THE EFFECTS OF INDEX CONSTITUENT CHANGES TO BORSA ISTANBUL'S BIST 100 AND BIST 30 INDICES

RAMAZAN ASLAN

BOĞAZİÇİ UNIVERSITY

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DECLARATION OF ORIGINALITY

I, Ramazan Aslan, certify that

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Date 30.07.2019

ABSTRACT

The Effects of Index Constituent Changes

to Borsa Istanbul's BIST 100 and BIST 30 Indices

This thesis examines the quarterly index revisions of BIST 100 and BIST30 indices of Borsa Istanbul Stock Exchange and tries to capture the effects and implications of these events on the prices and the volumes of the revised stocks. The purpose of this study is to search the effects of being in the scope of BIST 100 or BIST 30 indices on the stock performance by using abnormal return and abnormal volume concepts with the event study method. It is examined for a total of 296 changes in BIST 100 index and a total of 96 changes in BIST 30 index for the period of 2009 through 2017. The results have shown that although both of the stocks that included to BIST 100 index and BIST 30 index have positive abnormal returns, the results are statistically insignificant. However, the stocks excluded from the indices have statistically significant negative abnormal returns. Nevertheless, the abnormal volumes exist with statistically significant results for both of the index composition change events.

ÖZET

BIST 100 ve BIST 30 Endeks Kapsamındaki Paylardaki Değişikliğin Hisse Senedi Performansı Üzerine Etkileri

Bu çalışmada, Borsa Istanbul tarafından gerçekleştirilen BIST Pay endeksleri dönemsel çalışmasının BIST 100 ve BIST 30 endekslerinde bulunan payların getiri ve işlem hacmi üzerinde etkisinin olup olmadığı olay çalışması yöntemi kullanılarak incelenmiştir. Endekse dahil edilme ve çıkarılmanın etkisini anormal getiri ve anormal hacim kavramları ele alınarak 2009 ve 2017 yılları arasında gerçekleşen BIST 100 endeksi için toplam 296, BIST 30 endeksi için ise toplam 96 adet endekse dahil edilme ve çıkarılma olayı incelenmiştir. Sonuç olarak, endekse dahil edilmenin olumlu anormal getirisi olmasına rağmen istatistiksel olarak anlamlı değildir. Fakat, endeksten çıkarılmanın olumsuz anormal getirisi her iki endeks için de istatistiksel olarak anlamlı çıkmaktadır. Hem BIST 100 endeksi hem de BIST 30 endeksi değişikliği nedeniyle anormal hacim etkisi eklenen ve çıkarılan hisse senetleri için bulunmuştur.

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CHAPTER 1

INTRODUCTION

An equity index that includes a set of stocks can be used as an investment instrument by investors due to its function as a benchmark to evaluate the performance of investors' portfolios. Hence the constituent change in indices gains more attention by the investors that are interested in the indices. The periodic constituent change of the indices is regulated by their stock exchange authorities based on a set of rules that could be open to the public or not, depending on the decision of the index owner. Borsa Istanbul publishes the ground rules for the equity indices, which includes a set of criteria of the index change. The change is mainly based on market cap, free float, and liquidity of the stocks.

The price and the volume of the stocks affected by the index change are investigated in research by fund managers and academics to find whether there is an index effect or not. Shleifer (1986) was one of the first researchers to report the index effect on the stocks in the S&P500 index. He finds a significant increase of 2.79 % in the price of the stocks after the announcement date of the inclusion in the index in the period between 1976 and 1983. In addition to this, Harris & Gurel (1986) have also conducted research on the SP500 index, and, like most other studies on the index effect, they have concluded that there is an abnormal return for the stocks included in the index.

Harris and Gurel argue that their findings support the price-pressure hypothesis, which posits that the increase in price is followed by decline, while Shiefler suggests that his results support the imperfect substitutes hypothesis, in which long-run demand for stocks slope down so that the increase in price is not

permanent. Harris and Gurel conclude that an immediate increase in price and volume on the first trading day after an addition to the index are indicators of a positive shift in demand even though there is no new information brought by the changes in index composition about the prospects of the stocks. It seems that price pressure and abnormal returns is necessary to induce passive investors to offer their shares, while the reverse in stock price after event lets them reestablish their position at a net profit.

It is argued that there is no information in case where the periodic index constituent changes for the stocks. Hence, it could be said that the changes in the index composition do not include any new information for the market players. Then it comes into question whether the results are consistent or not with the theories which explain the market conditions for the stocks in terms of information. If investors believe that there is no new information that signals something to the market, then the price of the stocks included in or excluded from the index list does not change. However, it is stated in the literature that there is an abnormal return. Therefore, the result of the index list change is not consistent with the Efficient Markets Hypothesis, which states that the prices of securities reflect all available information in the market. Therefore, the index effect studies have the opportunity to test the EMH for the excluded and the included stocks.

It is not only that the abnormal return of the stocks that are included in or excluded from an index change due to the index effect, but also the trading volume of the stocks changes at the event time and post-event periods according to the studies . For excluded stocks from an index, the trading volume exhibits a larger change than the normal volume of the stocks. The same result is also valid for the included

stocks. The explanation for the changes is that the investors follow the periodic index composition change and then they remove the excluded stocks from their portfolios and replace it with the stocks included in the index. It is also explained by the liquidity hypothesis.

This thesis examines the effects of the index changes in the BIST 100 and BIST 30 indices on the price and the trading volume of the stocks in the period of 2009 through 2017. Event study methodology with OLS-regression is used to statistically examine the findings using the Stata statistical software.

The rest of the paper is organized as follows. Section 2 provides a brief introduction to the theoretical background and then summarizes the literature of empirical works on index constituent changes, Section 3 explains the methodology of the study in detail, Section 4 describes the data set, Section 5 illustrates the empirical results and Section 6 concludes.

CHAPTER 2

LITERATURE REVIEW

Equity price changes upon an index inclusion or deletion announcement have attracted academic interest in recent decades. Obviously, such an announcement is not related to any financial fundamentals of that specific equity. Therefore, as Efficient Market Hypothesis proposes, if there is no real news for equity, its price behavior should not change. Those announcements create a laboratory for testing this hypothesis. Nevertheless, previous studies have revealed that both the inclusion and exclusion of a stock from the indices have some effect on price changes. Here, I make a clear review of the hypothesis and the empirical pieces of evidence.

2.1 Theoretical background

Former studies on whether additions and deletions from an index have a positive or negative effect on abnormal returns look at the issue from many different angles depend on various arguments that can be elaborated on the five different hypotheses against the efficient market hypothesis (Putte, 2016).

2.1.1 The Efficient market hypothesis

The efficient market model is the most recognized insight on the efficiency of the market and creates a basis for various other economic theories. It portrays the allocation of ownership of capital, the main function of capital markets. Basically, the efficient capital market model claims that financial markets embrace a piece of new information instantly and this can be observed in prices immediately. Fama (1970) mentions that ideally market prices can provide true signals for resource allocation and security prices fully reflect the whole available information at any time. Only

then we can call those markets are efficient.

There are three levels of market efficiency in the model; weak form, semi-strong form and strong form and those levels create a path for previous literature in proving efficiency hypothesis. Previous research regarding the weak form used historical return or price data as the data set. Those initial papers mostly covered Random Walk studies and focused on the fair game model as a more general form of an efficient market hypothesis. Before the sixties it was believed that current prices of securities reflect available information and based on Random Walk Model successive adjustments were assumed to be identically distributed. It was accepted that stock returns have no economic meaning.

However, Samuelson (1965) changed this belief by suggesting investing in stocks is a fair game. He argues that the independence of the returns is an aspect of a well-functioning market. Current prices reflect present expectations on future events and each new information changes prices as they change those expectations. Then researcher focuses on the speed of adjustment of security prices rather than historical returns. Real changes such as earning reports, new stock issues and annual report announcements are tested in this semi-strong form. Fama et al. (1969) tested stock splits the relationship between the stock price adjustment and the change in information of the stocks.

Strong forms of efficient market tests include both available information to the public and the unavailable information to the public as a factor affecting price changes. This approach serves more as a limiting case of theory. In this field, Scholes (1970) has shown that company officers have the advantage of accessing private information and also Niederhofer and Osborne (1996) found that brokers in

New York Stock Exchange have some monopolistic power to access some specific information and thus generate economic profit.

2.1.2 The Price pressure hypothesis

This hypothesis was suggested by Scholes (1972). It claims that the prices of the stocks included in (excluded from) an index increase (decrease) before the event date due to the fact that the demand for the stocks changes by institutions, stock traders and fund managers. It also states that after the effective date the index effect turns out to be normal. This situation also supports the Efficient Market Hypothesis due to the horizontal demand curve for the stocks subject to the index change. Harris and Gurel (1986) investigated the index effect on the prices of the stocks in the S&P500 index.

2.1.3 The imperfect substitution hypothesis

This hypothesis claims that there is a permanent change in the prices of the stocks, contrary to the Price Pressure Hypothesis. It explains that if the stocks are not in the same equity index then the stocks are not perfect substitutes anymore. The traders or the investors sell their stocks which are excluded from the index list and buy the substitute of the stocks that are included in the index list. Therefore, the increase in the price of the stocks is suggested to be permanent with the downward sloping demand curve for these stocks.

The imperfect substitution hypothesis was first examined by Schleifer (1986) in order to explain the effect on the prices of the stocks by examining the S&P500 index. He found that the cumulative abnormal returns of the stocks included in the index had continued to show the increase in the price of the stocks 10 days after the effective date of the index composition change. As stated in the study, the demand

for the stocks indicates that the demand curve for the stocks included in the index is a downward sloping demand curve.

2.1.4 The information hypothesis

The information hypothesis was also firstly suggested by Schleifer (1986). He claimed that the event examined, such as changes in the index composition, always includes some kind of information. His study is on the periodic constituent changes of the S&P500 index to find the abnormal return, if it exists, and the reason for that. He concluded that the inclusion or the exclusion of the stocks are determined by a set of rules and the data for the stocks. He continues to claim that this is the only reason for the measured abnormal price changes (Schleifer, 1986). Therefore, the main reason for changing the prices of the stocks and hence the abnormal returns of them is the information about the index composition change. Consequently, it would follow that this case is the reverse idea of the EMH and the markets tend to be not efficient.

2.1.5 The liquidity hypothesis

The Liquidity Hypothesis, which is described by Woolridge and Ghosh (1986), suggests that the change in the price of the stocks that are included in the index could be explained by the increased liquidity of the stocks for a short time due to the index effect. The hypothesis claims that since inclusion into the index increases liquidity, costs of transaction stocks decrease and then the increase in the trade volume of the stocks cause an increase in the price of the stocks. The opposite is examined in the case of the exclusion of the stocks from the index (Mazouz and Saadouni, 2007).

2.1.6 The attention hypothesis

The hypothesis was firstly mentioned by Merton (1987). He argues that the possible positive and negative effects of the media on the demand of the stocks by the analysts, investors, and traders . In his model, it could be seen that the stock prices are affected by the news about the company on the media. This could be explained by the reduction of the cost of trading due to the efforts spent to gather some information that are announced to the public.

One of the studies about this hypothesis was carried out by Polonchek and Krehbiel (1994). They examined the price effects of the inclusion and the exclusion of stocks from the Dow Jones indices. There were two different indices for that study namely, the DJIA and the DJTA indices. The periodic index composition reviews of those indices were announced on a media report which shows the details of the DJTA in the footnotes whereas on the front page for the DJIA index. The different presentation of the data to the public by the media created a difference in the results of the index effect study for the included and excluded stocks to those indices. For the stocks included in the DJIA, the cumulative abnormal return in the 10 days of the event window is 2.1%. However, for the stocks included in the DJTA, there was no cumulative abnormal return. In addition to the inclusions, there was no change in the price of the stocks that were excluded from the two indices. As a result, their study showed that the validity of the attention hypothesis in the index effect.

2.2 Empirical works on index constituent changes

In the literature, there are a limited number of studies handling the effects of inclusions in and exclusions from indices. Within the context of the literature review, some of the selected studies are examined in detail.

Harris & Gurel (1986) examined the effects of adding to the index. S&P 500 was studied in the period between the years 1977 and 1983. As a result, they were defined that prices of stocks increased by 3% after an addition announced, and this effect was reversed fully after 2 weeks.

Beneish & Gardner (1995) studied the effects of inclusions in and exclusions from the index. The Dow Jones Industrial Average (DJIA) index was studied in the period between the years 1929 and 1988. Their result was that the trading volume of the excluded stocks experiences a decrease after the event date. As a result of the index composition change, gathering information for the deleted stock is much harder than before; hence, they suggest that the trading costs of the stocks excluded from the DJIA could be higher. No such effects are found for added firms.

Lynch & Mendenhall (1997) analyzed the effects of composition changes in the index. S&P 500 index was examined in the period between the years1976 and 1988. As a result, they found that the abnormal returns and the abnormal volume of the stocks excluded from the index show significant changes mainly in the post-announcement period, but in directions opposite to those that included in the index. After the inclusions in and exclusions from the index of the S&P 500, the price of the stocks exhibits a reverse pattern. This situation shows that the existence of the price effect is temporary.

Nikkei 500 index was examined in the period between the years 1991 and 1999 in the study of Liu (2000). He examined the effects of addition and deletion in the index. As a result of the study, he concluded that inclusions in and exclusions from the Nikkei 500 index cause the price of the included stocks to increase and the price of the excluded stocks to decrease without significant reversals after the event date. He also states that the inclusions and exclusions cause the trade volume to increase significantly in the short run after the event window. However, the trading volume of the stocks decreases significantly for the stocks included and it increases for the stocks excluded in the long run.

Bildik and Gülay (2001) analyze the effects of addition and deletion in the indices. Istanbul Stock Exchange (ISE) 100 (IMKB 100) and ISE 30 (IMKB 30) indices were studied in the period between the years 1995 and 2000. As a result, they stated that the periodic index composition changes do matter for the participants in the market and the changes create a positive pressure on the return and the volume of the stocks included in the index and particularly for the stocks that are excluded from the indices in Borsa Istanbul (old name ISE).

Cooper and Woglom (2003) examined the effects of the addition and the deletion in the index. S&P 500 index was analyzed in the period between the years 1978 and 1998. The study showed that after a stock is included in the S&P500 index, the price of the stock exhibits an increase initially but then it changes its direction to the other way for the price of the stocks. That is because of the expected increase in the volatility of the stock price after the inclusion in the index. They also stated that the results from their study are consistent with the model by the help of the post-event reversal for the initial increase in the prices of the stocks.

Denis, McConnell, Ovtchinnikov & Yu (2003) studied the effects of adding to the index. S&P 500 index was examined in the period between the years 1987 and 1999. As a result of their index effect study, it was claimed that the inclusion and the exclusion in the S&P index are not an information-free events.

Gregoriou & Ioannidis (2003) analyzed the effects of the addition and the deletion in the indices for the FTSE 100 index. The index effect was examined in the period between the years 1984 and 2001 by the event study methodology. Consequently, it was found that the abnormal return and the abnormal trading volume of the included stocks increase positively and the excluded stocks decrease as consistently to the previous researches for FTSE 100.

Chen, Noronha, & Singal (2004) studied the effects of the addition and the deletion in the index. S&P 500 index was examined in the period between the years 1962 and 2000. They claimed that the increase in the price of the included stocks to the index is permanent, whereas, for the excluded stocks, the decline in the prices is not the same. They supported the Attention Hypothesis that the awareness of the investors causes the price of the stocks to be changed due to the effect of the S&P 500 index additions and deletions in the cumulative abnormal returns of the stocks.

In addition to this study, the index effect of the S&P 500 and Russell 2000 was studied for the years 1989-2002 and 1996 and 2002 by Chen, Noronha & Singal (2006). They found the result that the predictability of the changes in the index list before the announcement date of the periodic index constituents change causes many index fund investors to lose their profits of the asymmetric information due to the fact that the fund managers set their objective to minimize the tracking error of the index stocks.

Like the others, Dahya (2006) also questioned the effects of the addition and the deletion in the index of the FTSE 100 in the period between the years 1984 and 2003. They concur with other studies for the FTSE 100 in the matter of a permanent increase in the prices of the stocks included and excluded. However, they gave a different opinion about the index effect as a steady increase in the cumulative abnormal return followed after the announcement date, whereas the negative direction was shown for the excluded stocks.

Gowri Shankar & Miller (2006) examined the effects of the addition and the deletion in the index of S&P Smallcap 600 in the period between the years 1995 and 2002. As a result of their study, they found that the price of the stocks included in and excluded from the S&P 600 index increased and decreased significantly after the event date. The stocks that were recently included in the index exhibit a higher price change in a positive way due to the demand to the stock by investors, whereas the stocks excluded from the index experience a decrease in their price. The effect of the index on those stocks is much higher than the stocks change their position among the other S&P indices. The trading volume of the stocks is also examined by the authors and it shows an increasing trend after the day of the announcement. Consequently, the index effect on the price and the volume of the stocks is not permanent and it lasts 60 days after the announcement date in the case of the S&P Smallcap 600 index.

Mase (2007) depicted the effects of changes in the FTSE 100 index in the period between the years 1992 and 1999. He determined that the stocks included in the index have positive cumulative abnormal returns in the long period of the event window and the stocks excluded from the index have cumulative abnormal return but it is negatively valued. He also found evidence of the index effect on the stocks by

looking at the abnormal returns in a short period around the event time.

Bayraktar (2009) analyzed the effects of the addition and the deletion in the index of ISE 100 (IMKB 100) index in the period between the years 2000 and 2007. As a result, it was determined that the additions and the deletions in IMKB-100 made an important effect on the price of stocks but not to be statistically significant values.

Teke (2011) examined the effects of the periodic index change on the stock in the index of IMKB 30 index in the period between the years 2005 and 2011. He found that there is no index effect for those stocks by examining the announcement of the changes regarding the additions and the deletions in the index but the results did not make any significant effect on the price of stocks.

Cheung & Roca (2013) studied the addition and the deletion in the index of the Dow Jones Sustainability World Index in the period between the years 2002 and 2010. At the end of the study, they were suggested that the index effect on the prices of the stocks is on the way of the decline in their returns but with increasing the trading volume of the stocks. Interestingly, they carried out their studies by looking at the risks of the stocks. They found that there is no change in the systematic risk of the stocks but it is not the same for the idiosyncratic risk.

Mazgit (2013) examined the effects of the addition and the deletion in the index of Borsa Istanbul (BIST) Dividend 25 index in the period between the years 2011 and 2013. He found that the changes in the index regarding the inclusions and the exclusions did not make any important effect on the price performance of the stocks.

Chang, Hong & Liskovich (2014) studied the index effect of the Russell Indices in the period between the years 1996 and 2006. They argue that the index

change is made by the data of the market capitalization of the stocks that are subject to the index change as of the end of May. They explained the rules for the periodic index change for the Russell 2000 index. By explaining the characteristics of the indices, they showed that the stocks have abnormal returns due to the index effect at the event time and in the other event windows.

Putte (2016) analyzed the indexing effect of the FTSE in the period between 1984 and 2016. As a result, it was determined that the price of the stocks increases with 6.7% for the stocks included in the index and it decreases with 9.5% for the stocks excluded from the index on the pre-announcement date. However, the stocks included in the index become more popular and it helps to increase the trading volume of the stocks around the event date examined and lasts longer than the price increase not less than 30 days after the event date.

Fernandes & Mergulho (2016) examined the effects of the changes in the index of the FTSE 100 in the period between the years 1992 and 2010. They used the event study methodology to find the index effect on the price of the stocks and their trading volume. As a result, they showed that the anticipative trading of the stocks examined captures about 40% and 23% of the cumulative abnormal returns of the stocks included and excluded, respectively.

Yu, Fuller, & Freeman (2017) researched the addition and the deletion in the index of the Dow Jones Industrial index for the year 2013. As a result, it was concluded that the price-pressure hypothesis was supported with statistically significant results by the changes in the prices and the trading volume of the stocks included in the index and the stocks excluded from the index.

While considering the studies in the literature, it can be said that addition and deletion in the index are very important for the investors and the traders. However, taking into consideration that there is a limited number of studies in Turkey about the subject, it can be concluded that there is a need for new studies that analyze recent periods in Borsa Istanbul. Hence, it would be possible to analyze the recent situation in Borsa Istanbul in terms of inclusion in and exclusion from the indices.

CHAPTER 3

METHODOLOGY

The goal of this thesis is to analyze the effects of periodic index constituent changes on the return and volume of the stocks in BIST 100 and BIST 30 indices. To examine these effects, the event study methodology is used by the help of Stata for this research. In the following sections, the event study methodology is explained in detail, in addition to the concepts of abnormal return and abnormal volume.

3.1 Event study

According to MacKinlay (1997), an event study measures the impact of a specific event on a stock's return using historical return data. The event study method has a wide usage area. In the field of academic accounting and finance, the event study method can be applied by diversifying company-specific and general economic events. Some examples include merger acquisitions and profitability announcements, new borrowing instruments or issuance of shares and disclosure of macroeconomic variables such as foreign trade deficit. It has also been applied in other areas. In the field of legal and economic regulation, for example, the event study method is used to measure the impact of the regulatory framework on the firm value of the change of legal obligation (Campbell et al.,1997).

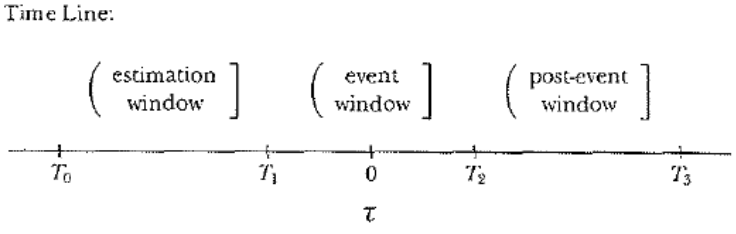

Figure 1. Event window time line (Campbell et al.,1997).

The event study method is used extensively in measuring market efficiency. This is because the most obvious evidence of market efficiency is provided by the event studies of daily returns. The benefit of the event studies is that it provides a framework for the rate at which prices are adjusted according to information. Because of the date of an event that would significantly affect prices is known, it would be pointless to try to determine abnormal daily returns from expected returns.

In the event that market activity is valid, an event with a known date will be considered by the investors before the event and since the market prices will vary to include the effect of the event as the event is approached, there will be no abnormal return on the days selected as the event window. In cases where there is no market activity, the use of this information will cause an abnormal return as the information is not fully and timely reflected in the prices.

In the literature of the event study, it can be seen that Fama et al. (1969) used the model in order to see the effects of events on the price. They used the event study methodology to examine the effect of corporate actions of stocks but then other fields of studies also have made. For example, it has been used to emphasize the effect of the announcement of the events such as index constituent changes, rule changes in finance, and other corporate actions cases (Jong and Goeij, 2012).

There are different versions of event study which mainly differ in calculating the abnormal returns. In this thesis, the abnormal returns at the specific event intervals are calculated by the event study methodology by using the market model which is a linear regression model of abnormal return on benchmark index returns. Hence the model takes into consideration the differences in the β with taking the log of returns.

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t} \quad (1)$$

$R_{i,t}$ is the normal return on stock i during period t.

α_i is the stock specific return component.

β_i is the sensitivity to the market index.

$R_{m,t}$ is the return of the market index

ε_{it} is the error term, assumed to be normal through time with mean zero and constant variance.

3.2 Abnormal returns

It is a perfect fit for the goal of examining the index effect due to the events' separation as announcement day and effective day. Since periodic index constituent changes should announce before the effective date, two event dates are used in this study as announcement dates and effective dates with AD and ED shortly and respectively.

The abnormal returns of the stocks in the index are the residual $\hat{\varepsilon_{it}}$, and it shows the abnormal return of stock i at event period t. We can also find the abnormal returns from the following model's prediction errors. The model uses the returns by taking the log of returns.

$$NR_{i,t} = \hat{\alpha}_i + \hat{\beta}_i R_{m,t} \quad (2)$$

Where $R_{i,t}$ is the logarithmic return for the stock i on day t measured by the percentage change in stock's log price on day t relative to the log price on day t-1,

and $R_{m,t}$ is the log return of market (for BIST-100 index and for BIST 30 index) on day t measured by the percentage change in BIST 100 index average value and in BIST 30 index average value, respectively.

Where $\hat{\alpha}_i$ and $\hat{\beta}_i$ are the OLS-estimates of the regression coefficients, and the $NR_{i,t}$ is the normal return that calculated by the log of returns and we can say also it is the benchmark return. The abnormal return $AR_{i,t}$ stock i at time t is calculated as follows:

$$AR_{i,t} = RR_{i,t} - NR_{i,t} \tag{3}$$

The regression is done by the data of the estimation window which is a period that includes the dates the 200 days preceding the event date in this study. As stated in the literature, the length of the estimation windows varies among other studies concerning the data and the characteristics of the related stock exchange.

After defining the estimation windows, the event windows have to be defined in order to calculate the abnormal returns for each stock i in the index constituent changes sample. An event window is a chosen time interval in which the event occurs. Both the effective date and the announcement date of the periodic index change are used as the event time as t=0 for our study.

Hence, in this study, event windows are crated by both announcement dates and the effective dates in separate analyses. Table 1 shows the event windows used in different cases to see the index effect.

After abnormal returns for each stock is calculated, they are averaged across the whole stocks in the index change sample, which gives us the Average Abnormal Return (AAR_t).

Table 1. Event Windows and Estimation Windows

Event Windows	Estimation Windows
AD-10 to AD-1	200 days before the Event Date
AD	200 days before the Event Date
AD+1	200 days before the Event Date
AD+1 to ED-1	200 days before the Event Date
ED	200 days before the Event Date
ED to ED+10	200 days before the Event Date
AD-10 to ED-1	200 days before the Event Date
AD to ED+10	200 days before the Event Date
AD-10 to ED+10	200 days before the Event Date
EVD+1	200 days before the Event Date

$$AAR_t = \sum_{i}^{N_t} \frac{AR_{i,t}}{N_{i,t}} \tag{4}$$

Where $AR_{i,t}$ is the abnormal return for the stock i on the trading day t and $N_{i,t}$ is the total number of stocks in the sample during the event day t.

In the event study methodology, the cumulative abnormal return is an important indicator of the index effect. The cumulative abnormal return (CAR) is the sum of the abnormal returns over the event window for each stock i. This is done by summing the abnormal returns for each day from the beginning of the event window, t_1, up to t_2 at the end of the event window by using the following equation:

$$CAR_t = AR_{i,t_1} + ... + AR_{i,t_2} = \sum_{t=t_1}^{t_2} AR_{i,t} \tag{5}$$

We can obtain the cumulative average abnormal return by averaging CARs over the total number of events as defined by the following equation:

$$CAAR = \frac{1}{N}\sum_{i=1}^{N} CAR_i \tag{6}$$

Another expression of that can be shown by aggregating the AAR_t's overtime:

$$CAAR = \sum_{t=t_1}^{t_2} AAR_t \tag{7}$$

3.3 Testing for significance

If addition to or deletion from an index creates an abnormal return, we can see that from the cumulative average abnormal returns. However, we need to test the significance of the cumulative abnormal returns. The CAAR is equal to zero in the null hypothesis. This means that inclusions in or exclusions from the index contain no information from the stocks affected. Moreover, the CAARs are positive (negative) for the index inclusions (exclusions) in the alternative hypothesis. The reason for the alternative hypothesis is linked to one of the hypotheses in the literature.

The testing for significance is done by the following test statistic (Jong and Goeij, 2012):

$$TS = \sqrt{N}\frac{CAAR}{S_{CAAR}} \approx N(0,1) \tag{8}$$

$$S_{CAAR} = \sqrt{\frac{1}{N-1}\sum_{i=1}^{N}(CAR_i - CAAR)^2} \tag{9}$$

3.4 Abnormal volume

Harris and Gurel (1986) were the pioneers of analyzing the volume effects of periodic

index constituent changes. They used the mean volume ratio (MVR) to examine the trading volume of S&P500 index stocks additions. MVR measures the trading volumes of stock i at time t relative to the benchmark market volumes. The formula of the mean volume ratio is as follows:

$$MVR_t = \frac{1}{N}\sum_{i=1}^{N} VR_{i,t} \tag{10}$$

where

$$VR_{i,t} = \frac{V_{i,t}}{V_{m,t}} . \frac{V_m}{V_i} \tag{11}$$

In the equation, MVR_t is the average volume ratio for day t and it represents the average of all volume ratios in the sample of the index change period. Moreover, $VR_{i,t}$ is the standardized ratio of trading volume at day t in the stock i, adjusted for the benchmark market volume ratio. If it is 1 then it means that no change in volume of stock i during the event window by comparing to the estimation window of 200 days.

$V_{i,t}$ is the trading volume of the stock i during the event window, and $V_{m,t}$ the trading volume of the benchmark index on day t during the event window. The other constituent V_i is the average of $V_{i,t}$ during the estimation window. Lastly, V_m is the average trading volume of the benchmark index during the estimation window.

$$V_i = \frac{1}{T}\sum_{s=t_1}^{t_2} V_{i,t} \tag{12}$$

$$V_m = \frac{1}{T} \sum_{s=t_1}^{t_2} V_{m,t} \tag{13}$$

where in both equations T is the total days of event windows.

To examine the effect of the index constituent change on the trading volume of the stocks, the ratios are calculated from estimation windows and event windows. As in the abnormal return calculations, the estimation window is 200 days before the event date at t = 0.

The estimation windows and the event windows in Table 1 are so chosen as to see the effects of periodic index constituent changes on the return and the volume of the stocks. The different types of event windows are taken into consideration to examine the effects with the help of the hypotheses in the literature review.

Pre-announcement period : It contains the data from AD-10 to AD-1 days. The periodic index change methodology is open to the public hence the study can also be made by the fund managers, stock analysts and even individual investors, therefore, the change in the price of the stocks could be anticipated before the Borsa Istanbul announces the changes in the indices.

Announcement day : It is investigated both for AD and AD+1 days. If there is an index effect on the stocks then we can see that from the abnormal returns of the stocks on the day of announcement or one business day later due to the fact that the trading session could be closed in the market on the announcement day.

Post-announcement period : It contains the days from AD to ED-1. Borsa Istanbul makes an announcement that states the effective date in which the stocks move to or remove from the indices.

Effective change day : In this case, the event window is on the effective date of the change, ED. The first day of the stocks takes part in their changed positions.

After the effective date period : This event window is from ED to ED+10 in order to see whether there is a change in demand for the stocks that changed in the indices by the fund managers, stock analysts, and individual investors.

Long Event Window until Effective Date : It contains the days from AD-10 to CD-1 to see the effect of index composition changes.

Long Event Window After Announcement Date : After the announcement date, the demand change in the stocks has examined in the event window from AD to CD+10.

Full Event Window : It contains the longest interval as from AD-10 to CD+10 to examine the total change in demand relative to the estimation window.

After Evaluation Date : This case is the first time examining the event window by this study. As explained in the rules of the index changes, the data used for periodic index change study is until the last day of the related quarter. Hence, at the evaluation date t, the index composition change can be calculated and hence the investors can take action after the opening of the market.

CHAPTER 4

DATA

The first step of obtaining the dataset is to find the announcement dates of the periodic index changes made by Borsa Istanbul. This information is gathered from the Public Disclosure Platform (KAP) for the period from December 2008 to September 2017. After finding the announcements, the stocks with the codes and the dates for the additions and the deletions from BIST100 and BIST 30 indices are listed. The next step is to find the historical prices and volumes for these stocks and the indices in order to calculate the return and volume ratios. The price used in this study is adjusted daily average prices for the stocks, which means that they are adjusted for the dividends and the rights issues.

An adjusted price is described as follows in the BIST Stock Indices Ground Rules; ”in case of corporate actions, previous close prices are adjusted by a factor obtained via the division of the theoretical price (calculated for the corporate action) by the close price”.

In this event study, the total number of stocks included in the BIST 100 index is 149 and 3 stocks are not part of the included stocks due to lack of data, and the total number of stocks excluded from BIST 100 index is 147 and 5 stocks not part of the excluded stocks due to the lack of data. The total number of stocks included in and excluded from BIST30 in the sample are equal to each other and 48 stocks. The data of the stocks and the indices are obtained from Borsa Istanbul datastore. Since the periodic constituent changes to the BIST Equity Indices are held for each quarter of a year, there are 36 different index composition change periods in this study for both BIST 100 and BIST 30 indices.

These data are gathered to examine the price and volume behaviors of included and excluded stocks for the different event windows in order to see the index effect on the stocks. This is done by taking into consideration the abnormal return and trade volume of the sample. The Stata statistical software package is used for this purpose. In Stata, three important dates are assigned for each stock, namely, announcement date, effective date, and evaluation date. Each of those are then analyzed for event windows.

4.1 The Rules for periodic index changes of Borsa Istanbul

The rules for periodic index changes of Borsa Istanbul are taken from the document of BIST Stock Indices Ground Rules from Borsa Istanbul web-page that explains the periodic index change procedure in depth. It can be seen in the appendix.

4.2 Descriptive statistics

This thesis examines the constituent changes of BIST 100 index and BIST 30 index from December 2008 to September 2017 with total number of 36 different quarterly index revision periods in which there has been a total of 296 changes for BIST 100 index (149 additions and 147 deletions) and a total of 96 changes for BIST 30 index (48 additions and 48 deletions). Figure 2 and Figure 3 show the total number of changes in BIST 100 index and BIST 30 index, respectively.

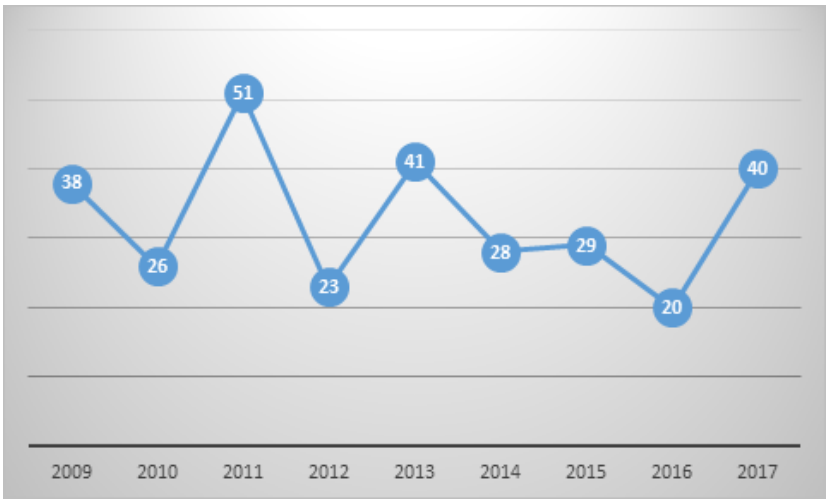

Figure 2. The total number of yearly constituent changes in BIST 100 index

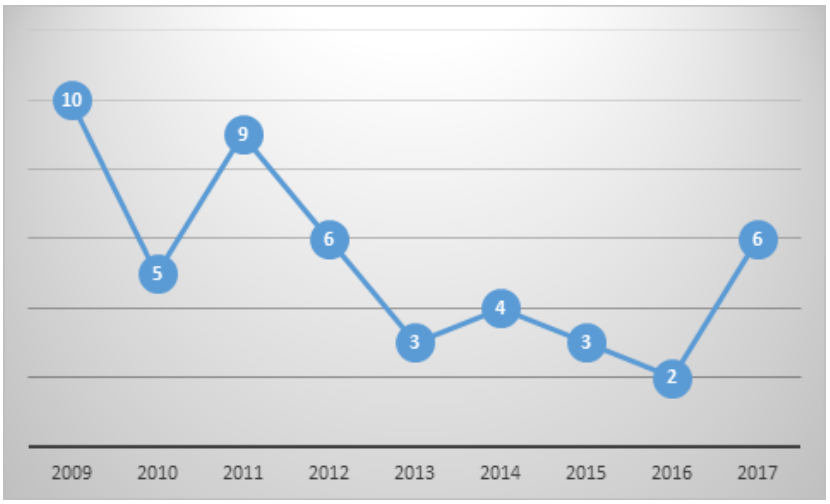

Figure 3. The total number of yearly constituent changes in BIST 30 index

In the scope of this study, there are 149 stock additions and 147 stock deletions for the BIST 100 index. In each quarterly period, the mean number of stock additions is 4.14 and the mean number of the stock deletions is 4.08. The number of days between announcement days and effective days shows the distribution of the number of trading days between them. The minimum number of days is 11 days and the maximum number of days is 24 days with a mean of 16.2 days. The announcement date, the effective date, the evaluation date, the periods and the number of the stocks included and excluded are deeply summarized in Table 2 for

BIST 100 index.

There are the number of 48 stocks additions and the number of 48 stocks deletions for the index of BIST 30. The mean number of stock addition and deletion is the same with 1.33 . The number of days between the announcement day and the effective day is the same with BIST 100 index statistics. The announcement date, the effective date, the evaluation date, the periods and the number of the stocks included and excluded are summarized in Table 3 for BIST 30 index.

Table 2. The Intervals of Index Revision for BIST 100 (2009 - 2017)

No	Announcement Date	Effective Date	Evaluation Date	Period	The Number of Included Stocks	The Number of Excluded Stocks	Difference between AD & ED
1	17.12.2008	1.1.2009	28.11.2008	2009/1	4	4	15
2	13.3.2009	1.4.2009	27.2.2009	2009/2	3	3	19
3	15.6.2009	1.7.2009	29.5.2009	2009/3	7	6	16
4	14.9.2009	1.10.2009	31.8.2009	2009/4	5	6	17
5	11.12.2009	4.1.2010	26.11.2009	2010/1	3	2	24
6	10.3.2010	1.4.2010	26.2.2010	2010/2	1	2	22
7	9.6.2010	1.7.2010	31.5.2010	2010/3	4	4	22
8	13.9.2010	1.10.2010	31.8.2010	2010/4	5	5	18
9	16.12.2010	3.1.2011	30.11.2010	2011/1	13	12	18
10	17.3.2011	1.4.2011	28.2.2011	2011/2	5	5	15
11	17.6.2011	1.7.2011	31.5.2011	2011/3	3	3	14
12	15.9.2011	3.10.2011	29.8.2011	2011/4	5	5	18
13	15.12.2011	2.1.2012	30.11.2011	2012/1	4	4	18
14	14.3.2012	2.4.2012	29.2.2012	2012/2	3	3	19
15	13.6.2012	2.7.2012	31.5.2012	2012/3	1	1	19
16	20.9.2012	1.10.2012	31.8.2012	2012/4	4	3	11
17	20.12.2012	2.1.2013	30.11.2012	2013/1	7	7	13
18	18.3.2013	1.4.2013	28.2.2013	2013/2	6	6	14
19	20.6.2013	1.7.2013	31.5.2013	2013/3	5	6	11
20	13.9.2013	1.10.2013	29.8.2013	2013/4	2	2	18
21	16.12.2013	2.1.2014	29.11.2013	2014/1	3	3	17
22	20.3.2014	1.4.2014	28.2.2014	2014/2	3	3	12
23	13.6.2014	1.7.2014	30.5.2014	2014/3	3	3	18
24	16.9.2014	1.10.2014	29.8.2014	2014/4	5	5	15
25	15.12.2014	2.1.2015	28.11.2014	2015/1	3	3	18
26	17.3.2015	1.4.2015	27.2.2015	2015/2	5	5	15
27	18.6.2015	1.7.2015	29.5.2015	2015/3	3	3	13
28	17.9.2015	1.10.2015	31.8.2015	2015/4	4	3	14
29	18.12.2015	4.1.2016	30.11.2015	2016/1	3	3	17
30	18.3.2016	1.4.2016	29.2.2016	2016/2	2	2	14
31	17.6.2016	1.7.2016	31.5.2016	2016/3	3	3	14
32	20.9.2016	3.10.2016	31.8.2016	2016/4	2	2	13
33	13.12.2016	2.1.2017	30.11.2016	2017/1	5	5	20
34	17.3.2017	3.4.2017	28.2.2017	2017/2	5	5	17
35	20.6.2017	3.7.2017	31.5.2017	2017/3	6	6	13
36	19.9.2017	2.10.2017	31.8.2017	2017/4	4	4	13
				Mean	4,14	4,08	16,22
				Median	4	3,5	16,5
				Sum	149	147	584

Table 3. The Intervals of Index Revision for BIST 100 (2009 - 2017)

No	Announcement Date	Effective Date	Evaluation Date	Period	The Number of Included Stocks	The Number of Excluded Stocks	Difference between AD & ED
1	17.12.2008	1.1.2009	28.11.2008	2009/1	4	4	15
2	13.3.2009	1.4.2009	27.2.2009	2009/2	2	2	19
3	15.6.2009	1.7.2009	29.5.2009	2009/3	3	3	16
4	14.9.2009	1.10.2009	31.8.2009	2009/4	1	1	17
5	11.12.2009	4.1.2010	26.11.2009	2010/1	1	1	24
6	10.3.2010	1.4.2010	26.2.2010	2010/2	2	2	22
7	9.6.2010	1.7.2010	31.5.2010	2010/3	1	1	22
8	13.9.2010	1.10.2010	31.8.2010	2010/4	1	1	18
9	16.12.2010	3.1.2011	30.11.2010	2011/1	2	2	18
10	17.3.2011	1.4.2011	28.2.2011	2011/2	2	2	15
11	17.6.2011	1.7.2011	31.5.2011	2011/3	3	3	14
12	15.9.2011	3.10.2011	29.8.2011	2011/4	2	2	18
13	15.12.2011	2.1.2012	30.11.2011	2012/1	3	3	18
14	14.3.2012	2.4.2012	29.2.2012	2012/2	1	1	19
15	13.6.2012	2.7.2012	31.5.2012	2012/3	2	2	19
16	20.9.2012	1.10.2012	31.8.2012	2012/4	0	0	11
17	20.12.2012	2.1.2013	30.11.2012	2013/1	1	1	13
18	18.3.2013	1.4.2013	28.2.2013	2013/2	1	1	14
19	20.6.2013	1.7.2013	31.5.2013	2013/3	0	0	11
20	13.9.2013	1.10.2013	29.8.2013	2013/4	1	1	18
21	16.12.2013	2.1.2014	29.11.2013	2014/1	2	2	17
22	20.3.2014	1.4.2014	28.2.2014	2014/2	0	0	12
23	13.6.2014	1.7.2014	30.5.2014	2014/3	0	0	18
24	16.9.2014	1.10.2014	29.8.2014	2014/4	2	2	15
25	15.12.2014	2.1.2015	28.11.2014	2015/1	1	1	18
26	17.3.2015	1.4.2015	27.2.2015	2015/2	1	1	15
27	18.6.2015	1.7.2015	29.5.2015	2015/3	0	0	13
28	17.9.2015	1.10.2015	31.8.2015	2015/4	1	1	14
29	18.12.2015	4.1.2016	30.11.2015	2016/1	1	1	17
30	18.3.2016	1.4.2016	29.2.2016	2016/2	0	0	14
31	17.6.2016	1.7.2016	31.5.2016	2016/3	0	0	14
32	20.9.2016	3.10.2016	31.8.2016	2016/4	1	1	13
33	13.12.2016	2.1.2017	30.11.2016	2017/1	1	1	20
34	17.3.2017	3.4.2017	28.2.2017	2017/2	1	1	17
35	20.6.2017	3.7.2017	31.5.2017	2017/3	1	1	13
36	19.9.2017	2.10.2017	31.8.2017	2017/4	3	3	13
				Mean	1,33	1,33	16,22
				Median	1	1	16,5
				Sum	48	48	584

CHAPTER 5

EMPIRICAL RESULTS

5.1 Price effects

5.1.1 Stocks in BIST 100 index

Descriptive statistics of the cumulative abnormal returns of the stocks included in BIST 100 index with different event windows are summarized below in Table 4.

Table 4. Descriptive Statistics of Cumulative Abnormal Returns for Stocks Included in the BIST100 Index

Inclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Mean	0.01171	-0.00135	0.00176	0.00075	0.00284	0.01320	-0.00902	0.01294	0.00431	-0.00384
Median	-0.00840	-0.00417	0.00007	-0.00757	0.00017	-0.00477	-0.01182	-0.01302	-0.00932	-0.00219
Std. Dev.	0.11717	0.02338	0.01936	0.09891	0.02451	0.18836	0.15787	0.20919	0.26229	0.03493
Minimum	-0.20711	-0.05500	-0.05062	-0.21462	-0.07654	-0.19498	-0.56510	-0.34477	-0.70036	-0.13926
Maximum	0.51164	0.10952	0.05490	0.50054	0.10802	1.87432	0.68261	1.75249	1.85777	0.12940
Sum	1.51063	-0.17533	0.22891	0.09499	0.35766	1.66314	-1.13675	1.63063	0.54301	-0.49577
Count	129	130	130	126	126	126	126	126	126	129

In Table 5, the descriptive statistics of the cumulative abnormal returns of the stocks excluded from BIST 100 index with different event windows are summarized.

Table 5. Descriptive Statistics of Cumulative Abnormal Returns for Stocks Excluded from BIST 100 Index

Exclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Mean	-0.01743	0.00108	-0.00378	0.00471	0.00100	0.00238	0.02597	0.00822	0.02908	-0.00034
Median	-0.01798	-0.00012	-0.00316	-0.00231	-0.00139	-0.00501	0.01238	0.00655	0.02853	0.00021
Std. Dev.	0.06952	0.02524	0.02892	0.07841	0.02168	0.06665	0.10777	0.10924	0.13178	0.02746
Minimum	-0.31603	-0.18975	-0.24184	-0.16373	-0.09952	-0.25804	-0.33380	-0.38076	-0.61564	-0.09025
Maximum	0.20895	0.08561	0.12939	0.64224	0.10252	0.20787	0.63919	0.59862	0.60027	0.12473
Sum	-2.40563	0.14982	-0.52511	0.64033	0.13533	0.32360	3.53206	1.11847	3.95464	-0.04672
Count	138	139	139	136	136	136	136	136	136	139

Figure 4 gives the mean cumulative abnormal return for stocks included to BIST 100 index between 2009 and 2017 years. The announcement date is 0. The CAR are obtained from the market model and estimated over the estimation period.

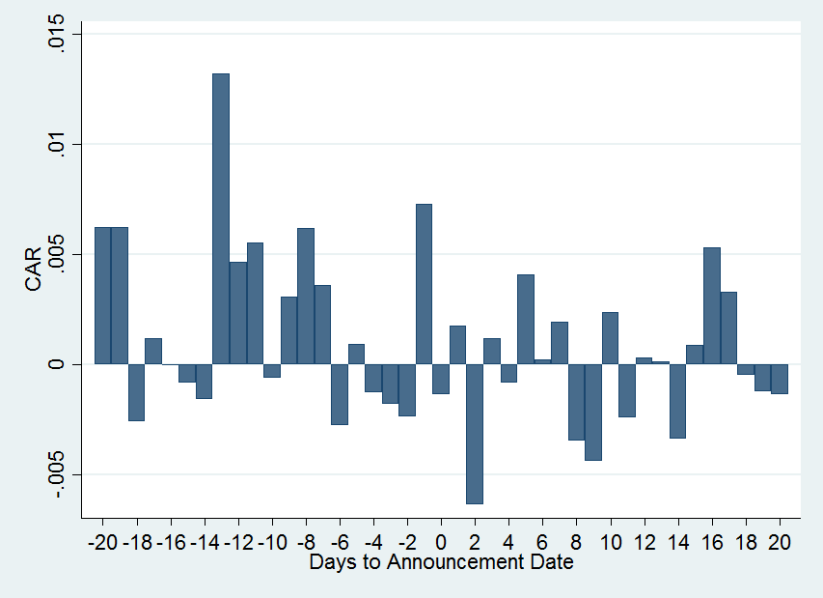

Figure 4. Cumulative abnormal returns around the announcement date of additions to BIST 100 index

The cumulative abnormal returns (CARs) of the included stocks to BIST 100 between 2009-2017 and t-test results with p-values of those are summarized in Table 6. As it can be seen from the results, the cumulative abnormal returns have relatively small values and t-statistics are not significant at conventional levels (p-values shown). Firstly, it could be important to see an abnormal return on the announcement date and effective date. It can be seen from Table 6 that the cumulative abnormal returns are 0.176% and 0.284% one day after the announcement date AD+1 and at the effective date ED, respectively.

Table 6. Cumulative Abnormal Returns for Stocks included in BIST 100 Index

Inclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	0.01171	-0.00135	0.00176	0.00075	0.00284	0.01320	-0.00902	0.01294	0.00431	-0.00384
t-stat	1.13	-0.64	1.03	0.09	1.3	0.78	-0.64	0.69	0.18	-1.24
p-value	0.26	0.52	0.304	0.932	0.198	0.435	0.524	0.49	0.855	0.215

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

After the effective date period, ED to ED+10, the CARs is 1.319% as the maximum value of the CARs among the different event windows for the included stocks. It can be said that there is a change in demand after the effective date. While looking at the CAR value of the evaluation date, it can be seen that there is a drop in the return by -0.384%.

Figure 5 gives the mean cumulative abnormal return for stocks excluded from BIST 100 index between 2009 and 2017 years. The announcement date is 0. The CAR are obtained from the market model and estimated over the estimation period.

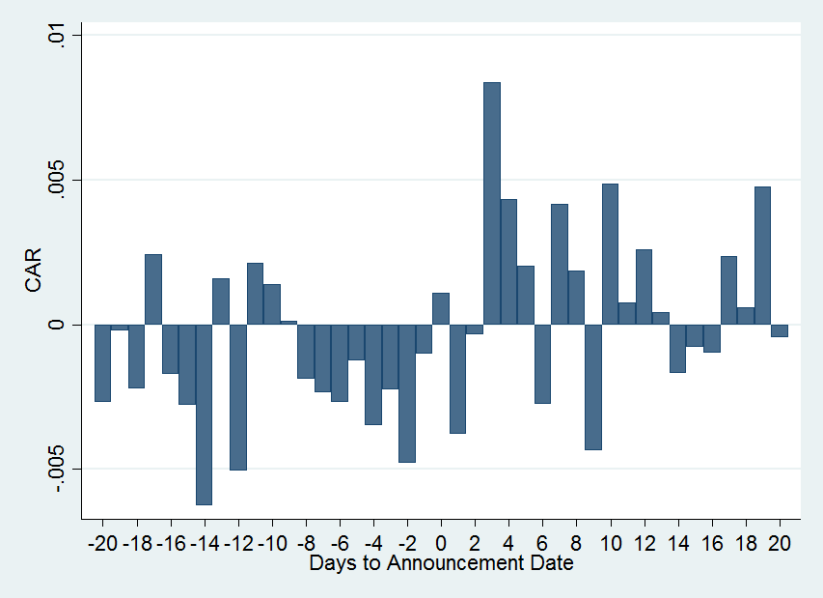

Figure 5. Cumulative abnormal returns around the announcement date of deletions from BIST 100 index

In Table 7, the results of CARs are summarized for the stocks excluded from BIST 100 index between the period 2009 and 2017. It can be concluded that there is a dramatic change in demand for the deleted stocks in the event window of AD-10 to AD-1 with the CAR value of -1.743% and it is the statistical significance among the event windows. This could be the result of EVD+1 event window due to the anticipated trading.

The other important event window is the AD-10 to ED-1. The CAR is 2.597% with a p-value 0.006. The abnormal return in a positive way for the excluded stocks until the effective date could be a signal of the speculative tradings. The rest of the event windows are against the idea of the hypothesis due to positive returns for the deleted stocks but with insignificant statistics values.

Table 7. Cumulative Abnormal Returns for the Stocks Excluded from BIST 100 Index

Exclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.01743***	0.00108	-0.00378	0.00471	0.00100	0.00238	0.02597***	0.00822	0.02908**	-0.00034
t-stat	-2.94	0.5	-1.53	0.7	0.53	0.41	2.8	0.87	2.56	-0.14
p-value	0.004	0.616	0.127	0.487	0.595	0.679	0.006	0.383	0.011	0.886

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

The mean of the cumulative abnormal returns is positive for the included stocks to BIST 100 index whereas it is negative for the excluded stocks from BIST 100 index with 0.176% and -0.377% abnormal returns, respectively. In addition to these, the returns for both additions and deletions for BIST 100 index (1.171% and -1.743%) change in a positive (negative) direction for additions (deletions) on the pre-announcement days, AD-10 to AD-1.

So far, the period 2009-2017 has been examined in order to see the index effect. It could be easy to see the effect, if it exists, by dividing the sample into the sub-periods which are 2009-2012 and 2013-2017 for both the stocks included in and excluded from BIST 100 index.

In the sub-period analysis for the included stocks to BIST 100 in Table 8, most of the event windows have positive CARs for the years between 2009-2012. In AD-10 to ED+10 event window, the CARs value of 4.000% is a highly bigger value compared to the full period but t-statistics and p-values are insignificant at 5% level.

Table 8. The Stocks included in BIST100 in between 2009-2012

Additions 2009-2012	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	0.00810	0.00084	0.00159	0.01132	0.00184	-0.00002	0.01403	0.03853	0.04000	-0.00110
t-stat	0.54	0.34	0.67	0.91	0.64	0.9	0.66	1.28	1.08	-0.22
p-value	0.591	0.734	0.503	0.366	0.527	0.373	0.51	0.203	0.284	0.83

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

In the 2013-2017 sub-period for the included stocks in Table 9, it is consistently realized that in the event window of AD-10 to AD-1, the CAR value is 1.984% but the p-value is 0.129. In the AD-10 to ED-1 event window, the p-value is less than 0.05 with the CAR value of -3.734% before the effective date. On the effective date, it has the CAR value of 0.417% with insignificant t-statistics. In addition to these, the similar results with the full period of 2009-2017 for the included stocks to BIST 100 can be seen in the event windows of AD-10 to AD-1, AD+1, and ED. On those days, the cumulative abnormal returns are greater than 0 for the included stocks but the t-statistics are insignificant.

Table 9. The Stocks included in BIST100 in between 2013-2017

Additions 2013/2017	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	0.01984	-0.00406	0.00162	-0.01212	0.00417	-0.00218	-0.03734**	-0.01787	-0.03972*	-0.00709*
t-stat	1.54	-1.17	0.67	-1.06	1.26	-0.16	-2.24	-0.96	-1.65	-1.77
p-value	0.129	0.246	0.508	0.292	0.214	0.871	0.029	0.341	0.105	0.083

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

For the stocks excluded from BIST 100, the CARs values, t-statistics, and p-values are summarized in Table 10 for the years between 2009-2012. The pre-announcement period shows that the CAR value is -2.222% with statistically significant values. However, in the event windows of AD-10 to ED-1 and AD-10 to ED+10, the returns show an increase for the deleted stocks and it is statistically significant with the CARs values 4.124% and 5.107%, respectively.

Table 10. The Stocks Excluded from BIST100 in between 2009-2012

Deletions 2009/2012	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.02222	0.00351*	0.00076	0.00743	0.00081	0.00789	0.04124***	0.01914	0.05107***	0.00260
t-stat	-2.6	1.65	0.32	0.7	0.29	1.09	3.57	1.47	3.65	0.73
p-value	0.011	0.102	0.751	0.483	0.775	0.278	0.001	0.144	0.001	0.466

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

In Table 11, it can be seen that the effect of index composition change on the stock prices is reflected in the event windows of AD+1, and EVD+1 with the CAR values of -0.280% and -0.547% with significant t-statistics, respectively for the years between 2013-2017. There are similar results with the full period of 2009-2017 for the excluded stocks from BIST 100 in the event windows of AD-10 to AD-1, AD+1, and EVD+1. On those days, the CARs are negative for the deleted stocks.

Table 11. The Stocks Excluded from BIST 100 in between 2013-2017

Deletions 2013/2017	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.00775	-0.00281	-0.01051**	0.00112	0.00060	-0.00649	0.00460	-0.00794	-0.00145	-0.00548***
t-stat	-1.08	-0.68	-2.22	0.16	0.23	-0.7	0.31	-0.6	-0.08	-2.76
p-value	0.284	0.502	0.03	0.871	0.817	0.489	0.758	0.552	0.938	0.008

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

In the analysis of these event windows, there is a change in the demand for the stocks usually before the announcement date and effective date. This could be explained by the help of the demand of the investors and traders in the news of the stocks which are related to the index composition changes. For the included stocks, the effect continues after the effective date but for the excluded stocks, the important effect of the index revisions is until the event date then it starts to decline.

As it is explained by the previous section , the methodology of the periodic index constitutes change is open publicly and hence all institutions, traders, and investors can reach the rules of the selection criteria and can duplicate the study of the officials. The results could be evaluated by this perspective due to the abnormal returns before the announcement date and effective date.

It can be divided into two separate investigations of the index effect as for the included stocks to the index and for the excluded stocks from the index since the effect of index change on the stock prices is more obvious than the others with statistically significant results.

5.1.2 Stocks in BIST 30 index

The effect of the periodic index constituent changes on the stocks price and volume could be seen more clearly for the stocks related with BIST 30 index due to the fact that BIST 30 is the blue-chip index of Borsa Istanbul that contains the companies traded on the BIST Stars and the BIST Main markets. Hence, the demand of the institutions and investors for the index is much higher than the demand for BIST 100 index.

In Table 12, the descriptive statistics of the cumulative abnormal returns of the stocks included in BIST 30 index with different event windows are summarized in detail.

Table 12. Descriptive Statistics of Cumulative Abnormal Returns for Stocks Included in BIST 30 Index

Inclusions	A-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Mean	-0.01217	0.00195	0.00410	-0.00289	0.00073	-0.02217	-0.01582	-0.02694	-0.03745	0.00604
Median	-0.01048	-0.00177	0.00067	-0.01505	-0.00242	-0.02075	-0.00982	-0.02343	-0.01370	0.00710
Std. Dev.	0.10172	0.02533	0.02109	0.07941	0.01909	0.06070	0.13029	0.11483	0.14526	0.02297
Minimum	-0.22897	-0.03513	-0.05163	-0.21502	-0.03289	-0.14162	-0.53819	-0.34189	-0.60004	-0.07780
Maximum	0.36247	0.10748	0.07626	0.20558	0.03833	0.12055	0.33490	0.23476	0.23812	0.04272
Sum	-0.52331	0.08364	0.17649	-0.11269	0.02858	-0.86468	-0.61698	-1.05060	-1.46042	0.25959
Count	43	43	43	39	39	39	39	39	39	43

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

Table 13. Descriptive Statistics of Cumulative Abnormal Returns for Stocks Excluded from BIST 30 Index

Exclusions	A-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Mean	-0.04070	-0.00734	-0.01047	-0.00658	-0.00259	0.00616	0.00227	-0.00916	0.00834	0.01115
Median	-0.02397	-0.00259	-0.00809	0.00226	0.00129	0.01223	0.00315	0.00761	0.02143	0.00272
Std. Dev.	0.09772	0.03084	0.03786	0.08091	0.02292	0.07805	0.12676	0.12551	0.16939	0.03590
Minimum	-0.32821	-0.18975	-0.24184	-0.38797	-0.09952	-0.28378	-0.41185	-0.48275	-0.61564	-0.04131
Maximum	0.11804	0.02478	0.03776	0.12612	0.03801	0.14645	0.26140	0.21488	0.33912	0.14853
Sum	-1.79082	-0.33787	-0.48147	-0.27649	-0.10865	0.25874	0.09525	-0.38484	0.35034	0.49046
Count	44	46	46	42	42	42	42	42	42	44

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

In Table 13, the descriptive statistics of the CARs of the stocks excluded from BIST 30 index with different event windows are summarized in detail. In addition, Figure 6 gives the mean cumulative abnormal return for stocks included to BIST 30 index between 2009 and 2017 years. The announcement date is 0. The CAR are obtained from the market model and estimated over the estimation period.

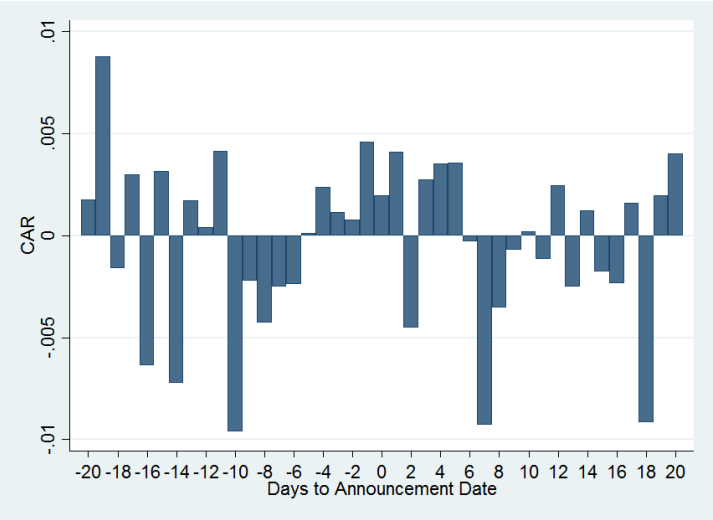

Figure 6. Cumulative abnormal returns around the announcement date of additions to BIST 30 index

The summary of the cumulative abnormal returns of the stocks included in BIST 30 index with t-test and p-values results are shown in Table 14 with the event windows used for the years between 2009 and 2017. The results indicate that the cumulative abnormal returns are relatively small with insignificant t-statistics and p values. On the day of the announcement, the CAR value is 0.194% and after one business day from the announcement date, it rises to 0.410%. However, on the effective day, it also has positive abnormal return, despite being with a declining percentage relative to the other days with the CAR value of 0.073%.

Figure 7 gives the mean cumulative abnormal return for stocks excluded from BIST 30 index between 2009 and 2017 years. The announcement date is 0. The CAR

are obtained from the market model and estimated over the estimation period.

Table 14. Cumulative Abnormal Returns for the Stocks included in BIST 30 Index

Inclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.01217	0.00195	0.00410	-0.00289	0.00073	-0.02217**	-0.01582	-0.02694	-0.03745	0.00604*
t-stat	-0.78	0.5	1.26	-0.22	0.24	-2.25	-0.75	-1.45	-1.59	1.7
p-value	0.442	0.621	0.214	0.824	0.814	0.03	0.459	0.156	0.12	0.096

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

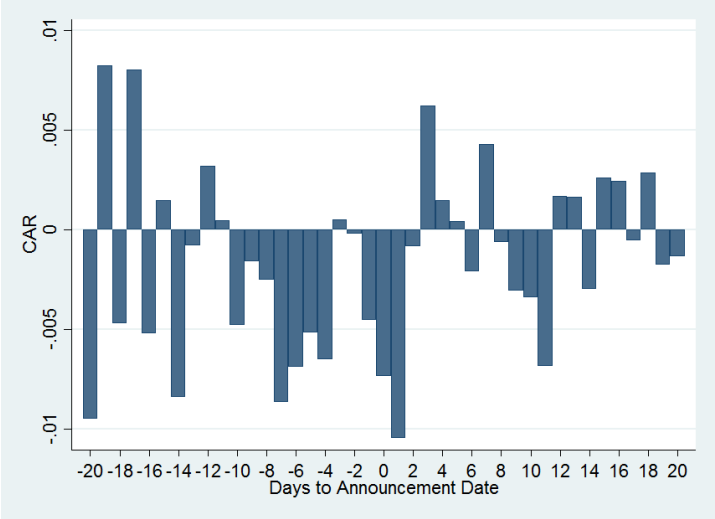

Figure 7. Cumulative abnormal returns around the announcement date of deletions from BIST 30 index

In Table 15, the cumulative abnormal returns are shown for the stocks excluded from BIST 30 index for the period 2009 through 2017. The pre-announcement period shows a significant result to the readers of the table. On the days of AD-10 to AD-1, the value of the cumulative abnormal return is -4.070 % and the t-statistics is -2.73 with a p-value of 0.009. Moreover, until the effective date, it can be seen that the CARs values are different from 0 with negative values for the excluded stocks from BIST 30. After the effective date, it turns out to be normal values. On the evaluation day of the index change period, the stocks exhibit positive returns but the statistics are significant, which can be indicative of speculative demand for the stocks. Consequently, the changes in the demand for excluded stocks could be summarized as the effect of index constituent changes on the stock prices

due to the attention of the investors.

Table 15. Cumulative Abnormal Returns for the Stocks Excluded from BIST 30 Index

Exclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.04070***	-0.00734	-0.01047*	-0.00658	-0.00259	0.00616	0.00227	-0.00916	0.00834	0.01115**
t-stat	-2.73	-1.6	-1.85	-0.52	-0.72	0.51	0.11	-0.47	0.32	2.04
p-value	0.009	0.117	0.07	0.605	0.474	0.616	0.909	0.643	0.754	0.048

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

In Table 16, the sub-period analysis for the included stocks to in BIST 30 index in for the periods of 2009-2012 is summarized with the CARs, t-statistics and p values. On the day after the evaluation date, the stocks show an excess return with the value of 0.885% and it is statistically significant. It continues to have an abnormal return for the days after the announcement date until the effective date. After the effective date, the CARs value starts to have negative values but with the values statistically insignificant.

Table 16. The Stocks included in BIST 30 in between 2009-2012

Additions 2009/2012	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.00193	0.00767	0.00709	0.00329	-0.00115	-0.02508**	-0.00539	-0.01813	-0.02692	0.00885**
t-stat	-0.17	1.63	1.69	0.13	0.07	-2.26	-0.23	-0.85	-0.94	2.28
p-value	0.87	0.114	0.101	0.896	0.945	0.033	0.82	0.403	0.355	0.03

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

For the included stocks to BIST 30 index in the periods of 2013-2017, the cumulative abnormal returns are highly negative as shown in Table 17 with t-statistics and p values. The CARs values of ED and EVD+1 are 0.144% and 0.054%,which are small but in a positive direction.

Table 17. The Stocks included in BIST 30 in between 2013-2017

Additions 2013/2017	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.02719	-0.01180**	-0.00334	-0.01196	0.00145	-0.01842	-0.03252	-0.04258	-0.05103	0.00054
t-stat	-1.38	-2.84	-0.98	-0.56	0.32	-0.92	-1.3	-1.23	-1.57	0.08
p-value	0.19	0.014	0.345	0.587	0.754	0.374	0.216	0.239	0.141	0.94

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

In Table 18, the CARs values for the stocks excluded from BIST 30 are

correlated with the previous result in the full period that pre-announcement date (AD-10 to AD-1) and AD+1 event windows show that the stocks exhibit negative abnormal returns and they are observed to be statistically significant. Particularly, on the pre-announcement date, the cumulative abnormal return value is -4.416% and one day after the announcement date, it is -0.751%. That means that excluded stocks for BIST 30 are also followed closely by the investors due to the index effect.

Table 18. The Stocks Excluded from BIST 30 in between 2009-2012

Deletions 2009/2012	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.04416**	-0.00255	-0.00752***	-0.00115	-0.00042	0.00873	0.03452*	0.00523	-0.02809	0.01598**
t-stat	-2.29	-1.33	-2.83	-0.1	-0.14	0.61	1.82	0.29	-0.94	2.3
p-value	0.029	0.194	0.008	0.922	0.893	0.549	0.08	0.771	0.355	0.028

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

Looking at Table 19, the CARs are mostly negative values and all statistically insignificant. It is hard to say that there is an index effect for the stocks excluded from BIST 30 for the periods 2013-2017 even though there are negative abnormal returns.

Table 19. The Stocks Excluded from BIST 30 in between 2013-2017

Deletions 2013/2017	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
CAR	-0.02439*	-0.01959	-0.01808	0.01088	-0.00247	0.00587	-0.03523	-0.00394	-0.03895	-0.00095
t-stat	-1.73	-1.36	-1.13	-0.56	-0.78	0.05	-1.49	-0.82	-1.57	-0.21
p-value	0.109	0.197	0.278	0.588	0.451	0.964	0.159	0.429	0.141	0.839

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

These results also show that institutions, investors and traders that invest in excluded stocks are more sensitive to these types of change in the index compared to the inclusion of the stocks to the index due to the pressure of selling the stocks. Moreover, the findings in the sub-period analysis are consistent with the full period analysis for the excluded stocks from the index. For the inclusions to the index, the pre-announcement period is more obvious to see the effect of the periodic index composition change on the stock prices and returns.

5.2 Trading volume effects

In this section, the index effect is analyzed by the help of the change in the volume of the stocks that are subject to the index composition change. As stated in the methodology section, the abnormal volume ratio should show the index effect if it exists.

5.2.1 Stocks in BIST 100 index

Figure 8 gives the mean abnormal volume ratios for stocks included to BIST 100 index between 2009 and 2017 years. The announcement date is 0. The abnormal volume ratios are obtained from the mean volume ratio (MVR) model and estimated over the estimation period.

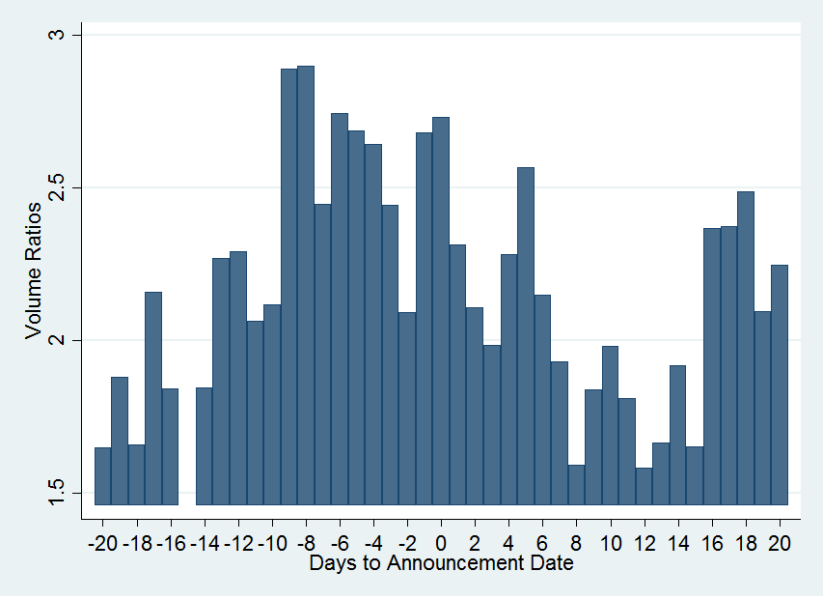

Figure 8. Abnormal volume ratios around the announcement date of additions to BIST 100 index

The expected value of the abnormal volume ratio of the stocks should be 1 if there is no change in the volume of the stocks during the event windows determined. The volume ratios of the stocks included in BIST 100 index are summarized in Table 20 with t-statistics for the different event windows.

Table 20. Volume Ratios for Stocks Added to BIST 100 Index

Inclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Volume Ratio	2.53729***	1.27117***	1.34469***	1.63024***	2.42815***	1.31723***	1.73330***	1.51194***	1.66534***	1.83823***
t-stat	10.3657	2.5843	2.9305	8.3947	2.6237	6.1938	13.6524	11.437	16.1016	3.6435

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

It can be seen from the table that the abnormal volume for the included stocks is apparent. The volume ratios for all event windows are different from 1 and high above the values in the estimation window. The volume ratios are also statistically significant for all event windows. The volume ratio for the included stocks has the highest ratio on the pre-announcement period of AD-10 to AD-1 event window which is 2.537. Then the ratio for the stocks starts to decline until the effective day. On the effective day, it is also high as 2.428.

After the effective day, the ratio is still high but decreases compared to the other event windows. In the table, it can be seen that the smallest volume ratio is on the announcement day and it is 1.271 which is significantly higher than 1 to say there is an index effect on the stocks included in BIST 100 index.

Figure 9 gives the abnormal volume ratios for stocks excluded from BIST 100 index between 2009 and 2017 years. The announcement date is 0. The abnormal volume ratios are obtained from the mean volume ratio (MVR) model and estimated over the estimation period.

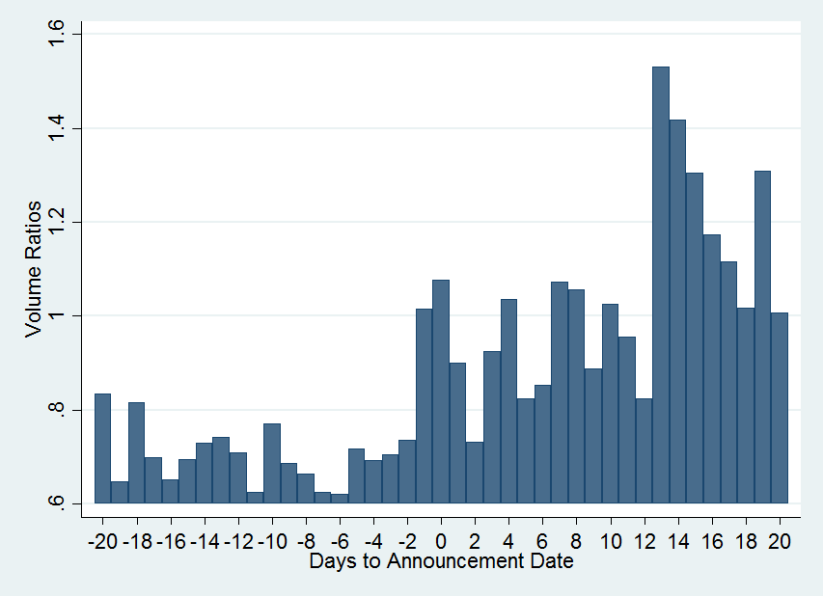

Figure 9. Abnormal volume ratios around the announcement date of deletions from BIST 100 index

In Table 21, the summary of the study is shown with t-statistics for the stocks excluded from BIST 100 index. The findings for the excluded stocks are highly interesting since the volume ratios are relatively small compared to the ratios of the included stocks. In the pre-announcement period, it is smaller than 1 and it is statistically significant with the ratio of 0.739.

However, on the announcement day and the effective day, the trading volume ratios are greater than the expected value of 1 but the t-statistics of them are not statistically significant.

Table 21. Volume Ratios for Stocks Excluded from BIST 100 Index

Exclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Volume Ratio	0.73971***	1.07710	0.89972	1.09800	1.16135	1.01251	1.03546	1.06037	1.03001	0.83652
t-stat	-7.0338	0.5156	-1.1376	1.383	1.2321	0.3055	0.8635	1.5398	0.9725	-1.6275

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

The volume ratios of the stocks excluded from the index show that after the effective date the trade volume is even higher than the normal trade volume. It is 1.012 in the event window of ED to ED+10. The volume ratio for these types of

stocks reaches its maximum values at the effective date with the volume ratio of 1.161.

Interestingly, the volume ratios of the stocks included in BIST 100 index are usually greater than 1 and the ratios are greater than the volume ratios of the stocks excluded. Hence, in abnormal volume analysis, it can be said that the traders and the stock investors are more sensitive to the news of the stocks included in the index compared to the stocks excluded from the index.

Consequently, the trade volumes of the stocks subject to the periodic index constituent change draw a picture to the investors that the index effect on the stocks is more obvious in the analysis of the abnormal volume. The effect of the index composition change on the stocks can be seen as a positive increase in the volume of the included stocks to BIST 100 index, whereas the exclusion from the index creates a negative result for the stocks trade volume on the sell-side. These effects are apparent in the pre-announcement date and after the effective date for the included stocks, whereas for the deleted stocks it starts to be seen from the effective date and so on.

5.2.2 Stocks in BIST 30 index

Figure 10 gives the abnormal volume ratios for stocks included to BIST 30 index for 2009 and 2017 years. The announcement date is 0. The abnormal volume ratios are obtained from the mean volume ratio model and estimated over the estimation period.

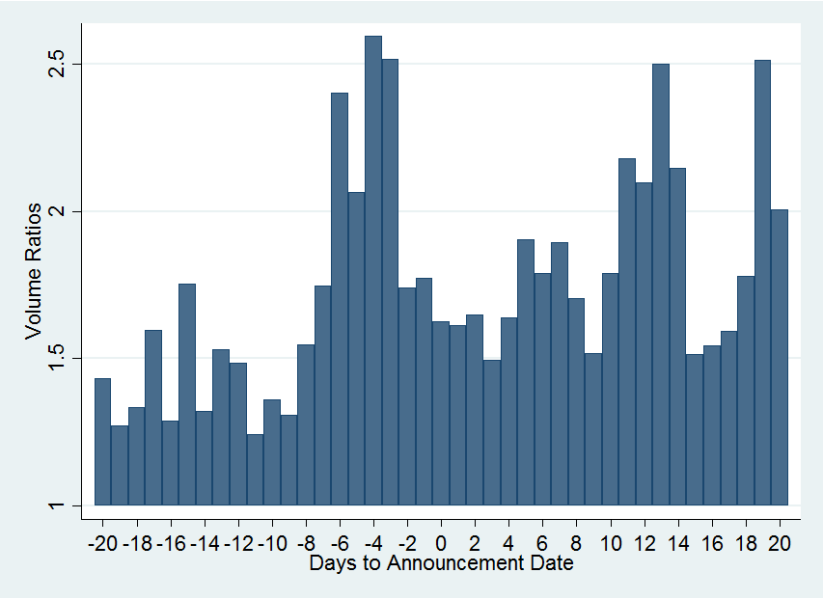

Figure 10. Abnormal volume ratios around the announcement date of additions to BIST 30 index

In Table 22, the volume ratios of the stocks included in BIST 30 index are summarized for the event windows. The results are consistent with the findings for the stocks included in BIST 100 index with statistically significant values. The abnormal volumes for those are always greater than the normal trade volume. The maximum volume ratio of the analysis among the different event windows come from the pre-announcement date as 1.886. Then it starts to fall a little bit in the next days until the effective date.

Table 22. Volume Ratios for Stocks Added to BIST 30 Index

Inclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Volume Ratio	1.88629***	1.62401*	1.61206**	1.42042***	1.78385***	1.16400***	1.46334***	1.34213***	1.41221***	1.60178***
t-stat	5.8309	1.7749	1.9799	4.6038	2.8647	3.2679	7.3568	6.3025	8.7622	3.0242

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

Figure 11 gives the abnormal volume ratios for stocks excluded from BIST 30 index between 2009 and 2017 years. The announcement date is 0. The abnormal volume ratios are obtained from the mean volume ratio (MVR) model and estimated over the estimation period.

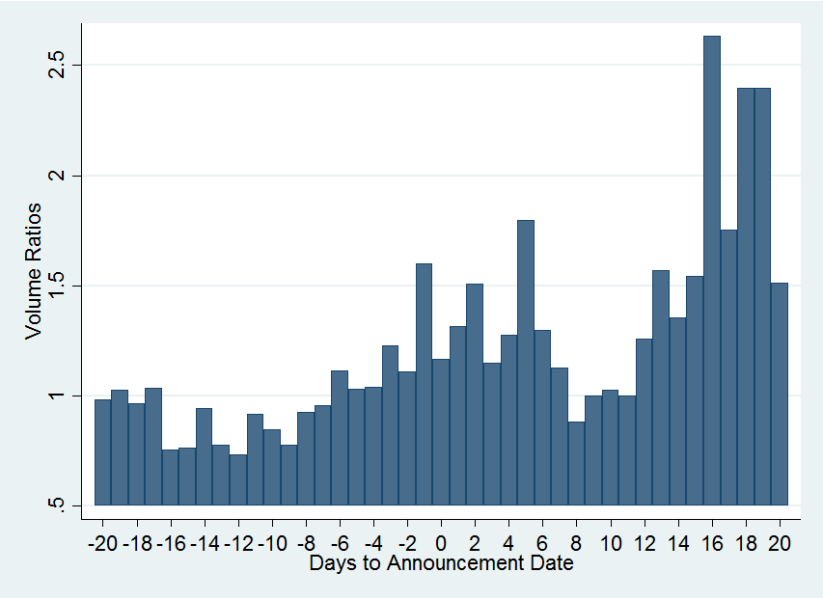

Figure 11. Abnormal volume ratios around the announcement date of deletions from BIST 30 index

In Table 23, the results of the study for the excluded stocks from BIST 30 index are summarized in detail. Contrary to the volume ratios of the excluded stocks from BIST 100 index, the volume ratios of those stocks are always greater than the normal volume. They are statistically significant, especially after the announcement date period. The event window of AD+1 to ED-1 shows the abnormal volume of the stocks excluded from BIST 30 index as 1.402.

Table 23. Volume Ratios for Stocks Excluded from BIST 30 Index

Exclusions	AD-10 to AD-1	AD	AD+1	AD+1 to ED-1	ED	ED to ED+10	AD-10 to ED-1	AD to ED+10	AD-10 to ED+10	EVD+1
Volume Ratio	1.07229	1.06705	1.02209	1.40265***	0.96203	1.18949***	1.35472***	1.30835***	1.32321***	1.28546
t-stat	1.1433	0.4147	0.1499	4.4429	-0.4809	2.7233	5.525	5.4607	6.4689	1.4623

(***) , (**) and (*) indicate significance at 0.01, 0.05 and 0.1, respectively

CHAPTER 6

CONCLUSION

Empirical research on stock market prices has indicated that the addition (deletion) of stocks to an index leads statistically significant positive (negative) abnormal returns and changes in trading volume upon announcements. Nevertheless, there are various hypotheses that attempt at explaining those findings.

A branch of research has examined the price and volume abnormalities focusing on S&P 500 index. Although other market analyses do not have a further contribution to the hypothesis other than pieces of evidence from US market, they provide an opportunity to examine the validity of phenomena and hypothesis with different market structures, regulation and the application of index revision rules. In this manner, this thesis explores the price effect of constituent changes in BIST 30 and BIST 100 indices announced by Borsa Istanbul, from 2009 to 2017.

The period includes 149 additions and 147 deletions for BIST 100 index and 48 additions and 48 deletions for BIST 30 index consisting of 36 quarterly index revision intervals. Event studies are conducted via event study with the market model methodology by OLS regression. Stock prices exhibit interesting movements before the announcement periods but the findings reveal that those abnormalities are statistically insignificant for included stocks.

In particular for BIST 30, entering into the index leads to positive abnormal returns and the reverse is true for exiting from the index at the announcement day and post-announcement periods. On average 1.171 percent increase for the stocks included in BIST 100 index and 1.743 percent decrease for the stocks excluded from BIST 100 index at the pre-announcement period. However, on average it is

0.194% for the stocks included in BIST 30 index at the announcement day and 4,07% decrease for the stocks excluded from BIST 30 index the pre-announcement period with statistically significant results.

As market players tend to take advantage of expected price changes they buy the stocks, which increases the prices a few days before announcement and event dates in the case of inclusions. Just after benefiting from the expected price increases they sell stocks and reduce the prices. In the case of deletions, they take advantage of the reverse strategy. Therefore cumulative returns represent a temporary pattern for announcements and event day changes.

In fact, index revision rules are obvious for all traders and they can anticipate the changes. That's why they can cause speculative trading just before announcement date until event date as index funds will not rebalance their positions during this period. Since those index funds such as big pension funds move after event date they shift the equity demand and the speculators can make a "risk arbitrage" by preceding those funds although there is no asymmetrical information. This phenomenon can happen only if there are enough funds to shift the demand for rebalancing their index-based portfolio. Also, it explains some results in the literature for indices such as DJIA not followed closely by big funds.

On the other hand, it is shown that trading volume increases both for additions and deletions. The increase in trading activity begins 10 days before the announcement date and continues until the effective date and longer for the additions to BIST 100 index and BIST 30 index. This abnormality stays strong until event date for deletions but weakens towards to event date for additions. Volume abnormalities are higher for included stocks.

The increase in trading activity begins on the announcement day and continues after the effective date for the deletions from BIST 100 index and the deletions from BIST 30 index, it begins 10 days before the announcement date and continues after the effective date. This extra reaction of the market for deletions is probably caused by Borsa Istanbul's policy that non-BIST 100 stocks are not subject to margin trading, short selling and borrowing and the positions should be closed in a short period in the period of the study.

On the other hand, there is no compelling policy for market players for stocks added to indices and players take such positions on those added stocks in a longer period. Finally, the number of exchange traded funds on the indices is insufficient for Borsa Istanbul Stock Exchange. The decreasing pattern of the index exchange traded funds can help to understand the result of this study.

APPENDIX

PERIODIC CHANGES ON CONSTITUENT STOCKS

”Periodic changes on stocks within BIST 30, BIST 50, BIST 100 and BIST Dividend 25 indices are conducted according to the following principles, based on the study carried out for the next index period using the review period data:

In order for a stock which is not a constituent to be included, it must rise to a specific upper rank or above in the final ranking.Similarly, in order for a constituent stock to be excluded, it must fall under a specific lower rank in the final ranking.

Specific upper and lower ranks are;

25th and 35th for BIST 30 Index,

45th and 55th for BIST 50 Index,

90th and 110th for BIST 100 Index,

In the final ranking;

a-) Stocks which ascend to the specific upper rank or higher and are not covered by the index are included.

b-) Stocks which descend down below the specific lower rank and are covered by the index are excluded.

c-) If the number of stocks ascending to the specific upper rank or higher is higher than the number of stocks which descend down below the specific lower rank, then starting from the stock which is positioned in the specific lower rank, the required number of stocks in the upper ranks are excluded from the index until the numbers of stocks included-excluded are equal.

d-) If the number of stocks descending down below the specific lower rank is higher than the number of stocks ascending to the specific upper rank or higher, then starting from the stock which is positioned one place below the specific upper rank, the required number of stocks in the lower ranks are included the index until the numbers of stocks included-excluded are equal.

e-) Reserve Stocks: 2 stocks for BIST 30, 3 stocks for BIST 50, 5 stocks for BIST 100 and 5 stocks for BIST Dividend 25 indices are selected as substitutes for any changes likely to occur within the period and this Reserve List is announced concurrently with the periodic changes.

Announcement of Periodic Changes

Periodic changes on BIST 30, BIST 50, BIST 100, BIST Dividend, BIST Dividend 25 and BIST SME Industrial indices are announced at least 10 days prior to the beginning of the relevant index period. The review period is the last 6 months as of the last trading day of November, February, May and August. The review day is the The last trading day of November, February, May and August. ”

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