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Review

Event studies in Turkey

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Abstract

The primary goal of this paper is to review the event studies conducted for Turkey to in order to identify the common components in their designs. This paper contributes to the existing literature by reviewing all event studies for Turkey for the first time, but more importantly; this review leads to the upcoming event studies on Turkey by highlighting main components of a proper design. Based on the review of 75 studies, it is observed that event studies generally choose BIST-100 (formerly, ISE-100) market index and market adjusted returns with the parametric tests. In general, the studies prefer to rely on one type of model to calculate abnormal returns without discussing the selection of the underlying model. Especially for the event studies focusing on the impact of political events or macroeconomic announcements in Turkey, there is a risk of clustering due to the application of same event date for all observations.

JEL classification: G14; G1

Keywords: Event study methodology; Stock returns; Clustering; Borsa Istanbul

1. Introduction

An event study refers to tests of the impact of an economic or political event on stock prices by adopting different performance measures. Starting from the first event study of Dolley (1933) on stock splits, both the methodology and the application area of event studies have developed. Among several studies, early analyses of Ball and Brown (1968), Brown and Warner (1980, 1985) and Fama, Fisher, Jensen and Roll (FFJR, henceforth) (1969) are the major cornerstones. Indeed, the studies of Ball and Brown (1968) and FFJR (1969) introduce event studies whereas Brown and Warner (1980, 1985) describe how to conduct event studies.

According to Binder (1998), FFJR start a "methodological revolution" in finance and Brown and Warner (BW, henceforth) present the basics of the methodology. Binder (1998) underlines two modifications to the methodology after FFJR: use of longer dataset and separation of estimation and event windows. Nevertheless, the main format of event studies has not been changed since FFJR (Kothari and Warner, 2007, chap. 1). Besides, practical importance of assumption violations and adjustments suggested by BW studies provide a benchmark (MacKinlay, 1997). Studies of BW compare three basic performance measures (mean adjusted returns, market adjusted returns and market and risk adjusted model) with monthly and daily stock returns, and examine not only models, but also empirical problems such as clustering and cross-correlation.

The primary goal of this paper is to review the event studies conducted for Turkey in order to identify the common components in their designs. This paper contributes to the existing literature by reviewing all event studies for Turkey for the first

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time, but more importantly; by leading to the upcoming event studies on Turkey by highlighting main components of a proper design. Based on the review of 75 event studies, it is observed that event studies generally choose BIST-100 (formerly, ISE-100) market index and market adjusted returns, without basing the choice of model, and mainly focusing on the parametric tests. In general, the studies prefer to rely on one type of model to calculate abnormal returns. In most of the studies, even though the main research question is to examine the impact of the selected event, there is little room to discuss on the selection of the underlying model. Especially for the event studies focusing on the impact of political events or macroeconomic announcements in Turkey, there is a risk of clustering due to the application of same event date for all observations.

This paper is organized as follows: Part 2 reviews the basics of an event study; Part 3 presents the literature review on event studies for Turkey. Lastly, Part 4 discusses the common issues addressed in the event study designs of these studies.

2. Event study methodology

The main aim of an event study is to quantify the abnormal or unexpected impact of an economic or political event on security prices. Considering the wide coverage of the event studies, as indicated in Corrado (2011), no one really knows the number of published event studies. Only over 1974–2000 five major finance journals published 565 articles with event study results (Kothari and Warner, 2007, chap. 1). Even though event study tests are not direct tests of efficiency, the timing and persistence of events' impact may give information about the structure of the market. In other words, the initial test itself is not a test of efficiency, but persistence is. Fama (1970) states that semi-strong form tests of efficiency concern "the speed of price adjustment to other obviously publicly available information" (such as announcements of stock splits), not the magnitude of price changes.

Fama (1970) describes an informationally efficient market as "a market in which prices always fully reflect available information". In the same study, Fama classifies the whole information set into three sub-sets: weak, semi-strong and strong form of efficiencies.[1] According to the semi-strong form efficiency, all publicly available information should already be reflected in prices. Therefore, in an inefficient market either information to the market affects prices even though it is already available to market (i.e., information is known publicly)[2], or the impact of new information does not fade away. Correspondingly, the duration of the adjustment, not the level of abnormal returns, would be direct tests of efficiency.

2.1. Basics of an event study

Simply, an event study consists of 7 simple steps (Campbell, Lo, & MacKinlay, 1997): event definition, choice of selection criteria, calculation of normal and abnormal returns, choice of estimation procedure, testing procedure, empirical results, and interpretation of results. Even though each step would not be considered in detail here, a general overview of a regular event study is given. Since the basic aim of this paper to review the studies for Turkey, only necessary information on the components is briefly explained.

2.1.1. Definition of timeline in an event study

An event study starts with the identification of a specific event. Generally, depending on the model for modeling expected returns, there are two components of an event study: estimation window and event window (Fig. 1).

1. *Estimation period over [T1,T2] and/or [T3,T4] (Pre- or post-event windows):* The normal returns would be estimated over estimation period. This period can be either before or after the event window (or both periods). Armitage (1995) explains that there is a trade-off in selecting longer and shorter estimation period. With a longer period you can have higher precision but you would also have out of date data. Armitage (1995) claims that average range of estimation period is [100,300] for daily studies and [24,60] for monthly series.
2. *Event window over [T2,T3]:* To test the effect of an event, the event date has to be specified precisely. The length of event windows is crucial since the underlying assumption of the event studies on corporate announcements is generally the learning of the related information by the investors within the defined short-term. However, in case of information leakages or predictions and anticipations about the events, event study results or methods used may change. As shown in Brown and Warner (1985), the power of tests significantly decreases whenever the event date is not accurately known. Besides, there is a risk of misleading conclusions with contaminated results in case of imprecise events.

[1] Malkiel (1992) re-states the view of Fama as follows: "market is said to be efficient if it fully and correctly reflects all relevant information in determining security prices. The market is said to be efficient with respect to some information set". As in the first well-categorized study of Fama (1970), three subsets of information are defined as follows: (a) Weak-form efficiency: According to the weak form efficiency, current prices reflect past prices and returns, so an investor can predict the prices by using this set of information, and an investor cannot earn excess returns In other words, this information set contains only the history of prices and returns. (b) Semi-strong form of efficiency: This information set includes all information known by all market participants. This means that current prices reflect all publicly available information. (c) Strong-form efficiency: This information set contains private information (i.e., "the monopolistic access to any information relevant for price formation"). Comparing the performance of insiders with the market, if the insiders can beat the market on average, then the market is concluded to be inefficient.

[2] In an efficient market, any predictable future prospects of a company have already been priced into the current value of the stock. If a recovery, for example, is already anticipated, the actual recovery is not news. The stock price should already reflect the coming recovery.

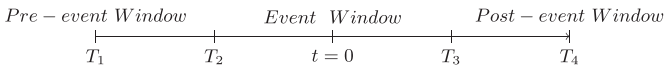

Fig. 1. Timeline in a basic event study.

2.1.2. Frequency of data

Considering the frequency of data used in the analysis, MacKinlay (1997) states that there would be a substantial gain by using daily data instead of monthly data. Also, Kothari and Warner (2007, chap. 1) underline the more prevalent use of daily data to increase both precision in estimation and information content of announcements. Besides, use of daily data can increase the precision of event window. To illustrate; the announcements of stock splits or M&As can be easily identified in calendar time, and other contaminating events occurred within the same month can be eliminated. Nevertheless, the data with less than daily frequency may not give additional benefit. MacKinlay (1997) argues that there is not a common net benefit of intraday data.

2.1.3. Tests for event study

In general, to test the impact of an event, cumulative abnormal returns (CARs) are calculated over the estimation window by using the abnormal returns (ARs) as follows:

$$CAR_i(T_2, T_3) = \sum_{t=T_2}^{T_3} AR_{it} \quad (1)$$

where T_2 and T_3 are the start and end points of an event window. Therefore, cumulative abnormal returns refer the summation of abnormal returns over event window. Parametric or non-parametric tests may be preferred to test the hypothesis of "there are no abnormal returns over event window". Parametric tests would be sensitive to the underlying distribution of returns whereas non-parametric tests are independent of the assumptions on distribution.

As MacKinlay (1997) supports, non-parametric tests are generally used together with parametric tests. In Brown and Warner (1980, 1985), non-parametric tests are used for robustness check of parametric test results. There are other studies (such as Corrado and Truong (2008)) finding the superiority of non-parametric tests over parametric tests. Nevertheless, the results may be country- or region-specific.

2.1.4. Modeling expected returns

Because an event study tests the abnormal performance, modeling the expected returns has a special importance. As Kothari and Warner (2007, chap. 1) indicate, you cannot measure the abnormal (unexpected) returns without modeling the normal (expected) returns.

Considering different performance measures used by previous studies (Table 1), there is not a comprehensive single model. Each model has some drawbacks to handle some common features of return data (non-normality, heteroscedasticity, cross correlation, etc.), but apart from these model-specific problems, as Fama (1991) indicates, all tests may suffer from the "joint-hypothesis problem". Joint hypothesis problem means that all tests would be a test of both the selected model and efficiency, so you cannot separate one from the other. In other words, as long as the correct model is not chosen to characterize the expected returns, any test of abnormal returns could be misleading. Selection of the correct model helps to reduce the noise term and increase the power of tests. In case of selecting a wrong model, Binder (1998) underlines several model misspecification errors, such as omitted variable problem, or inclusion of irrelevant factors. This means that all tests and inferences based on these statistics would be misleading. Therefore, the choice of the model(s) is one of the most crucial steps of an event study.

Comparing previous studies, Brown and Warner (1980) find that market adjusted model, mean adjusted returns and market and risk adjusted simple market model perform similarly, but whenever there is clustering problem, mean adjusted returns perform badly. Other papers (Armitage, 1995; MacKinlay, 1997) also indicate the poor performance of mean adjusted model. This implies that mean adjustment is not able to handle problems of heteroscedasticity and autocorrelation as the market model deals with.

As a rule of thumb, market and risk adjusted models (market model, CAPM, APT, etc.) perform better than the ones without any market or risk adjustment, and the market model is the most common one (Armitage, 1995). Considering the fact that there can be differences in test results when both CAPM and market model are applied to same dataset (Brenner, 1979; Brick, Statman, & Weaver, 1989), MacKinlay (1997) claims that due to the questionable validity of restrictions imposed by the CAPM, the market model is more common than the CAPM. In a recent study by Campbell, Crown, and Salotti (2009) the classification of event study articles on multi-country samples indicates that the benchmark models are generally the market adjusted returns and simple market model. On the other hand, Armitage (1995) argues that beyond the market model complex methods and further adjustments add little benefit to the performance.[3]

3. Event studies in Turkey

So far, impacts of several different events have been investigated for Turkey. To illustrate; impact of group affiliation on stock prices is examined in the study of Gonenc, Kan, and Karadagli (2007) where there was no significant relationship. Also the change in the risk perception level of investors with the results of the most popular football teams in Turkish stock market has been questioned where the win results are followed by higher asset returns and lower risk aversion (Berument, Ceylan, & Onar, 2013). Another important topic has been the capital market integration where Turkey has found out to display a growing integration to the world since 1999 (Lagoarde-Segot & Lucey, 2007). Fernandez (2007) finds a volatility shift in the stock index of Turkey

[3] This means that with the complex models, decrease in specification errors and increase in power of tests are negligible.

Table 1
Summary of abnormal return generating performance models.

Model	Abnormal return definition
Zero adjustment to returns	Actual return on a share is regarded as the abnormal return.
Mean adjusted returns	This model assumes that a share would earn the average return, which is calculated over an estimation period, before or around the event date. Any deviation from the mean would be the abnormal returns.
Market adjusted returns (Index Model)	Market adjusted returns are the returns of a share over the market returns. Therefore, this approach assumes that on average a share should earn same as the market. Unless beta of sample is equal to 1, the index model can lead potential bias by increasing variance and lowering the power.
Market and Risk adjusted models	This approach assumes that as eliminating the market's impact on actual returns of a share, the risk factor of the firm should also be incorporated.
a. Simple Market Model $R_i = \alpha_i + \beta_i R_{mt} + \varepsilon_{it}$	Different than the index model, now returns are adjusted for the risk factor of that share as finding the expected returns. After regressing the market model over the estimation period, the abnormal returns over the event window are: $AR_{it} = R_{it} - (\alpha_i + \beta_i R_{mt})$ where R_{it} denotes the stock i's return at time t, and R_{mt} refers the market returns.
b. Capital Asset Pricing Model (Sharpe-Lintner) $R_{it} = R_{ft} + \beta_i (R_{mt} - R_{ft}) + \varepsilon_{it}$ or in another way $R_{it} = (1 - \beta_i) R_{ft} + \beta_i R_{mt} + \varepsilon_{it}$	Compared with the simple market model, now the excess returns over risk free rate (R_{ft}) are used. Abnormal returns are: $AR_{it} = R_{it} - (R_{ft} + \beta_i (R_{mt} - R_{ft})$
c. Capital Asset Pricing Model (Black) $R_{it} = R_{ft} + \beta_i (R_{mt} - R_{ft}) + \varepsilon_{it}$	Black (1972) suggests that in the CAPM instead of risk-free rate any other measure of risk-free rate can also be used. Therefore, the calculation of abnormal returns is same except the definition of R_{ft}: $AR_{it} = R_{it} - (R_{ft} + \beta_i (R_{mt} - R_{ft})$
d. Arbitrage Pricing Theory (APT) $R_i = E(R_i) + b_{i1}\gamma_1 + \ldots + b_{ik}\gamma_k + \varepsilon_i$ $E(R_i) = \alpha_0 + \alpha_1 \cdot b_{i1} + \ldots + \alpha_k \cdot b_{ik}$	This theory assumes that common K factors influence the returns on all assets. In this model α_0 is the expected return on an asset with zero systematic risk, α_j is the risk premium corresponding to jth factor, and b's are the factor betas. Then, abnormal return for each i is the error term.
e. Fama–French Three Factor Model $R_{pt} - R_{ft} = a_p + b_p (R_{mt} - R_{ft}) + s_p SMB_t + h_p HML_t + \varepsilon_{pt}$	In this model, SMB is the difference in returns of small and big firms, and HML is the difference in returns of high and low book-to-market value. In the model, now return on the portfolios are used: R_{pt}.
f. Control Portfolio	To apply this method, first a portfolio of shares has to be formed to test the effect of an event. Then, another control portfolio is formed with the same risk (i.e., same beta) of the test portfolio. Abnormal returns would be the difference between these two portfolios: $AR_{pt} = R_{pt} - R_{ct}$ where c stands for the control portfolio and p denotes the test portfolio. Therefore, this approach implicitly assumes that all portfolios at the same risk level should earn the same return.
g. Fama–Macbeth Model $R_{it} = \alpha_{1t} + \alpha_{2t} \cdot \beta_{it} + \varepsilon_{it}$	This model is based on the cross-sectional regressions of returns. Starting with shares of different betas, Fama and Macbeth (1973) regress the returns in each month against the beta of that share. After obtaining α, cross-sectional coefficients, from the specified estimation period, abnormal returns are calculated as: $AR_{it}=R_{it} - (\alpha_{1t} + \alpha_{2t} \cdot \beta_{it})$
Other methods	
a. Firm characteristics in cross-sectional models	MacKinlay (1997) explains that given a sample of N observations and M characteristics the model is regressed as follows: $AR_j = \gamma_0 + \gamma_1 \cdot x_{1j} + \ldots + \gamma_M \cdot x_{Mj} + \varepsilon_j$ where $E(\varepsilon_j) = 0$. To illustrate; Asquith and Mullins (1986) use the size of offerings (as a percentage of the value of total equity) and cumulative abnormal returns as "characteristics" in the regression. Nevertheless, MacKinlay (1997) warns the selection bias problem in case of a "relation between the firm characteristics and degree of anticipation of the event".
b. Abnormal returns as coefficients of the model	According to the classification of Binder (1998) a line of literature uses dummy variables for event periods so that abnormal returns are simply the coefficients of equations. This approach models expected returns as follows: $R_{it} = \alpha_i + \beta_i R_{mt} + \eta_i D_t + \varepsilon_{it}$ where D denotes one-event period. Therefore, coefficient of D becomes the abnormal return of share i at time t. Multivariate extension of this analysis can be found in Binder (1998).
c. Post-event risk-adjusted performance models	
(i) BHAR Approach	The characteristic-based matching approach assumes that you invest in all firms, which experienced the event, and at the end of a specified period you sell these shares. Then, the average multiyear return of this strategy is compared to that of a similar strategy, where now you invest in non-event firms. Nevertheless, this matching based model can suffer from systematic difference between two groups of firms (Kothari and Warner, 2007).
(ii) Jensen-alpha approach	In this method, first calendar-time portfolio returns for event firms are calculated. Then, excess returns of this portfolio is used as the dependent variable of the following Carhart (1997) model (either CAPM or three factor F–F Model can be used): $R_{pt} - R_{ft} = a_p + b_p(R_{mt} - R_{ft}) + s_p \cdot SMB_t + h_p \cdot HML_t + m_p \cdot UMD_t + \varepsilon_{pt}$ where UMD is the difference between the return of past one-year winners and losers.

around the beginning of the Iraq war. In another paper by Sari, Uzunkaya, and Hammoudeh (2013) a significant long-run relationship between the Turkeys risk ratings and stock market movements is supported implying that three economic, financial, and political risk rating components are the forcing variables of stock market movements whereas in the short run the impact of economic risk rating is no longer significant. Besides, the performance of hedging strategies (Olgun & Yetkiner, 2011), the relationship between the investor sentiment and returns (Canbas & Kandır, 2009) and spillover effects over markets (Hatipoglu & Uyar, 2012) are also examined in the Turkish financial markets.

The studies aforementioned are just some examples showing the wide coverage of studies conducted for Turkey. Nevertheless, in those studies event study methodology is not used to test the impact of selected variables, sometimes as a consequence of their research questions. Hereafter, this study would cover the studies that employ the event study methodology (as a major method or robustness check) as examining the case of Turkey or a group of countries including Turkey. Even though the other studies (not using the event methodology) include very important results, only the ones with event study are considered from the point of their designs.

There have been previous event studies for Turkey testing the impact of different "events" on security prices. Specifically, several issues including the effect of news, initial public offerings, rights issues, stock splits, merger and acquisitions in different industries, dividend announcements, dividend payments, rights offerings, investment decision announcements, export connection announcements, cooperation among firms, audit reports, rating score and earnings announcements, financial restructuring decisions of distressed firms, political or macroeconomic events and index revisions on stock prices are investigated. Previous studies mentioned "the Istanbul Stock Exchange (ISE)" since Borsa Istanbul is registered and started operations on April 3, 2013 by consolidating all exchanges in Turkey.

3.1. Stock market gossips and security recommendations

Kıymaz (1999) considers the effect of stock market gossip on prices of stocks operating in manufacturing industry in ISE. It is found that investment decisions based on 614 gossips published in "Economic Trend" magazine over 1996–1997 would not generate any positive ARs whereas the ARs in the pre-publication period of gossip are positive and significant. Therefore, only for the investors who can possess the information initially just before the publication in the magazine can make profit in ISE (i.e., in contrary to the efficiency of markets) whereas individual investors cannot earn ARs by following a strategy based on published gossip. Yazıcı and Muradoglu (2001) investigate the impact of security recommendations in the financial press on common stock prices in ISE. Based on 199 buy recommendations, the results show that the recommendations are associated with the positive and significant ARs on the day of publication and preceding days indicating an impact of publications on stock prices and possible abuse of this practice in ISE. Even though the published investment advice does not help small investors earn excess returns, "preferred investors", who can access the information before publication date, can achieve superior ARs by front-running. In another study by Erdogan, Palmon, and Yezegel (2010), the analyst recommendations are evaluated in ISE over 1993–2005. Neither the long-run ARs of a trading strategy of purchasing (selling) stocks with the most (least) favorable recommendations nor the stock recommendations could support the stock picking ability of analysts. Only some specific brokerage houses are found successful at stock picking. Therefore, there is a mixed evidence on efficiency of markets in Turkey based on the recommendations published.

3.2. Initial public offerings, stock splits, rights issues and cross listing

Considering the performance of public offerings, Kıymaz (1997b) investigates the performance of initial public offerings (IPOs) of 39 financial institutions over 1990–1995 in ISE. Over 30-month event window following the IPO, 11 per cent positive AR is observed. In another paper by Kıymaz (1997a), 10.8 per cent market adjusted abnormal returns are observed on the first trading day of 25 firms in ISE in 1996. Kıymaz (2000) also investigates the IPO performance of 163 firms over 1990–1996, and find underpricing on initial trading day on average of 13.1 per cent. The size of issuer, uptrend in the stock market between the date of public offering and first trading day, institutional ownership, and self-issued offerings are referred as significant determinants of underpricing. In another study by Ayden and Karan (2000), underpricing in IPOs is also examined for 70 IPOs over 1992–1995. Nevertheless, no evidence is found to support significant CARs over 36 months following the IPO.

Teker and Ekit (2003) examine the performance of 34 IPOs in 2000 in ISE and observe positive ARs over the first two days of IPOs. Yalçıner (2006) finds that the average returns of stocks offered to public at the ISE on the first trading dates have a positive value (i.e., underpricing) over 1997–2004 independent from the IPO method and IPO prices. Erpek (2006) also considers the 30-days performance of IPOs of 9 incorporated companies in 2005. The results indicate that over 2 days following the IPO, there is a significant abnormal return over the market (ISE-100) indicating underpricing and inefficiency in the ISE. Ayaz (2006) considers IPOs of 245 firms over 1990–2004, and three-year average CAR is calculated as 17.49 per cent supporting the underpricing argument.

Bildik and Yilmaz (2008) also find evidence of underpricing in the IPOs over the period of 1990–2000. The results from the IPOs of 234 firms indicate an first-day average abnormal return (5.94%) and underperformance up to three-year holding period in the ISE. On average, IPOs are found to underperform the market by 84.5% over this holding period. Tűkel (2010) also considers the underpricing in the context of asymmetric information by using the IPO data of 42 stocks in ISE over 2000–2007. First trading day returns are found 10.94 per cent and CARs increase from 27.95 per cent (for the first

month) to 39.74 per cent at the end of 36th month following the IPO.

On the other hand, Altan and Hotamış (2008) could not find any evidence for or against underpricing in IPOs over 2000−2006 in ISE based on daily, weekly, and monthly ARs. Otlu and Őlmez (2011) examine the performance of 53 stock certificates offered to public for the first time in ISE over 2006−2011. Following the public offering, the evaluation of 21-day price performance indicates that an investor, who purchased the certificate at the IPO price, may earn 6.99 per cent average abnormal return by selling at the first-trading day. In a recent study by Kaya (2012), short term performance of 32 IPOs in ISE over January 2010−June 2011 is considered. Nevertheless, the results do not support the previous findings: for 15 of 32 IPOs negative returns are observed after the first trading day. One possible explanation is indicated as the price margin regulations in ISE. Apart from these opponent findings, in general, the results on IPOs support the view of underpricing and positive abnormal returns on the first trading day where both the magnitude and length of the CAR calculation window change dramatically from study to study even over overlapping time periods.

Akarim (2013) also considers the impact of international cross listings on risk and return of the American Depository Receipts (ADRs) issued by Turkish companies stocks. Based on 26 stocks' data, negative ARs are found on the listing day where the variances of the most stocks increase following the listing.

In addition to the IPOs, the effect of right issues and stock splits on returns is investigated by several papers. Őzer and ve Yűcel (2001) consider the impact of capital increases through rights issues and stock splits over 1989−1997 on stock prices. Based on the results on the day and before the rights issues significant positive ARs are observed, and hence, a strategy of buying before the stock splits and selling following 2 days after the split creates positive ARs. On the other hand, no significant difference between rights issues and stock splits is indicated. Adaoglu (2001) examines the impact of the "unsweetened" and "sweetened" rights offerings during the announcement and subscription periods over 1986−1999. Based on the negative (positive) market reaction to "unsweetened" ("sweetened") rights offerings during the announcement period, and positive reaction to both "unsweetened" and "sweetened" rights offerings,[4] signaling and improved liquidity hypotheses are supported. Also, Cukur and Eryigit (2007) investigate the effect of bonus share issues on closed-end mutual funds' returns where no abnormal returns over event windows (−10,+10) were found between 2000 and 2005.

In another study by Yolsal (2011), the impact of splits on returns for the shares included in ISE-30 Index is examined over 2005−2011. Out of 159 stock splits, a sample of 45 splits is selected randomly (once). Based on both parametric (*t*-tests) and non-parametric tests (rank test), stock splits do not create any abnormal returns referring the semi-strong form efficiency of ISE.

3.3. Mergers and acquisitions

The impact of the mergers and acquisitions on stock performance has also been investigated for Turkey. In a study by Cukur and Eryigit (2006) the effect of merger and acquisitions (M&A) in banking industry in 2005 on stock prices is examined. The results from 5 stocks indicate that the announcements of M&A plans produce positive and significant ARs whereas the realizations of M&As do not lead any significant impact. Kırkulak Uludag and Demirkaplan Gűlbudak (2010) also investigate the impact of mergers of non-financial firms on stock prices over 1997−2006. In line with Cukur and Eryigit (2006), an increase before the merger announcements is observed followed by a decrease with the announcement and during post-merger period. In a recent study by Meder Cakır and Gűlcan (2012), the effect of mergers and acquisitions of 81 non-financial firms on stock returns is examined over 2005−2009, and based on (−5,+5) and (−20,+20) event windows significant positive CARs are observed especially before the announcements reaching a peak around the event date and/or at $t = 1$.

Considering industry-specific results, Yőrűk and Ban (2006) examine the impact of mergers on the stock prices of firms operating in food industry. Based on 8 mergers in food industry over 1997−2004 in Turkey, they find no excessive profit over long-term, but observe ARs over (−5,+5) event window. In another study, Tascı (2008) considers eight M&As of banks that listed at ISE over 2004−2008. Based on the CARs over event window (−3,+3), no significant ARs are found whereas significant negative ARs are observed over the post-event period. Additionally, overreaction to the announcement of M&As is indicated in contrary to the semi-strong form of efficiency at ISE.

Solakoglu and Orhan (2007) investigate the impact of M&As on firm value for the Turkish target and acquiring firms over 2003−2006. They claim that target firms realize larger increase in value than acquirer firms, and increase in the CARs before the announcement date refers information spillover. Hekimoglu and Tanyeri (2011) consider the effect of mergers of non-financial Turkish firms on stock prices over 1991−2006. Over 3 day event window around the merger announcement, 8.56 per cent CAR is observed for Turkish targets when the bidders purchase control rights. Comparatively low CARs (compared to the US around 20 per cent and to Europe around 10 per cent) are explained by the possible uncertainty in announcement dates and the impact of differences among countries' legal framework and competitive environment on the distribution of value created by the merger to buyers and target. Akben-Selcuk and Altiok-Yilmaz (2011) also examine the impact of M&A deals on the performance of acquirer Turkish companies. Based on 62 companies involved in M&A over 2003−2007, the results over 10-day and 7-day

[4] Plain right offerings are called as "unsweetened" and rights offerings accompanied by simultaneous distribution of bonus shares are called as "sweetened" in the Turkish capital market.

event windows support that the acquirers are negatively affected by M&A activities, but over shorter event windows the significance of results are melt away.

Oelger and Schiereck (2011) examine the impact of cross-border takeover announcements for Turkish shareholders. Based on event study results from 112 acquisitions initiated by Turkish companies over 1992–2010, CARs over (−10,+10) event window is found significant and positive for Turkish acquirers even dividing the sample into two sub-samples: "national" and "cross-border" mergers. Focusing on the cross-border transactions, CARs of acquirers making transaction with Asia and Europe are compared, and it is found that the Turkish capital market is not in favor of takeovers into Asia while the effect for transactions into Europe is neutral (i.e., a negative correlation between the stock price reaction and the distance between the target nation and Turkey).

Zhu and Jog (2012) also focus on cross-border partial acquisitions and matching firms in 18 emerging countries including Turkey over 1990–2007. The risk measures of target firms before and after the acquisition are compared using (day −10 to −260) and (day +10 to +260, day +261 to +510, and day +511 to +760) depending on the risk measure. The results from all markets indicate that cross-border acquisitions significantly reduce target firm risk in the long term after partial acquisitions whereas the domestic acquisitions increase the target firm's risk. Besides, positive stock performance around the M&A indicates the favorable perception of investors. After the cross-border partial acquisitions, long-term risk-adjusted stock performance in target firms also improves.

Yen, Chou, and Andre (2013) consider 98 merger and acquisition deals over 1998–2006 since this period is defined as a rapid growth period for emerging market companies that had joined the M&A global market. Based on the regression results where the pretax operating cash flow returns (OCFR) are used to measure long-term acquisition performance, emerging market acquirers typically have good operating performance before transactions occur, but that the average adjusted operating performance over a three-year period following a merger transaction shows little improvement. Considering the methodology, OCFRs were computed for each company for three years before and after the acquisition event. The data for the year of the acquisition ($t = 0$) were excluded. Since the sample of the study includes the listed firms from the countries included in the MSCI (Morgan Stanley Capital Investment) EM (emerging market) index from the SDC Platinum mergers and acquisitions database, the deals from Turkey are also considered. Nevertheless, there is no Turkey specific analysis nor country-specific design.

Different from these studies on merger and acquisitions, Onar and Topcu (2011) suggest employing Bayesian Belief Network (BBN)[5] in order to observe the interactions among events. In order to apply BBN, 50 strategic decisions (such as mergers, acquisitions, joint ventures) over 1996–2006 are considered. After defining the important factors for performance of strategic decisions via event study with CARs, causal relationships between the factors are evaluated. Based on the scenario analysis in BBN the conditional probability of strategic decision has the highest value when strategic decision is equity alliance, investment is foreign investment and the strategic decision is given in a related area.

In general, some of the studies focusing on M&As suffer from the sample size to analyze the overall market since results from five or eight stocks would be sufficient to draw company-specific results, but not the efficiency of the entire market. On the other hand, most of studies agree on positive ARs before and around M&A announcements. Also, in line with the studies on other countries, target firms are found to utilize larger gain than acquirer firms in Turkey.

3.4. Dividend announcements

Aydogan and Muradoglu (1998) examine the impact of announcements of implementations of rights issues and stock dividends on stock prices in ISE. Based on 109 rights offerings-stock dividend announcements over 1988–1993, neither board meeting nor the actual implementation of stock dividends and rights offerings is found to be significant. Within the event study methodology, non-parametric tests (sign and rank tests) are employed, but non-parametric tests are indicated "not suitable" for this analysis due to two reasons. First, the sensitivity of the length of event window for rank test creates an obstacle since in their study abnormal returns over event window are significant up to 18 days. Second, the outperformance of sign test in case of extreme abnormal returns could not be useful in their case since only low abnormal returns are detected.

In another study by Muradoglu and Aydogan (1998), the reaction to the implementation of stock dividends and rights offerings is considered over an extended time period (1988–1994) for a total of 513 events of 169 companies. Based on both t-test and rank test results, only for the sub-period of 1993–1994 significant price reaction is found over a thirty day event window. Following this study, in another study by Muradoglu and Aydogan (2003) price reactions to the announcements of stock dividends and rights offerings are analyzed considering different time periods and investor mix changes. Based on all stocks listed at the ISE over 1988–1994, significant and persistent price reactions are observed only for the 1993–1994 sub-period (even confirmed with the non-parametric tests that are employed as a cure for the thin trading during the initial phases of the ISE). This pattern is explained with the improved quality and quantity of financial information during the latest periods, and the changing investor profile from institutional to individual investors during the 1993–1994 period (i.e., individual investors with higher number of shares traded and smaller executed orders).

Batchelor and Orgakcıoglu (2003) consider the effect of stock dividends on company value via a GARCH process with event-related intercept terms that capture induced changes in

[5] Bayesian Belief Network (BBN) is defined as graphical model that represents the casual relationships between the variables with their conditional probabilities. Application of BBN requires both a dataset and prior knowledge.

the volatility of stock prices. They employ a regression model to estimate the coefficients for the ARs over different windows: (−30,−11), (−10,−1), $t = 0$, (+1,+10), (+11,+30), and use these coefficients in the GARCH process. Over 1990−1994 the change in returns before a pure stock or cash dividend payment is found positive and significant. Besides, the prices are found exceptionally volatile on the stock dividend payment date. This change in volatility also continues after the payment date, but as a reaction to the volatility around the dividend date (i.e., explained in terms of conditional heteroscedasticity).

Yilmaz and Gulay (2006) examine the impact of cash dividend payments on stock returns and trading volumes in ISE over 1995−2003. Their results indicate that prices start to increase during a few sessions before cash dividend payments made, and prices fall less than the amount of change in dividend payments on ex-dividend days. Therefore, the findings support profitable trading opportunities based on before and after dividend payment dates.

Bayazıtlı, Kaderli, and Gurel (2008) consider the impact of dividend payment announcements on stock prices of construction industry firms at ISE in 2005. The results from 16 stocks indicate significant positive CARs (2.02%) over (−10,+10) event window in contrary to the semi-strong form of efficiency. In another study by Kadioglu (2008), the effect of cash dividends on share prices in ISE is observed over (−5,+5) event window for 330 events of 88 companies from 2003 to 2007. Kadioglu (2008) finds significant negative relationship between cash dividend announcements and ARs after the event date whereas there is no relationship prior to the announcement. Besides, the persistence of this change in prices continues from the event date to 15 days following the event date.

Gűnalp, Kadıoglu, and Kılıc (2010) use 321 cash dividend announcements of relevant 83 companies in the ISE over 2003−2007 and find the information content of the dividend announcements (i.e., negative relationship between cash dividend and ARs after announcement) whereas there is no relationship prior to the announcement (i.e., no information leakage). Besides, similar to the findings of Kadioglu (2008) it is stated that starting from the announcement date, the adjustment of prices continues at least 15 days. In another study by Altiok-Yilmaz and Akben-Selcuk (2010), market reaction to dividend change announcements is analyzed in ISE over 2005−2008. Based on 184 announcements, the results indicate that, in line with the signaling hypothesis, prices increase (decrease) as dividend increases (decreases), and do not react to unchanged dividends.

Even though the change in stock prices before the cash dividend payment announcement is controversial, there may be a change in the perceptions of investors and/or market structure over time since the significant results by Kadioglu (2008) and Gűnalp et al. (2010) cover 2003−2007 as Yilmaz and Gulay (2006) examine 1995−2003 period. On the other hand, most of the studies claim a negative reaction in prices following the announcement, generally lasting for more than a week.

3.5. Audit reports and ratings

Aygőren and Uyar (2007) also consider the effect of audit reports of 101 firms on stock prices in ISE over 2004−2005. Considering four types of publicly announced audit reports (positive, conditional, avoidance to comment, and negative), the results indicate that positive and conditional types of audit reports are differently perceived by the investors than the other types, and for these announcements significant ARs over (−10,+10) event window are concluded to be a violation of semi-strong form of efficiency in ISE.

In another study by Sakarya (2011), the relationship between the rating score announcements of the companies listed in the ISE Corporate Governance Index in 2009 and stock returns is analyzed. Contrary to the semi-strong form of efficiency, a positive correlation is found between the announcement of favorable corporate governance rating score and stock returns. Bozcuk (2010) also investigates the price reaction to corporate governance rating announcements in the ISE over 2006−2009. Based on 20 events, where the events are the issue date of the corporate governance rating report by the rating agencies, 0.5 per cent average AR is found on announcement day as well as positive average CARs for the next 18 days.

Kaminsky and Schmukler (2002) investigate the impact of changes in sovereign debt ratings on stock returns for 16 emerging markets including Turkey over 1990−2000. For 103 changes in ratings and outlook, the dollar "stock spreads" of emerging markets' stock prices over the S&P 500 US stock market index indicate that upgrades (downgrades) occur when the markets are rallying (collapsing). Kaminsky and Schmukler (2002) explain this phenomenon as follows: "rating agencies provide bad news in bad times and good news in good times, reinforcing investors' expectations" making a contribution to the insatiability in emerging financial markets.

In addition to the reports and ratings, Erdogan and Yezegel (2008) also consider the impact of announcement of "no new news" on stock prices in ISE over 1998−2004. Specifically, Erdogan and Yezegel (2008) focus on the instances where ISE requested information from firm management, but firms replied stating the absence of new news. Correspondingly, the event date is the day that the firm's response to ISE's request is published and publicly made available through ISE's daily report. Based on results, prices continue to decrease even though there is no news published following large negative price changes. Even though there is partially reversal in prices following the positive price changes, there is no complete price reversal.

The findings on audit reports and ratings indicate that positive information (positive audit reports and favorable corporate governance ratings) is perceived positively by the market whereas "no news" is considered as negative information in ISE.

3.6. Insider trading

Considering the impact of insider trading in ISE, the findings of Kurtay (2007) over 2004−2006 indicate that insiders

are successful on timing of transactions especially on the sell side. Dogu, Karacaer, and Karan (2010) also support the view that all insider groups leak information to the market over 2005–2007 by the analysis of 4564 observations related to 213 companies listed in ISE. In a more recent paper, Tahaoglu and Gűner (2011) investigate the return performance of insiders of companies listed on ISE from their open market transactions and that of uninformed investors following insider transactions announced to the public. Based on 9163 observations from 216 companies over 2007–2008, it is found that affiliated shareholders can earn above market returns from their transactions (especially from sales) against the semi-strong or strong form efficiency.

Muslumov (2008) examines the impact of insider trading on stock price volatility in ISE over 2005–2007. Based on results, sell decisions, trades of insider traders who are more related with the company, larger amount of trades, trading in smaller stocks, and trading with contrarian strategies cause more volatility in stock prices following the trading. Overall, these results are found to be indication of destabilizing impact of insider traders in ISE.

In general, insider trades can earn positive ARs with strategic trading in ISE violating the strong-form of efficiency. Besides, the study of Muslumov (2008) may provide evidence about the destabilizing impact of insider traders on underlying stocks in ISE.

3.7. Financial statements

Considering the earning announcements, Odabasi (1998) investigates the stock return reaction to earnings announcements in ISE for 603 semi-annual and annual earnings announcements of 92 firms over 1992–1995. Separating good and bad news, average ARs on announcement days are found significantly different from zero for each sub-sample (positive for good news, and negative for bad news) referring that earnings announcements possess informational value. Aksoy (2008) analyses the information content of inflation adjusted financial statements, and tests the impact of financial statement announcements on stock returns of non-financial firms. Based on simple market model results, where the coefficients of the model are gathered from another database, there exist negative ARs over the event window in 2004, but not in 2002. However, Aksoy (2008) indicates that further research is necessary to isolate the effect of political and world-wide economic news around the announcement days since these events may prevent to state that either the inflation adjustment or the political forces impel the price activity in the ISE at the time of research.

Penas and Tumer-Alkan (2010) consider the impact of indicators of financial fragility in Turkish banking sector (such as increases in maturity mismatches, currency mismatches and non-performing loans) on stock returns. The results from the financial statements of 12 commercial banks over 1995–2001 indicate that shareholders react negatively to these indicators.

In brief, the studies on the announcements of financial statements in Turkey indicate that these events possess information. However, as emphasized in Aksoy (2008), separation of the real effect needs caution due to the coincidence of several correlated events around financial statement announcements in Turkey.

3.8. Investment strategies, index revisions and other corporate announcements

CARs have also been used for the comparison of investment strategies. Yucel and Taskin (2007) support the overreaction hypothesis with substantial price correction in ISE by using monthly returns over 1992–2005. Correspondingly, contrarian strategies are found profitable for one-year, two-year and three-year portfolio formation periods. On the other hand, Mehdian, Nas, and Perry (2008) could not find any evidence supporting the overreaction hypothesis whereas uncertain information hypothesis (i.e., corrective process of positive returns following favorable news) is affirmed over 1997–2004. Erzurumlu (2011) also tests and supports the overreaction hypothesis on the ISE-100 index by examining the investor reaction to unexpected news. Based on index changes over 1988–2010, the events (trigger points) are defined by employing GARCH model and buying losers in ISE-100 is found to generate superior returns for investors. In a recent paper by Dogukanlı, Vural, and Ergun (2012), based on winner and loser portfolios composed of stocks listed in ISE-100 index over 1998–2008 the overreaction hypothesis and effectiveness of the contrarian strategies are supported contrary to weak form efficiency.

In another study by Bildik and Gűlay (2008) the relation between the revisions in ISE-30 and ISE-100 indices and underlying stocks' returns are considered over 1995–2000. Based on results, stocks included in an index demonstrate significant positive ARs on the announcement day, and vice versa.

Apart from these studies, impact of other corporate decisions' announcements is considered. Nevertheless, these studies reviewed below may give company- or industry-specific information, but may also have insufficient sample size problem preventing to generalize results for the Turkish stock market. Kaderli and Demir (2009) investigate the impact of investment decision announcements in 2008 on stock prices in ISE. The results of 26 stocks from 5 sectors indicate that these announcements have positive impact on stock prices violating the semi-strong form of efficiency. Kaderli (2007) also states that it is possible earn positive ARs based on export connection announcements of firms in ISE. Based on only 3 announcements in 2005, positive CARs over (−20,+20) event window are observed. Bekçioglu, Ozturk, and Kaderli (2004) investigate the impact of cooperation among firms on stock prices in ISE by considering three announcements of three stocks in 2003. Positive and significant CARs are found to be violating the semi-strong form of efficiency in ISE. Őzkanlı (2011) examines the effect of public announcements about financial restructuring applications of distressed companies on returns. Based on one selected textile firm's 43 public announcements over 2002–2008, positive

reaction to public announcements is confirmed only for this firm.

3.9. Macroeconomic announcements

Another application area of event study methodology has been the macroeconomic announcements. Agcaer (2003) examines the effects of the Central Bank foreign exchange auctions and direct interventions on the level and volatility of US $/TL exchange rates using E-GARCH and event study analysis over 2001−2003. By using the data from the Central Bank (CB), the changes in the foreign exchange rate over (−10,−1) and (+1,+10) are compared with *t*-test. Based on three auctions and five direct interventions, it is concluded that CB foreign exchange auctions and direct interventions have a favorable impact on both the level and volatility of exchange rates. Akıncı, Culha, Ozlale, and Sahinbeyoglu (2005) also investigate the impact of foreign exchange interventions of CB on the exchange rates as well as the volatility, but by comparing a new methodology, a time-varying parameter model, with the event study method over 2001−2003. Considering 11 interventions before and after 5 days from the event date, both methodologies indicate that purchase interventions during the second half of 2003 seem to be effective. In another study by Duran, Ozcan, Ozlu, and Unalmis (2010), the impact of monetary policy is investigated by employing both heteroscedasticity-based generalized method of moments (GMM) and event study. Based on GMM models results, a rise in the policy rate causes an appreciation of domestic currency, increase in interest rates, and decline in stock prices, especially for financial sector firms. Duran et al. (2010) also find negative impact of policy rates on stock prices by employing event study method. Nevertheless, the study does not provide any details about their event study methodology.

In another study by Binici and Koksal (2013) the impact of changes in the required reserve ratio on banks' stock returns is investigated over 1988−2008 for 25 reserve events. A simple market model is estimated over thirty different event windows from date −30 to date +1 by including a dummy variable for the reserve changes. Based on the results of 16 banks listed in the Exchange, an increase in the ratio causes lower stock returns implying that shareholders share a portion of the required reserve tax.

Ulku (2001) examines the relation between commencement of the 2000−2003 disinflation program of the government and stock market index. Based on weekly autocorrelations starting from September 1999 to September 2000, the overreaction in the ISE-100 index around the start of program is found. Nevertheless, this study follows autocorrelations based on regressions instead of standard event study methodology. Kocyigit and Kilic (2008) investigate the impact of VAT (value added tax) regulations in the leasing sector on the returns of public leasing sector shares in 2008. Based on the results from 7 companies, the CARs are found significant only between the 38th and 40th days before the event, but not over other windows.

Related to the macroeconomic data, Tokel and Yucel (2009) focus another aspect: access to data. In order to measure the impact of announcements of policy interest rates and consumer price data on online data access statistics, the Central Bank average data access statistics are used, and both events are found to be significant on the data access behavior of people.

By its nature of macroeconomic announcements, the definitions of "event" and design change from one study to another preventing to make general inferences about different types of announcements. Nevertheless, in general it can be concluded that macroeconomic news have informational value for the market. It is also important to note that macroeconomic news affects the observed variable in question (for example, the stock returns) at the same date causing a clustering problem (i.e., restriction of same event date), but clustering may not be a serious problem depending on the sensitivity of the chosen methodology.

3.10. Political events

Mandacı (2003) investigates the impact of general elections on market index, ISE-100. Based on the (−15,+15) event window, it is found that following only some elections there are ARs in the market. The results could not be generalized for all elections in conjunction with the uncertainty in political environment and macroeconomic conditions. Aktas and Oncu (2006) also consider the impact of a major political event, March 1, 2003 when the Turkish Parliament rejected the highly controversial bill that allows the deployment of US Troops in Turkey, on prices of 50 stocks listed in ISE-50 index. On the first trading day after the rejection of the motion, historical betas are estimated by using simple market model with 60 days, 120 days and 240 days of returns. Based on OLS estimates, historical betas are found significant exploratory variables for the percentage decline in stock prices on the day of sharp market fall. By using ARs on the day following the event date ($t = 1$), two portfolios (stocks with lower ARs vs. stocks with higher ARs) are formed, but the difference between portfolio returns are found insignificant referring no sign for underreaction or overreaction.

In order to examine the impact of the European Union Membership related events on stock market, Eryigit (2007) considers abnormal CARs on 17 sector indices for six important dates over 2000−2005. Different than many studies considering the returns on stocks, the significance of CARs of an index over the event window is tested. Based on results, there is no uniform pattern in the reaction to the selected events.

As a mixture of several types of events, Mutan and Topcu (2009) focus on the impact of various 10 events (including military, economic, political events, terrorism, and natural disaster) on ISE-100 index over 1990−2009. For each specific event, both CARs and the persistence of the change in index are interpreted. In another study by Chesney, Reshetar, and Karaman (2010) the impact of 77 terrorist events that occurred in 25 countries (including Turkey) on stock, bond

and commodity markets is examined over 1994–2005. Each terrorist attack is classified based on its type, target, damage and place of occurrence. By adopting three methodologies (event study, non-parametric and GARCH approaches), the differences in various markets and industries are compared. From the point of portfolio diversification, investment in US Government bond and banking stock indices are referred as "safe" whereas investing in gold and commodity markets are indicated as "not always the best hedge". Besides, the non-parametric approach is found as the most appropriate method based on the comparison of the robustness of results.

In another paper by Önder and Simga-Mugan (2006) consider the political and economic news' impact on volatility of returns and trading volume in Argentina and Turkey over 1995–1997. In each country the equality of median values of volatility and trading volume are tested. Based on the results, political news affects the stock markets' volatility and volume regardless of the market analyzed. Domestic economic news does not seem to affect the Turkish market, but country-related world economic news increases volume in Turkey. These findings suggest the importance of consideration of economic and political factors in investment decisions of international investors in emerging countries.

Similar to macroeconomic news, political events also possess information for the Turkish markets. However, again similar to macroeconomic announcements, the robustness check for the clustering would be important.

3.11. Other events

In addition to the political, economic or finance related events, impact of other events such as the football games and natural disasters on capital markets is also examined. Aygören, Uyar, and Sarıtas (2008) consider the impact of performance of football teams on stock returns in ISE where the event date is defined as the date of derbies and European football games of four biggest teams of Turkey over 2001–2007. Based on (−1,+1) event window for 87 derbies and 90 European matches, in all European football games significant ARs are observed. On the other hand, for derbies significant ARs are indicated only in case of defeats. In another study by Demir and Danis (2011), the price reactions of three biggest Turkish soccer clubs stocks to game results are examined. The results from 2008/9 soccer season indicate an asymmetric reaction to wins and losses whereas winning in a European Cup does not affect returns at all.

Bolak and Suer (2008) measure the effect of Marmara earthquake of August, 17, 1999 on stock returns in ISE. Based on results from 20 banking and insurance firms, for each insurance firm significant negative ARs are observed just after the earthquake whereas this impact is not significant for all banks.

3.12. Articles on event study methodology

Apart from these event studies conducted for Turkey, Gümüs (2008) applies BW methodology to the ISE by using 50 samples each with 20 securities where in BW studies 250 samples each with 50 securities are formed. Following BW, (−5,+5) is used as the event window and (−244,−6) as the estimation window with daily data. Comparing different methodologies (mean adjusted returns, market adjusted returns and simple market model) with certain and uncertain event dates over 1997–2007, it is concluded that, similar to BW, mean adjusted returns do not cause a serious problem. Nevertheless, other issues related to the methodology such as the calculation method of returns, sample size, length of event window, clustering problem are not considered in this elementary study.

In a more recent thesis, Basdas (2013) compares the performance of different models (mean adjusted returns, market adjusted returns, and simple market model) in the Turkish stock market with both parametric and non-parametric tests with both logarithmic and arithmetic returns. Also, the sensitivity of results to several parameters including the length of event window, different time periods, choice of database and clustering are considered. This paper basically follows the experimental design of BW, but contributes to the existing literature by extending the BW methodology in a developing market, actually first time comprehensively for the Turkish stock market. According to the results on Turkish stock market data of 471 securities over 1988–2012, similar to the findings of BW and Gümüs (2008), the mean adjusted returns do not cause a severe specification and power problem under certain circumstances, but in case of clustering, the results suggest not to use the mean adjusted returns for Turkish stock market.

In another study, Oran and Soytas (2008) also follow a simulation based method to examine the characteristics and stability of individual stock and portfolio betas in ISE. For individual stocks random 500 event dates are created, and for each date a stock is sampled with replacement. Basically the simple market model with ISE-100 index over 500-workday

Table 2
Number of event studies on Turkey reviewed year-by-year.

Year	Number of studies
1997	2
1998	3
1999	1
2000	2
2001	3
2002	1
2003	4
2004	1
2005	0
2006	8
2007	7
2008	14
2009	2
2010	9
2011	11
2012	4
2013	3
Total	**75**

Table 3
Studies employing event-study methodology with Turkish data.

Article	*N* (sample size)	Countries	Model	Index	Event window (in days otherwise stated)	Estimation Window (in days otherwise stated)	Tests
Adaoglu (2001)	838 rights offerings	Turkey, Database: ISE Publication named ISE Companies: Capital, Dividend and Monthly Price Data 1986–1999	SMM	ISE-100	(−5,+10)	(−200,−21)	*t*-test
Akarim (2013)	26 cross-listed stocks	Turkey, Database: Finnet (for prices) and Central Bank (for index)	SMM	ISE-100	(−15,+15)	(−250,−100)	*t*-test
Akben-Selcuk and Altiok-Yilmaz (2011)	62 companies involved in M&A activities	Turkey, Database: ISE	SMM	ISE-index (no other info)	(−5,+5) and (−3,+3)	Not indicated	*t*-test
Aksoy (2008)	72 financial statement announcements of 36 firms that existed both in 2002 and 2004	Turkey, Database: ISE (financial statement and event dates), Istanbul Bilgi Iletisim Sistemleri Inc. (IBS) database (the coefficients of simple market model)	SMM	ISE Comp. Index	(−10,+10)	(−110,−11)	*t*-test
Aktas and Oncu (2006)	50 stocks listed in ISE-50 index	Turkey, Database: Finnet Database	SMM	ISE-100	(0,+4)	(−16,−75), (−16,−135), (−16,−255)	*t*-test
Altan and Hotamıs (2008)	84 initial public offerings	Turkey, Database: ISE	MAR	ISE-100	Abnormal return at t=1 (first day, week and month)	–	*t*-test
Altiok-Yilmaz and Akben-Selcuk (2010)	184 dividend change announcements of 46 companies	Turkey, Database: daily bulletins of ISE	SMM	ISE-100	(−1,+1)	(−360,−6)	*t*-test
Ayaz (2006)	245 IPOs	Turkey Database: ISE	MAR	ISE-Comp. Index	36 months f ollowing the IPO	–	*t*-test
Ayden and Karan (2000)	70 IPOs	Turkey, Database: Datastream	MAR	ISE-100	36 months following the IPO	–	*t*-test
Aydogan and Muradoglu (1998)	109 rights offerings-stock dividend announcements	Turkey, Database: Survey to CEOs to obtain event dates & Capital Market Board (prices)	MAR	ISE-Comp. Index	(−30,+30)	–	*t*-test, rank and sign tests
Aygőren and Uyar (2007)	Audit reports of 101 firms	Turkey, Database: ISE and ISE daily bulletins	SMM	ISE-100	(−10,+10)	(−161,−11)	*t*-test
Aygőren et al. (2008)	87 derbies and 90 European football matches of 4 biggest teams	Turkey, Database: ISE and football teams web sites	SMM	ISE-100	(−1,+1)	(−251,−1)	*t*-test

Basdas (2013)	Application of BW (250 samples each with 50 securities)	Turkey, Database: Datastream and Matriks	MEAR, MAR, SMM	ISE-100	$t = 0$, (−1,+1) and (−5,+5)	(−244,−6)	CDA, Patell, sign and rank tests
Batchelor and Orgakcıoglu (2003)	110 announcements of 20 stocks	Turkey, Database: ISE	CAPM	No info	(−10,+10)	Full data is used to estimate CAPM.	Event related GARCH model
Bayazıtlı et al. (2008)	16 stocks	Turkey, Database: ISE (for announcements), Garanti Bank (daily returns)	CAPM	ISE-100	(−10,10)	Not indicated in the article	*t*-test
Bekçioglu et al. (2004)	3 announcements of 3 stocks	Turkey, Database: www.bigpara.com	MAR	ISE-100	(−10,10)	–	*t*-test
Bildik and Gűlay (2008)	204 inclusions to index and 180 exclusions from the index	Turkey , Database: ISE Official Daily Bulletins	MAR	ISE-100	(−10,+10)	–	*t*-test, signed-rank test and Wilcoxon sign
Bildik and Yilmaz (2008)	IPOs of 234 firms	Turkey, Database: ISE	MAR	ISE-100	1, 2, 3, 4, 5 trading days, 1, 3, 6, 12, 24, 36 months following the IPO	–	Parametric (*t*-test) and Non-parametric tests (sign and Wilcoxon signed rank)
Binici and Koksal (2013)	25 required reserve events	Turkey, Database: ISE	SMM	ISE-100	(−30, +1)	–	*t*-test
Bolak and Suer (2008)	20 firms	Turkey, Database: ISE	SMM	ISE-100	(+1,+30)	(−250,−1)	*t*-test
Bozcuk (2010)	20 corporate governance rating report announcements	Turkey, Database: ISE	SMM	No info	(−5,0), (−2,0), (0,2) and (0,5)	Not indicated	*t*-test
Chesney et al. (2010)	77 terrorist events from 25 countries	25 countries, Database: Datastream (financial market indices)	MEAR	Only impact in global indices	(0,+5)	(−11,−30)	CDA and non-parametric test (local polynomial regressions)
Cukur and Eryigit (2006)	5 stocks	Turkey, Database: ISE	SMM	ISE-100	(−10, 10)	(−159,−10)	*t*-test
Cukur and Eryigit (2007)	22 events	Turkey, Database: ISE	SMM	ISE-100	(−10,+10)	(−110,−11)	*t*-test
Demir and Danis (2011)	Event number changes per soccer club	Turkey, Database: Euroline (platodata.com.tr) and mackolik.com (soccer game results)	SMM	ISE-100	$t = 1$ (first trading day after the game)	Not indicated	*t*-test
Dogu et al. (2010)	4564 observations of 213 firms	Turkey, Database: ISE	SMM	ISE-100	(−15,+15)	(−250,−16)	Z-statistics
Dogukanlı et al. (2012)	Stocks included in ISE-100 index	Turkey, Database: ISE	MAR	No info	CARs over 1, 2, 3, 6, 12, 24 and 36-month periods	–	*t*-test
Erdogan and Yezegel (2008)	592 instances where ISE requested information from firm management	Turkey, Database: ISE	SMM	ISE-100	(−5,0)	(−300,−46)	Parametric (Patell, portfolio time-series standard deviation and

(*continued on next page*)

Table 3 (*continued*)

Article	*N* (sample size)	Countries	Model	Index	Event window (in days otherwise stated)	Estimation Window (in days otherwise stated)	Tests
							skewness corrected transformed normal tests) and non-parametric tests (sign and rank tests)
Erdogan et al. (2010)	10,147 analysts recommend.	Turkey, Database: I/B/E/S database (recommendations), ISE, Global Financial Database (bill rates)	SMM (CAPM for long term performance)	ISE-100	(−20,+20)	−300,−46)	Patell, portfolio time-series standard deviation and skewness corrected transformed normal tests and sign test
Erpek (2006)	IPOs of 9 incorporated companies	Turkey, Database: ISE	MAR, CAPM	ISE-100	(+1,+31)	Only for CAPM, (−91,−1) estimation window	*t*-test
Eryigit (2007)	6 important days related to the EU membership	Turkey, Database: Plato Data	SMM	No info	9 different event windows over (−20,+20)	Estimation period is defined as 150 days.	*t*-test
Erzurumlu (2011)	42 trigger points for ISE-100 and 23 points for ISE-30	Turkey, Database: ISE	Index changes are considered.	ISE-100	(0,+30)	–	*t*-test
Gűműs (2008)	Application of BW (50 samples each with 20 securities)	Turkey, Database: ISE	MEAR, MAR, SMM	ISE-100	(−5,+5)	(−244,−6)	*t*-test, sign and rank tests
Gűnalp et al. (2010)	321 dividend announcements of 83 stocks	Turkey, Database: ISE	MAR	ISE-TUM (ISE-ALL)	(−5,−1), (−2,−1), 0, (0,1), (0,2), (0,4), (0,10), (0,15)	–	Regression analysis with CARs
Hekimoglu and Tanyeri (2011)	125 merger announcements	Turkey, Database: Securities Data Company (SDC), Dow Jones Factiva, Market Line Financial Deals, Borsa Istanbul Company News, Datastream (prices and indices data)	SMM	ISE-100	(−30,+30)	(−282,−31)	CDA

Kaderli (2007)	3 announcements of 3 stocks	Turkey, Database: ISE	MAR	ISE-100	(−5,+5), (−10,+10), (−20,+20)	–	*t*-test
Kaderli and Demir (2009)	26 stocks from 5 sectors	Turkey, Database: Finnet and ISE	MAR	ISE-100	(−5,+5)	–	*t*-test
Kadioglu (2008)	330 cash dividend announcements	Turkey, Database: ISE	MAR	ISE-ALL	(−5,+5)	–	*t*-test
Kaminsky and Schmukler (2002)	103 domestic-country rating and outlook changes (56 upgrades and 47 downgrades). For Turkey, 6 events (3 upgrades and 3 downgrades)	16 emerging markets, Database: JP Morgans Emerging Markets Bond Index (EMBI) for sovereign bond yield spreads, Bloomberg and Datastream (stock prices, US interest rates and credit ratings)	MAR	S&P 500 US stock market index	(−10,+10)	–	Tests are conducted for panel regressions
Kaya (2012)	32 IPOs	Turkey, Database: ISE and Euroline (for prices), Central Bank and Turkish Statistical Institute (for risk free rate)	CAPM	ISE-100	1 day, 2−4 days, 1 week, 1, 3 and 6 months following IPO	182 days returns of similar firms (before IPO)	*t*-test
Kırkulak Uludag and Demirkaplan Gűlbudak (2010)	37 mergers	Turkey, Database: ISE (merger announcements and financial statements) and Analiz Software Co. Database (price data)	MAR	ISE-100	5 days and 12 months before and after the merger	–	*t*-test
Kıymaz (1997a)	25 initial public offerings	Turkey, Database: ISE	MAR	ISE-Composite Index	Over 1−10 days	–	*t*-test
Kıymaz (1997b)	39 initial public offerings	Turkey, Database: ISE	MAR	ISE-Composite Index	Over 1−30 months	–	*t*-test
Kıymaz (1999)	614 gossips about manufacturing firms	Turkey, Database: Ekonomik Trend Weekly Magazine	SMM	ISE-100	(−30,+30)	(−210,−31)	*t*-test
Kıymaz (2000)	163 initial public offerings	Turkey, Database: ISE	MAR	ISE-Composite Index	Over 1−8 days	–	*t*-test
Kocyigit and Kilic (2008)	7 companies in leasing sector	Turkey, Database: paragaranti.com	SMM	ISE-100	(−43,+43)	Indicated as 127 days	*t*-test
Kurtay (2007)	6650 transactions	Turkey, Database: ISE	SMM	ISE-100	(−20,+20)	Yearly estimations	*t*-test
Mandacı (2003)	Impact of 4 elections on ISE-100	Turkey, Database: TBMM.com (for elections) and ISE	Returns on index are used	ISE-100	(−15,+15)	(−360,−15)	*Z*-test, *t*-test
Meder Cakır and Gűlcan (2012)	M&As of 81 firms	Turkey, Database: Ernst & Young M&As Report	MAR	ISE-100	(−5,+5) and (−20,+20)	–	*t*-test
Mehdian et al. (2008)	14 favorable and 14 unfavorable economic and political events	Turkey, Database: ISE	Returns on indices are used.	ISE-100 and ISE-ALL	(0,+30)	–	*t*-test
Muradoglu and Aydogan (1998)	513 stock dividend/rights offering decisions of 169 companies	Turkey, Database: Capital Market Board of Turkey	MAR	ISE-Comp. Index	(−30,+30)	–	*t*-test and rank test
Muradoglu and	513 stock dividend/rights	Turkey, Database:	MAR	ISE-Composite	(−30,+30)	–	*t*-test, rank

(*continued on next page*)

Table 3 (*continued*)

Article	*N* (sample size)	Countries	Model	Index	Event window (in days otherwise stated)	Estimation Window (in days otherwise stated)	Tests
Aydogan (2003)	offerings decisions of 169 companies	Capital Market Board of Turkey		Index			test and sign test
Muslumov (2008)	7224 insider trading	Turkey, Database: ISE daily bulletins	Market adjusted volatilities	No info	(−2,+2)	Different pre-announcement windows over (−50,−3) and post-announcement windows (+3,+50)	*t*-test
Mutan and Topcu (2009)	10 events impact on index	Turkey, Database: Central Bank of Turkey	MAR	ISE-100	(−30,−11)	(0,+10)	*t*-test
Odabasi (1998)	603 earnings announcements	Turkey, Database: ISE and database of the Center for Applied Research in Finance (CARF) of the Bogazici University	SMM	ISE-100	(−15,+15)	(−60,−16) and (+16,+30)	*t*-test
Oelger and Schiereck (2011)	112 acquisitions	Turkey, Database: Thomson One Banker	SMM	ISE-100	(−20,+20)	(−220,−21)	*t*-test
Onar and Topcu (2011)	50 strategic decisions	Turkey, Database: ISE (for price data), Turkish Statistical Institute	Not indicated	No info	(−3,+3)	100 days estimation period	*t*-test
Otlu and Őlmez (2011)	53 stock certificates	Turkey, Database: ISE and Finnet	MAR	ISE-TUM (ISE-ALL)	Over 1-21 days	–	*t*-test
Őnder and Simga-Mugan (2006)	257 domestic political and economic, 310 world political and economic, 264 domestic world economic and political news	Turkey and Argentina, Database: WSJ and NYT for news and Datastream	Mean adjusted volatility	ISE-100	Yearly means of returns on index	–	*t*-test
Őzer and ve Yűcel (2001)	686 rights and bonus issues	Turkey, Database: ISE	MAR	ISE-100	(−20,+20)	(−61,−21)	Patell test
Őzkanlı (2011)	43 public announcements of one firm from textile industry	Turkey, Database: Central Bank of Turkey	MAR (SMM & MEAR results are not presented, but applied)	ISE-100	(−5,+5)	–	(None of the tests are applied)
Penas and Tumer-Alkan (2010)	199 bank-quarter observations	Turkey, Database: ISE	MAR	ISE-100	(−1,0)	–	*t*-test
Sakarya (2011)	11 stocks	Turkey, Database: Garanti Bank (paragaranti.com for prices and tkyd.org for	MAR	ISE-100	(−10,+10)	–	*t*-test

		ratings)					
Solakoglu and Orhan (2007)	52 acquirer and target information	Turkey, Database: Bloomberg data through a local investment firm (for M&A) and www.analiz.com	SMM	ISE-100	(−10,+10)	(−90,−11)	*t*-test
Tahaoglu and Gűner (2011)	9163 insider transactions in shares of 216 companies	Turkey, Database: ISE	Fama-French Three Factor Model	ISE-ALL	–	Portfolio formation method is used. (5, 10, 21, 42, and 63 day holding periods are used)	*t*-test (regression analysis)
Tascı (2008)	8 banks	Turkey, Database: bulletins of ISE for the announcements and Finnet for price data	SMM	ISE-100	(−3,+3)	(−315,−4)	CDA
Teker and Ekit (2003)	34 IPOs	Turkey, Database: ISE	CAPM	Not defined in the article	(−1,−91)	(0,+30)	*t*-test and Wilcoxon signed rank test
Tűkel (2010)	42 IPOs	Turkey, Database: ISE	MAR	ISE-100	1st trading day and 36 months following the IPO	–	*t*-test
Yalçıner (2006)	IPOs of 93 firms	Turkey, Database: ISE and IBSAnaliz.com.tr	MAR	Not defined in the article	1, 2, 3, 4, 5, 6, 7 trading days, 1, 2, 3, 4, 5 months following the IPO	–	*t*-test
Yazıcı and Muradoglu (2001)	199 recommendations, 89 different stocks	Turkey, Database: Stock recommendations by Investor Ali (from the issues of Moneymatik Magazine)	MAR	ISE-100	(−19,+20)	–	*t*-test
Yilmaz and Gulay (2006)	602 cash dividend payments	Turkey, Database: ISE	MAR	ISE-100	(−10,+10)	–	*t*-test
Yolsal (2011)	45 stock splits out of 159 stock splits (selected once randomly)	Turkey, Database: ISE	SMM	ISE-100	(−10,+10)	(−89,−11)	Traditional *t*-test, Patell test, BMP *t*-test, Corrado-Zivney Rank test, Corrados Rank Test

(*continued on next page*)

Table 3 (*continued*)

Article	*N* (sample size)	Countries	Model	Index	Event window (in days otherwise stated)	Estimation Window (in days otherwise stated)	Tests
Yőrük and Ban (2006)	8 mergers	Turkey, Database: ISE	MAR	ISE-100	(−116,+116), (−30,+30), (−20,+20), (−10,+10), (−5,+5)	–	*t*-test
Yucel and Taskin (2007)	All listed companies over 1992–2005 are used to form portfolios.	Turkey, Database: www.analiz.com	MAR	Not indicated	(−11,0) monthly returns	–	*t*-test
Zhu and Jog (2012)	1,669 domestic and 906 cross-border partial acquisitions (27 domestic and 36 cross-border for Turkey)	18 countries, Database: Datastream	SMM	Broadest local index	(−1,+1)	(−120,−30)	*t*-test

Notes: Mean Adjusted Returns: MEAR, Market Adjusted Returns: MAR, SMM: Simple Market Model, CAPM: Capital Asset Pricing Model.

window around the event date is employed. However, their study is not basically on the methodology nor on the measurement of a specific event.

4. Discussion of event studies on Turkey

In line with the growing literature on event studies in the literature, the number of event studies conducted for Turkey has also been rising from only 2 or 3 studies in 1990s (Table 2). In this review, selected 75 event studies over 1997–2013 are examined especially from the perspective of their event study designs rather than their conclusions. Indeed, evaluation of their designs plays the most crucial role before relying on their results.

Based on the summary of event studies in Turkish stock market that provide sufficient information about their underlying model (Table 3), it is generally seen that the results generally indicate the violation of semi-strong form of efficiency in Turkish Stock Market (where the main concern was to test the efficiency of the market). Nevertheless, this review paper focuses on the methodology of papers instead of tests of efficiency in Turkey. Correspondingly, the most important points about their designs are discussed as follows:

- Number of the events considered can significantly vary. Even though some of this variation is attributable to the main research question of the study, still there may be a problem of insufficient sample size in some of the papers conducted for Turkey. To illustrate; Bekçioglu et al. (2004) and Kaderli (2007) uses 3 announcements for 3 stocks and Őzkanlı (2011) collects the announcements of only one firm in textile industry. The results of these analyses can still be valuable for company-specific interpretations, but the number of events can be too low to make a generalization about the efficiency of an entire market. In case the number of events does not enable for a proper event study, the research question can be changed or the interpretation has to be cautiously done, probably specific to the selected stock(s).
- 32 out of 75 studies use only market adjusted returns, 27 articles apply only simple market model, and 1 study employs only mean adjusted returns. In the paper of Őnder and Simga-Mugan (2006) also mean adjustment is used, but yearly mean values on market index are used to calculate the volatility in the markets. In 4 studies only CAPM is used to calculate abnormal returns. Also, only in 1 study (Tahaoglu and Gűner, 2011) Fama–French Three Factor Model is used.

  In only 1 study (Erpek, 2006), both market adjusted and CAPM are employed. On the other hand, 1 study (Erdogan et al., 2010) employs simple market model, but also uses CAPM for the long term performance.

  In 3 studies returns on index are considered only, so that there is no underlying model for these papers. For 1 study, the details about model could not be found in the article.

Only in 3 studies (Basdas, 2013; Gűműs, 2008; Őzkanlı, 2011) mean adjusted, market adjusted returns and simple market model are used together. Indeed, Basdas (2013) and Gűműs (2008) are simulation based studies that must be separately considered from other event studies. Therefore, only Őzkanlı (2011) examines actual events with three models. It is important to note that except Basdas (2013) and Gűműs (2008), in none of the studies the choice of the underlying performance model is the main concern of study.

Overall, the choice of abnormal return generating model of studies indicate that the analysis is generally focused on only one model where in most of the cases this model corresponds to market adjusted returns. However, as shown in BW for the US and also in Basdas (2013) for Turkey, the test results may differ depending on the choice of model. Therefore, the researcher should be aware of the problems in his/her model if the market or mean adjusted returns would be used instead of market model.

- In 57 out of 75 studies (including 8 studies applying ISE-Composite Index), ISE-100,[6] which is named as BIST-100 after April 3, 2013, is selected as the market index. In 4 studies, ISE-TUM[7] (ISE-ALL or BIST-ALL with its name after April, 2013) is selected whereas in only 1 study S&P 500 Index is used considering the multi-country analysis. On the other hand, in 10 of the studies the market index is not indicated in detail. In only 1 study, returns on both ISE-100 and ISE-ALL are considered. In Chesney et al. (2010), the global indices are used to calculate the abnormal returns.
  Considering the fact that BIST does not provide any equally-weighted index, it is not surprising to observe that BIST-100 and BIST-ALL have been widely used (i.e., the sensivity to equal or value weighted index cannot be considered).
- Depending on the research question and selected model, the length of event windows varies, but generally (−5,+5) is preferred with daily data.
  Since selection of a narrower event window would help to isolate the impact of other events that can occur within the same window, it is favorable to have more shorter event windows. However, this window utterly depends on the main research question changing from study to study.
- In only 12 studies both parametric and non-parametric tests are applied. Mostly *t*-test is selected to test the significance of ARs, and among non-parametric tests the rank and sign tests are widely used. However, considering the high non-normality of stock returns, 12 out of 75 studies refers a weakness of the existing event studies on Turkey. Indeed, Campbell et al. (2009) claim that non-parametric test, especially the rank and sign tests, are better specified and more powerful than parametric tests, especially in multi-day windows, because of serious non-normality problems.

The summary of previous studies in Borsa Istanbul shows that event studies generally choose ISE-100 (BIST-100) and market adjusted returns, without basing the choice of model, mainly focusing on the parametric tests. In general, the studies prefer to rely on one type of model to calculate the ARs. In most of the studies, even though the main research question is to examine the impact of the selected event, there is little room to discuss on the selection of the underlying model. However, as suggested in Gűműs (2008) and more comprehensively in Basdas (2013), the results may be misleading due to improper designs.

Especially for the event studies focusing on the impact of political events or macroeconomic announcements, there is a risk of clustering, which means restricting the same event date for all securities in a given sample. The analysis of the clustering has important implications for the structure of the market. If the clustering problem does not alter the results of tests, this would imply that investigation of any event affecting all firms at a special date can be done by the event study without any methodological problem. However, as shown in the early studies of BW for the US, even though mean adjusted returns does not cause a significant problem in the specification and power of tests, under clustering problem the specification error considerably rises. In BW, the specification error jumps from 4% to 14% with mean adjusted returns in case of clustering problem. In other words, the null hypothesis of no abnormal returns would be rejected in 14 out of 100 cases on average when there is no abnormal return. This means that the researcher would report significant impact of 14 events when there is none. A similar problem in Turkish capital markets has also been stated by Basdas (2013) where the specification error can reach up to 16% with mean adjusted returns. Therefore, the upcoming event studies may prefer to avoid clustering in their design, and choose to follow other methodologies in order to avoid misleading results whenever the same event date affects all variables in one sample.

Another important observation from Table 3 is that some of the studies use the data source as the Exchange (BIST). However, it is important to note that the BIST does not provide adjusted price series, only the raw price series are available to public. Therefore, an adjustment is needed by the researchers in order to calculate the returns, or another database providing the adjusted series has to be chosen for a study on Turkey. In many studies this adjustment procedure on the acquired datasets from the ISE is not explained in detail. Besides, there

[6] ISE-100 index is used as the main index for Borsa Istanbul Equity Market. It is the successor of the Composite Index which was introduced in 1986 including the stocks of 40 companies and was in time limited to the stocks of 100 companies. It consists of 100 stocks which are selected among the stocks of companies listed on the National Market and the stocks of real estate investment trusts and venture capital investment trusts listed on the Collective Products Market. BIST-100 (ISE-100) index automatically covers BIST-30 and BIST-50 stocks.

[7] The index consists of the stocks of companies traded on all Borsa Istanbul markets except Investment Trusts.

is another robustness check is needed at this step: in case the adjustment procedures differ significantly, the choice of database may change the results as well (Basdas, 2013).

In a nutshell, the review of previous event studies on Turkey reveals the fact that the future event studies should question the compatibility of research questions to their designs in more detail. Especially inclusion of sufficient number of observations and definition of clear events should be essential components of a proper design. Since the research questions testing the impact of macroeconomic or political announcements on stock returns may be prone to clustering problem, the researcher should be aware of getting some misleading results under clustering based on the selected AR generating model. Therefore, the researcher should be prepared to change the methodology such as using a regression model in case the event study does not fit the basic aims of the study. Even though recent studies provide a base for the selection of underlying model in Turkish stock market, comparison of different AR calculation models would also be useful. Last but not least, both parametric and non-parametric tests have to be applied together due to high non-normality in returns. It is important to note that the developing literature on event studies for Turkey address important steps of the event study design, but the aforementioned points emphasize some additional highlights. After the inclusion of these components, event studies on Turkey would add more value to the discussion of the market structure.

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