they had the highest number of Swedish stocks added during our sample period, which means we could obtain a significant sample size.

Appendix: Detailed description of the indices used

OMXS30

The Nordic region's most widely used index, the *OMXS30*, consists of the 30 most traded stocks on the Stockholm Stock Exchange. The index is market weighted, hence every stock's share in the index is determined by the underlying company's market capitalization. Semi-annual revisions are used to update the stocks in the index. Stockholm Stock Exchange uses the following two rules to adjust the index:

- If a non-index stock is among the 15 most traded stocks during the measurement period, it will replace the index stock that has the lowest turnover.
- If an index stock is not among the 45 most traded stocks during the measurement period, it will be replaced by the non-index stock that has the highest turnover during that same measurement period.

The dates when the revisions come into effect are the first days of trading in January and June respectively.

EuroStoxx 600

The Dow Jones Stoxx 600, which was introduced on June 1998, is an index designed to provide a representation of large, mid and small capitalisation companies in Western Europe. As such it comprises Large, Mid and Small size indices of 200 components each. The basis for the weighting is the underlying company's market capitalisation but with a 20% weighting cap. The index is reviewed quarterly - March, June, September and December. The index universe is defined as all components of the Dow Jones Stoxx Total Market Index, which covers 95% of the market capitalisation of the major exchanges of 18 European countries. These components are then ranked by free float market capitalization to produce the Stoxx 600 selection list.

For the Stoxx Large 200 Index the largest 170 stocks on the selection list are selected as components. An additional 30 stocks are selected from the largest remaining current components of the Large 200 Index that are ranked between 171 and 230. If the number of stocks selected is still below 200, then the largest remaining stocks are selected until the component number reaches 200. The procedure to select the stocks for the Mid 200 and the Small 200 is similar.

FTSE Nordic 30

The FTSE Nordic 30 Index is designed to represent the performance of the Danish, Finnish, Norwegian and Swedish Stock exchanges. As index universe, it uses the FTSE All-World Index - Nordic region. The index is revised twice yearly, in April and October. In order to be eligible for inclusion, stocks must have a velocity of 40% or more (based on 6 months trading and defined as the total value of six months exchange turnover annualized and shown as a percentage of market capitalization).

To select the stocks for the index, all companies in the index universe are ranked by market capitalization. Index stocks which have fallen to position 41 or below will be removed, whereas non-index stocks which have risen to position 20 or above are added to the index. A 10% weighting cap is also applied.

Standard & Poor Euro Plus (S&P Euro+)

The S&P Euro+ Index is part of the S&P Europe 350 which is designed to provide exposure to the largest and most liquid stocks from 17 major European markets. The S&P Euro+ includes all Euro constituents plus those from other countries in mainland Europe (i.e. not the United Kingdom). Index additions are generally made only when a vacancy is created by an index deletion. Deletions can occur due to acquisitions, mergers and spin-offs or due to bankruptcies or suspension. Stocks are then added according to market size and liquidity, with a view to preserving regional, country, and sector representation in the index. Generally, a minimum float turnover of 30% (over 12 months) is required.

All share changes of 5% and over are done at the effective date, whereas share changes below that threshold are applied, respectively, in March, June, September and December.

FTSE Eurotop 300

The index (which as of September 29th 2004 is called FTSEuroFirst 300) was launched on July 25th 1997. It is designed to represent the performance of companies resident and incorporated in Europe. All constituents in the FTSE Developed Europe Index are eligible for inclusion in the FTSE Eurotop 300. Additions or deletions take place on the third Friday in March, June, September and December.