



APPLICATIONS OF PARAMETRIC AND NONPARAMETRIC TESTS FOR EVENT STUDIES ON ISE

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Abstract

In this study, we conducted a research as to whether splits in shares on the ISE-ON Index at the Istanbul Stock Exchange have had an impact on returns generated from shares between 2005 and 2011 or not using event study method. This study is based on parametric tests, as well as on nonparametric tests developed as an alternative to them. It has been observed that, when cross-sectional variance adjustment is applied to data set, such null hypothesis as “*there is no average abnormal return at day 0*” couldn’t be rejected through both parametric and nonparametric tests.

Keywords: Event Study, Parametric Tests, Nonparametric Tests

Jel Classification: G14, C12, C14

Özet

Bu çalışmada İstanbul Menkul Kıymetler Borsasında 2005-2011 döneminde İMKB-30 endeksine giren hisselerle ait bölünmelerin senet getirilerine etkisi olup olmadığı olay çalışması yöntemi ile araştırılmıştır. Çalışmada parametrik testler ve bu testlere alternatif olarak geliştirilen non-parametrik testler kullanılmıştır. Veri kümesine çapraz kesit varyans düzeltilmesi uygulandığında, seçilen örneklem için “*0. günde ortalama anormal getiri yoktur*” şeklindeki sıfır hipotezinin hem parametrik hem de parametrik olmayan testlerle reddedilemediği görülmüştür.

Anahtar Kelimeler: Olay Çalışması, Parametrik Testler, Nonparametrik Testler

Jel Sınıflaması: G14, C12, C14

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1. INTRODUCTION

Upon making a firm-specific event public, “event study” which examines the changes in the asset prices of the firm in question is used in many areas such as management and finance, corporate social responsibility projects, history, law, economics. Event study which has a very long history examines the effect of firm-specific event on the asset prices of the firms and also tests market efficiency based on information.

The adjustments in the stock prices as based on the information received by the markets take place in the finance literature as “efficient market hypothesis”. Accordingly, the market where the available information is reflected onto the financial asset prices are called “efficient market” (Fama, 1970: 383). The market efficiency is examined in three different categories as;

- Tests for return predictability
- Event studies
- Tests of private information. (Fama, 1991: 1575-1576)

The tests for the predictability of the returns which takes place in this classification are used in place of the weak efficiency concept that tests the anomalies in the stock price movements and include the variables such as the dividend payment, interest rates, and the tests such as the cross-section estimation of the balance pricing model, size effect, seasonal effect and price fluctuation tests (Fama, 1991: 1576-1577). The event studies in the second category, is the semi-strong efficiency form which examines the extent of the reflection of the publicly known information onto the current prices. The event studies test; the reflection on the stock prices, of the stock splits, announcement of the financial reports of the firms to the public; dividend payment, issuance of new stock, merging and acquisition, the change of top-management in the firms, any development in the industrial branch where the firm operates, any macro-economic decision or arrangement of the government, and any similar situation, event or action producing information, and how the prices shall be adjusted with these new situations which had arisen (Fama, 1970: 404-405). The “strong efficiency” concept, which is the final category and tests whether the information acquired by the insider training is



completely reflected on the prices or not, is named as “tests of private information” (Fama, 1991: 1577).

In an informational efficient market, it is believed that the stock prices reflect the real values of the firms they belong to. The event studies are developed in order to measure the effect of any unexpected situation, event or action on the stock prices in such a market. Formation of anomalies in the stock returns based on the information received by the market relevant to the firms is completely related to the theory of efficient market. At this point, the unexpected event for the market and how this event effects the stock prices should be explained first.

If there are anomalies in the stock prices around the date on which the event of the type mentioned above relevant to the firm is realized, the investor can predict these anomalies and obtain excess return. However, in an efficient market it is assumed that the stock prices would be adjusted rapidly as based on new information received by the market following the realization of a specific event and that no investors would obtain excess returns. Again, some news, such as the change of top-management, a firm taking over another firm, can be learned by some investors from time to time, before these are announced to market through the official channels. In case of such information leakage, the investors who receive the information, can adjust their positions and increase their profits since the event is expectable for them. Since this shall be in conflict with the efficient market theory, the firm-specific event in the event studies should be unexpected event. Otherwise, event studies would not be an appropriate method anymore.

One of the first studies relevant to the method was conducted by Dolley in 1933. In his study, Dolley examined the effect of the splits of 95 stocks on the prices of the stock prices between the years 1921 – 1931 (Campbell vd., 1997: 149). The pioneer study relevant to the event study applications in the finance literature today is the study conducted by Fama, Fisher, Jensen, and Roll [FFJR(1969)] as based on an idea given by J.H. Lorie (Fama vd., 1969: 1-21). In the study, which examined the effect of the new information caused by the stock splits on the returns of the stock, it was started off from the idea that abnormal behaviors in the returns based on the split would be observed on the months around the date



of the stock split and that such anomalies would be reflected onto the residuals of the regression predicted relevant to the stock in the mentioned months. In the study, the self-adjustment speed of the prices as based on new and private information received by the market is tested. In the study, 940 stock splits realized by using the monthly New York Stock Exchange data of Center of Research in Security Prices (CRSP) newly developed in USA at that period, which were made between January 1927 – December 1959 and the following changes in the dividend distributions were examined. All the studies conducted in the following years were based on FFJR (1969) in principle and in such studies, in addition to the examination of the effect of the event determined as firm-specific on the returns; the efficiency of the market was tested at the same time.

Starting from 1980s, the studies on the methodology of event studies were started to be conducted. In these studies, the statistical and econometric properties of event study methods were examined. First of all, security price performance was measured by using observed monthly stock return (Brown ve Warner, 1980: 205-258) and afterwards, daily data was used to explain how the event study methodologies would predict and test the excess returns (Brown ve Warner 1985: 3-31). It is determined that the monthly returns and daily returns used in these studies do not have a normal distribution and that the daily data is far and fat tailed to the normality when compared to the monthly data. Since the data moved away from the normal distribution together with the parametric “t tests” used in order to test the abnormal performance, the standard nonparametric tests such as “sign test” and “Wilcoxon sign rank test” were also used. Today, the methods used by Brown and Warner are generally constituted the basis in the event studies.

In Turkish stock market, the effect of firm-specific event on the asset returns was started to be examined starting from 1990s. However, the studies conducted had examined the effects of the event more with regards to the finance theory.

In the study conducted by Muratoğlu and Aydoğan (1998), the stock splits between the years 1988 – 1994 were examined and the change in the abnormal returns was examined by dividing the examination period into sub-periods. In the study, the returns of the new firms quoted on Istanbul Stock Exchange (ISE) and the previously quoted firms were compared



both with traditional t test and Corrado's rank test and it is concluded that there is significant abnormal returns on day 0. The parametric and nonparametric tests applied also gave results within the same direction.

In the study of Gürbüz, Tantan and Yolsal (2000) the significance of the abnormal returns and cumulative abnormal returns is tested with t test. It is observed that the stock splits announcements in short event period are significant and have negative effect.

When the study of Adaoğlu (2001), in which the returns of the firms which distribute bonus shares by stock splits and the firms which do not distribute such bonus shares between 1986 – 1999 period in ISE, is examined, Adaoğlu had determined by t test and regression analysis that the companies which distribute bonus share give positive market reaction.

Bildik and Gülay (2008) examined the revisions realized in ISE-30 and ISE-100 indices in the period 1995 – 2000. In the study, Boehmer, Musumeci, and Poulsen (henceforth BMP) (1991) t test is used. In both indices, it is determined that the price decreases after the revision date.

In the studies relevant to Turkish stock market, it is seen that generally parametric tests are used in testing the abnormal performance arising of the event effect and that nonparametric tests are not used, except in the study of Muratoğlu and Aydoğan (1998).

In this study, parametric and nonparametric tests used in testing the abnormal performance due to event effect shall be introduced and the effect of the stock splits quoted on ISE on the firm returns shall be tested both by parametric and nonparametric tests.

In Section 2, event study methodology shall be summarized and information shall be supplied about parametric and nonparametric tests. In Section 3, the effect of stock splits of the stocks traded at ISE and included within ISE-30 index, on the returns shall be tested by parametric and nonparametric tests. In the final section, the findings shall be interpreted.



2. EVENT STUDY METHODOLOGY

Conducting an event study initially starts with the introduction of a firm-specific event like stock split which is the subject matter of the study. The announcement date of the concerned event should be determined explicitly and clearly. Event date can be determined more clearly with the daily data when compared with the monthly data. In case daily data is used, event period (window) should be determined by considering that the event shall have effect on the returns on few days before and after the event date. Since the purpose of the event study is to measure the abnormal performance in the event period that covers the event date, first, it is required to predict the abnormal performance. Due to this reason, estimation period (window) starting from an older date should be selected prior to the event period. In estimation period a model is required in order to estimate the abnormal returns. The parameters of the selected model should be estimated in the estimation period and the abnormal returns should be calculated in the event period.

The price performance of a stock of any financial asset can be considered only relevant to a specific reference point. While the prices are adjusted as based on the new information received by the market, first, it is required to define the normal return in order to test whether the investor obtains abnormal returns or not. The normal return is defined as the expected return of the stock, in case no information relevant to the stock is received by the market, in other words, in case of the absence of the concerned event (Campbell *vd.*, 1997: 151). In the event studies, the processes that generate the ex-ante expected returns can be predicted by various models and each one of these models is defines the abnormal return of the concerned stock at a specific t time as the difference between the ex-post returns realized for the stock and the returns estimated from the model (Brown *ve* Warner, 1980: 207). In short, the abnormal returns are defined as the forecasting error of the model selected.

In general three models are used in order to model the abnormal returns in the event studies. These are mean adjusted returns model, market adjusted model and market and risk adjusted return model. All three models predict unbiased abnormal performance. The abnormal returns are estimated as;



$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (1)$$

In the market adjusted model. Here, R_{it} is the actual return of the i. stock on day t, R_{mt} is the return of the market portfolio on day t. For the market portfolio usually an index such as ISE-100 is used. α_i is the intercept term, β_i is the systematic risk of the i. stock and they are estimated by the ordinary least square (OLS) method from the estimation period. ε_{it} is the residuals of market model and $E(\varepsilon_i) = 0$, $Var(\varepsilon_i) = \sigma_\varepsilon^2$ The residuals are must be identically and independently normally distributed (NIID). Market model residuals give the abnormal returns (AR_{it}), which is defined as the difference between the actual return (R_{it}) and the expected return $E(R_{it} | R_{mt})$ as;

$$AR_{it} = R_{it} - E(R_{it} | R_{mt}) \quad (2)$$

In order to test the hypothesis of any specific event does not have an effect on the average of the returns, [$H_0 : E(AR_{it}) = 0$] in the form that the event study through the market model, first the abnormal returns predicted as individually should be aggregated. Aggregation should be realized both in the time series dimension and the cross-sectional dimension. During the performance of the aggregation, it is assumed that there is no correlation between two different abnormal stock returns at both the time series and the cross-sectional dimension. Moreover, it is assumed that the event concerned does not have the same event date for the stocks examined, in other words, there is no clustering. This way, the cross-sectional average of the abnormal returns is calculated as;

$$\overline{AR}_t = \frac{1}{N} \sum_{i=1}^N AR_{it} \quad (3)$$

where N indicates the number of firms included in the study.

If in the event period it is thought that the abnormal performance lasts not one day but a few days starting from the event date until the concerned date, and then Cumulative



Abnormal Returns (CAR) should be calculated. CAR is found by addition of the CAR values of the previous days to AR_{it} value on t day.

$$CAR_t = CAR_{t-1} + AR_t \quad (4)$$

The average of CAR value is calculated as;

$$\overline{CAR} = \frac{1}{N} \sum_{i=1}^N CAR_i \quad (5)$$

for N firms. The use of CAR values is useful only if the real event date is known definitely.

While the above assumptions are valid, AR_{it} and CAR_t are distributed independently and identically. Under these assumptions, various parametric and nonparametric tests are used when testing the statistical significance of AR_{it} . However especially with daily returns, these assumptions are violated. So security residuals are correlated and the variance of the return in the event period is not the same as the variance in estimation period. These problems of event study method could be solved when cross sectional variance correction is performed to data set.

2.1. Parametric Tests for Event Study Methodology

The parametric tests used commonly in the event study methodology are; the traditional t test used by Brown-Warner (1980) t test developed by Patell (1976), and BMP t test.

2.1.1. Traditional t test

Traditional t test, relies on the assumption that the average abnormal returns as

$$AR_t \sim N\left(0, \frac{\sigma^2}{N}\right)$$

are normally distributed independently and identically. Consequently it shall be as;



$$Z = \sqrt{N} \frac{\overline{AR}_t}{\sigma} \sim N(0,1)$$

However, σ is not known in the application. Due to this reason, the standard deviation of the residuals estimated from the estimation period is used as estimator of σ . With the assumption that the residuals which are the measurements of the abnormal performance are uncorrelated between the stocks, the abnormal performance standard deviation is based on the standard deviation of each stock performance measure of the sample in the estimation period. Accordingly, while T indicates the length of the estimation period, the test statistics on day 0;

$$t_{rad.} = \frac{\frac{1}{N} \sum_{i=1}^N AR_{i0}}{\frac{1}{N} \sqrt{\sum_{i=1}^N \frac{1}{T-1} \sum_{t=1}^T \left(AR_{it} - \sum_{t=1}^T \frac{AR_{it}}{T} \right)^2}} \quad (6)$$

complies with T-1 degrees of freedom and Student's t distribution (Brown ve Warner, 1980: 253).

In the traditional approach applied by Brown-Warner, the reason for calculating the standard deviation of the residuals from the estimation period is to solve a probable cross-sectional dependence problem.

2.1.2. Patell's t test

Patell approach, like the traditional t test, also assumes that the security residuals are uncorrelated both in the time series and cross-sectional dimension. In the Patell approach, the residuals should be standardized before the formation of the portfolio. This way, residuals with unit normal distribution shall be obtained. While the abnormal returns are standardized as;

$$SAR_{it} = \frac{AR_{it}}{SD_{it}} \quad (7)$$



SD_{it} is as

$$SD_{it} = s_i \sqrt{1 + \frac{1}{T} + \frac{(R_{m0} - \bar{R}_m)^2}{\sum_{t=1}^T (R_{mt} - \bar{R}_m)^2}} \quad (8)$$

Here, s_i is the standard deviation of the residuals for i.firm, T is the length of the estimation period, \bar{R}_m is the average returns of the market portfolio in the estimation period and this way, the forecast error is also taken into consideration while standardization.

Patell showed that \widehat{SAR} estimations comply with Student t distribution with 0 average and $T - 2 / T - 4$ variance and that the distribution shall approach the normal with 0 average and $T - 2 / 4(T - 4)$ variance for the large estimation period. Accordingly, while showing the length of T estimation period on day 0; Patell's statistics is as

$$t_{Patell} = \overline{SAR}_{i0} \sqrt{\frac{N(T-4)}{T-2}} \quad (9)$$

In Patell approach, event-induced variance increases are not taken into consideration. However, while calculating abnormal returns and the standardization in this approach, the idea of benefiting from the forecast error in (8) is also used in BMP t test which is proposed in order to solve the problem of event-induced variance.

2.1.3. BMP t test

In the event study, it is not generally examined whether there is an increase in the variance of the returns. However, the occurrence of event-induced increases in the variance of the returns shall influence the abnormal performance testing capability of the event study method. Brown-Warner assumes that the event has identical effect on all the firms. So, even a small event induced increase in the variances of the return shall cause the management to be unsuccessful. Negligence of variance increase shall cause the variance to be underestimated.



This way, the traditional t statistics shall be too large and the correct null hypothesis shall be rejected usually. BMP test is proposed in order to solve the problems due to the event-induced variance (Boehmer vd., 1991: 253-272).

During the test process, first, the residuals should be standardized upon proportioning to the estimation period standard deviation by taking forecast error into account as in Patell approach. Following this, the standard residuals should be aggregated as cross-sectional. The test statistic is calculated by proportioning the standardized residuals in the event period to the cross-sectional standard errors. This way, the test statistic on the event date is as follows:

$$t_{BMP} = \frac{\frac{1}{N} \sum_{i=1}^N SAR_{i0}}{\sqrt{\frac{1}{N(N-1)} \sum_{i=1}^N \left(SAR_{i0} - \sum_{i=1}^N \frac{SAR_{i0}}{N} \right)^2}} \quad (10)$$

Here SAR_{i0} indicates the standardized residuals on the event date.

2.2. Nonparametric Tests for Event Study Methodology

Parametric tests are valid only if the stocks returns are normal. However, it is known that the distribution of the daily returns specifically departures from the normal distribution. The simulation studies realized had shown that the return distribution is fat tailed, in other words, leptokurtic. In this case, the application of the parametric tests shall not be appropriate especially in the small samples. The nonparametric alternatives of these tests should be preferred. The nonparametric tests are also more robust than parametric test against outliers.

The standard nonparametric tests such as “Sign test” and “Wilcoxon sign rank”, which assume that excess return distribution is symmetrical, (Brown ve Warner, 1980: 220, Brown ve Warner, 1985: 24) are not appropriate for use in cases where the distribution is not symmetrical. In such simulation studies, it is determined that the excess return distribution is generally not symmetrical. Due to this reason, nonparametric tests are proposed by Corrado(1989) and Corrado and Zivney(1992).



2.2.1. Corrado's Rank Test

Corrado's rank test, which does not require the cross sectional distribution of the excess returns to be symmetrical, takes the magnitude of the excess returns into consideration, unlike from the standard sign test. However, Corrado's rank statistics test only the single day (day 0). In the test, all the time series observations of each stock are used. When the rank of the abnormal returns is shown by $K_{it} = \text{rank}(AR_{it})$; Corrado's Rank Statistics at day 0 is as follows;

$$C_{rank} = \frac{1}{N} \sum_{i=1}^N \left[K_{i0} - \frac{m+1}{2} \right] / s(K) \quad (11)$$

Here m is the number of total observations in the estimation period and event period. The standard deviation is as;

$$s(K) = \sqrt{\frac{1}{m} \sum_{t=1}^T \left[\frac{1}{N} \sum_{i=1}^N \left(K_{it} - \frac{m+1}{2} \right) \right]^2}$$

This way, under the null hypothesis, the rank of the excess returns on day 0 turns into uniform distribution (Corrado, 1989: 387-388).

It is determined that Corrado's rank statistics, which is a test based on median, is more resistant against the event-induced variance on day 0 and has a better performance than the traditional test used by Brown-Warner (Boehmer *vd.*, 1991: 256).

2.2.2. Corrado-Zivney Rank Test

The new nonparametric test proposed by Corrado-Zivney (1992) is the modification of Corrado's rank test developed to measure the abnormal performance in the event studies and it is based on the standardized ranks. This way, cross-sectional variance adjustment is applied to the data (Corrado *ve* Zivney, 1992: 475). During the test process, standardized excess



returns are shown by SAR and the average by \overline{SAR} , and the cross-sectional standard deviation on day 0 is defined as

$$s_{SAR} = \sqrt{\frac{1}{N-1} \sum_{i=1}^N (SAR_{i0} - \overline{SAR})^2}$$

And the standardized excess return series for Corrado-Zivney test is reproduced as,

$$SAR_{it}^* = \begin{cases} t \neq 0 \Rightarrow SAR_{it} \\ t = 0 \Rightarrow \frac{SAR_{it}}{s_{SAR}} \end{cases} \quad (12)$$

While m shows the number of nonmissing returns for security i , 1 is added to this returns, and the rank of this series is calculated as,

$$K_{it} = rank(SAR_{it}^*) / (m + 1)$$

and this order statistic has uniform distribution with an expected value of $\frac{1}{2}$ (Corrado ve Zivney, 1992: 467). The average of this order statistic is as

$$\overline{K}_t = \frac{1}{N_t} \sum_{i=1}^{N_t} K_{it}$$

While N_t is the number of nonmissing returns in cross section of N firm, \overline{K}_0 is the average on day 0, and the standard deviation calculated over the total observations both in the estimation and event period is

$$s_{\overline{K}} = \sqrt{\frac{1}{m} \sum_{t=1}^m \frac{N_t}{N} \left(\overline{K}_t - \frac{1}{2} \right)^2}$$

the rank statistics is

$$C - Z_{rank} = \frac{\overline{K_0} - 1/2}{s_{\overline{K}}}. \quad (13)$$

Corrado-Zivney had proposed a sign test together with the rank test defined as (12) and applied to the signs of the standardized excess returns series. Standard sign test only takes the signs into consideration. This test actually is the application of cross-sectional variance adjustment to the standard sign test. Accordingly, the median of SAR_{it}^* series is found from the whole sample period;

$$G_{it} = \text{sign}[SAR_{it} - \text{median}(SAR_t)]$$

the sign is calculated for each stock. G_{it} takes -1,0,+1 as the value of parenthesis is negative, zero or positive respectively. Again N_t shows nonmissing return number the standard deviation calculated from the whole sample period;

$$s(G) = \sqrt{\frac{1}{m} \sum_{i=1}^m \left(\frac{1}{N_t} \sum_{i=1}^{N_t} G_{it} \right)^2}$$

and the day 0 test statistics from the sign of G_{it} is as;

$$C - Z_{sign} = \frac{1}{\sqrt{N}} \sum_{i=1}^N G_{i0} / s(G). \quad (14)$$

3. EMPIRICAL RESULTS

In the study, all the stocks in ISE-30 index composition, among the stock being traded at ISE during the period 2005–2011 are selected. In the period of 2005–2011, 159 stock splits of the stock included in ISE-30 index composition were realized. From these splits, 45, which were selected randomly, were examined and the performance of the stock returns on the date of the split was tested. The stock returns are calculated as logarithmic returns over the daily closing prices as;



$$LR_t = \ln \left(\frac{P_t}{P_{t-1}} \right)$$

The residuals estimated from the standard market adjusted model given in the equation (1) are used as the measure of the excess returns. For each security, it is taken 100 daily return observations and no missing value in the entire 100 day period. Estimation period which includes the market model parameters is defined as 79 days from (-89) to (-11) and the event period is defined as 21 days from (-10) to (+10) where the event day is as “day 0”. The split dates of the stock and the prices are taken from www.imkb.gov.tr and www.kap.gov.tr. The dates for the stock splits are presented in the Appendix 1.

The stock included in the analysis and the properties of ISE-100 representing the market portfolio are presented in Table 1.

Table 1: Properties of daily time Series performance for individual securities from estimation period

Summary Statistics	Mean	Standard Deviation	Skewness	Kurtosis	Jarque-Bera (JB)	Prob
Individual Returns	0.000761	0.004292	-0.005512	5.033177	7.751117	0.020743
Market Portfolio Returns	0.000504	0.00254	-0.495311	3.316252	2.027523	0.362852

Number of time series observation is 79

According to Table 1, J-B value of 7.75 which belongs to individual stock returns is larger than χ^2 value for 2 degree of freedom is about 0.020743. Therefore asymptotically, individual returns distribution doesn't follow normal distribution. However market portfolio returns distribution is normal.

Moreover, the cross-sectional properties of the abnormal returns belonging to 45 stocks are presented in the event date.

Table 2: Properties of cross sectional average abnormal returns performance

Summary Statistics	Mean	Standard Deviation	Skewness	Kurtosis	Jarque- Bera	Prob
Estimation Period (79-day)*	0.000506	0.0045	0.225094	4.885879	12.37406	0.002056
Event Period (21-day)*	0.001168	0.005003	0.754208	3.145891	2.009528	0.366131

*Obtained from OLS market adjusted model for 45 individual securities

As seen that at table 2, cross sectional average abnormal returns distribution is especially far from normal in estimation period. Therefore one must be careful about the parametric tests used in study for testing the significance of average abnormal returns.

First, the traditional t test, Patell's t and BMP t test from the parametric tests and Corrado's rank applied to the single day and Corrado-Zivney rank and sign test from the nonparametric tests are applied to the data set respectively. Due to this reason, only the abnormal performance is tested in this study. CAR analysis is not performed. Abnormal returns and standardized abnormal returns in event period are given in appendix 2.

The results of the parametric tests on Day 0;

Abnormal Return Performance	AR(0)		
	Mean	St.Error	t
Traditional	0.01395	0.0034	4.1390*
Patell	0.57571	6.6205	3.8115*
BMP	0.57571	0.4604	1.2504

* significant at % 1

Accordingly, while positive excess return is determined as statistically significant on the day 0 in compliance with the traditional t test and Patell's t test, it cannot be stated that there is significant excess returns in the sample examined in compliance with BMP t test where event-induced variance adjustment is applied. Traditional t and Patell's t are tests which assume the uncorrelated state of time series and cross-sectional. These tests assume that the event has the same effect on all the firms. Due to this reason, the tests applied without performing the event-induced variance adjustment shall cause the rejection of the correct hypothesis, in other words, I. type error, since the variance estimation shall be underestimated



and the t statistics shall be very large. Also here, H_0 hypothesis is rejected according to the traditional t and Patell's t tests. However, H_0 hypothesis is not rejected according to BMP t test which uses event-induced variance adjustment as it can also be seen from the table.

When the abnormal performance is tested by nonparametric tests, results similar to those of BMP t test are obtained.

Abnormal Return Performance	AR(0)		
	Mean*	St.Error	t
Corrado's Rank	3.16667	19.33056	0.16382
Corrado-Zivney Rank	0.54979	0.74023	0.74273
Corrado-Zivney Sign	0.44721	1.10576	0.40444

The average rank of 100 days is 50.5 for Corrado's rank

*they are computed from nominators of equation (11), (13) and (14), respectively

As it can be seen from the table, the null hypothesis as there is average abnormal return on the day 0 is not rejected when event-induced variance adjustment is performed.

4. CONCLUSION

In this study, the abnormal performance on the day 0 is tested by parametric and nonparametric tests in a portfolio of 45 observations formed of stock splits in ISE – 30 compositions in the period 2005–2011. When event-induced variance adjustments are performed with the findings derived, it is concluded by the parametric tests that the stock splits do not create abnormal returns. The same conclusions are also supported by the nonparametric tests. However, the power of the tests applied should also be examined separately.

Based on the conclusions derived from the tests, it can be stated with the event study method that stock splits information made public in Turkish stocks market do not cause excess returns according to the efficient market hypothesis and consequently, it can be stated that the market is semi strong efficient at least for this portfolio.



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APPENDIX

App.1: Announcements Date of Stock Splits Which Belongs to ISE-30 Index (2005-2011)

NO	STOCKS	KOD	A.DATE	NO	STOCKS	KOD	A. DATE
1	Anadolu Efes	AEFES	17.09.2007	24	İhlas Holding	IHLAS	13.05.2011
2	Akbank	AKBNK	08.06.2006	25	İŞ G.menkul Yat.Ort.	ISGYO	05.06.2007
3	Akenerji	AKENR	13.04.2010	26	Koç Holding	KCHOL	18.06.2009
4	Aksigorta	AKGRT	14.01.2010	27	Koza Madencilik	KOZAA	30.11.2007
5	Aksa	AKSA	30.06.2009	28	Kardemir (D)	KRDMD	27.07.2005
6	Alarko	ALARK	19.07.2007	29	Pektim	PETKM	02.07.2010
7	Anadolu Sigorta	ANSGR	10.06.2008	30	Petrol Ofisi	PTOFS	12.06.2008
8	Arçelik	ARCLK	04.05.2009	31	Sabancı Holding	SAHOL	14.01.2010
9	Asya Katılım Bankası	ASYAB	09.06.2008	32	Şişe Cam	SISE	10.10.2007
10	BİM Mağazaları	BIMAS	27.05.2010	33	Şekerbank	SKBNK	30.06.2011
11	Denizbank	DENIZ	18.07.2008	34	Sinpaş Gayrim. Y.O.	SNGYO	13.07.2009
12	Doğuş Otomotiv	DOAS	25.11.2010	35	TAV Havalimanları	TAVHL	30.01.2009
13	Doğan Holding	DOHOL	12.01.2009	36	Turkcell	TCELL	12.06.2006
14	Doğan Yayın Holding	DYHOL	31.05.2005	37	Türk Ekonomi Bankası	TEBnk	09.06.2006
15	Eczacıbaşı İlaç	ECILC	07.08.2008	38	Türk Hava Yolları	THYAO	04.06.2010
16	Enka İnşaat	ENKAI	02.06.2011	39	Tefken Holding	TKFEN	10.06.2009
17	Ereğli Demir Çelik	EREGL	29.05.2007	40	Tofaş Oto Fabrikası	TOASO	18.07.2005
18	Finansbank	FINBN	11.10.2005	41	Türk. San. Kalkın. B	TSKB	24.05.2011
19	Fortisbank	FORTS	08.01.2007	42	Ülker	ULKER	28.12.2007
20	Ford Otosan	FROTO	27.05.2005	43	Vestel	VESTL	30.12.2008
21	Garanti Bankası	GARAN	21.07.2005	44	Yazıcılar Holding	YAZIC	12.07.2007
22	GDS Holding	GSDHO	21.03.2006	45	Yapı ve Kredi Bankası	YKBNK	11.05.2007
23	Hürriyet Gazetesi	HURGZ	05.08.2009				



App.2: Abnormal Returns and Standardized Abnormal Returns in Event Period

EVENT PERIOD	AR	SAR
-10	-0.1830	-8.9705
-9	-0.1818	-10.8969
-8	0.1639	6.8142
-7	0.0050	-1.7451
-6	0.1448	6.8634
-5	0.0238	6.0003
-4	0.2250	12.1073
-3	0.3727	21.6603
-2	0.3472	18.6108
-1	0.2417	16.1520
0	0.6279	25.9069
1	-0.1815	-6.5862
2	0.0111	5.8429
3	-0.2636	-12.2945
4	-0.1382	-3.6558
5	-0.1700	-8.5975
6	-0.0996	-1.9096
7	0.0571	1.0469
8	0.0709	4.7958
9	0.1264	2.0914
10	-0.0962	-7.9241