



Event Study Methodology

ANJALI GUPTA

Assistant Professor, A.R.S.D College, University of Delhi-110021

Abstract:

The event study is a methodology used to study share price behaviour around specific events and share price reaction to such events as stated by Binder (1998). Most of early event study works are focused on examination of share prices behavior in relation to corporate announcements like mergers and acquisitions, dividend announcements, stock splits and changes in accounting rule as stated by Binder (1998). According to him event study has become standard methodology in any strategic and financial economic research in order to measure the effect of event on share prices. This paper discusses in detail the event study methodology with specific reference to market model.

Keywords: *Event Study, Methodology, Share Price, Corporate Sector, Market*

1. Introduction

An event study is an analysis of whether there was a statistically significant reaction in financial markets to past occurrences of a given type of event that is hypothesized to affect public firms' market values.

Lo and Mac Kinlay (2004) and Binder¹ (1998) claim that the event study has most successful application in area of corporate finance. According to Mac Kinlay (1997) an early event study which examined share prices reaction was done by Dolley (1933). Ball & Brown (1968) and Fama et al.(1969) are credited with seminal work to examine the impact of an economic event or news on share prices in response to the event using this methodology. They are responsible for popularity of this methodology which uses abnormal stock returns. There are numerous studies which uses event study. The most often cited resources relating to event study are - Brown and Warner (1980), Brown and Warner (1985), Corrado (1989), Cowan (1992) , Kothari and Warner (1997), Campbell (1997) and Binder (1998).

The event that affects a firm's market value may be within the firm's control, such as the event of the announcement of a stock split, as in this case. Or the event may be outside the firm's control, such as the event of a legislative act being passed, or a regulatory ruling being announced, that will affect the firm's future operations in some way. An event study is used to examine reactions of the market to events of interest. An event study methodology assumes that capital markets are sufficiently efficient to evaluate the impact of new events on the firms' expected future profits. McWilliams and Siegel (1997) states that an event study methodology, “determines whether there is an ‘abnormal’ stock price effect associated with an unanticipated event. From this analysis the researcher can infer the significance of the event”.

¹ The event study is a methodology used to study share price behaviour around specific events and share price reaction to such events as stated by Binder (1998).

2. Event studies can be classified into three groups

- Market efficiency studies these studies using the methodology to assess speed and accuracy of market's reaction and incorporation of original news.
- Information impact researches: these studies evaluate the extent to which companies returns response to an event.
- Group segregating researches: these studies examine abnormal return after segregating securities into various sub sections. They analyze the variation of abnormal return among different subsections. It is also termed as Metric explanation (Bowman, 1983) where metric means extra returns.

A simple event study involves the following steps:

- Identifying the event of interest and defining an event window.
- Selecting a set of cases to include in the analysis, to form the sample.
- Predicting a "normal" outcome during the event window in the absence of the event using the estimation period just immediately before the event period.
- Estimating the abnormal outcome within the event window, where the abnormal return is defined as the difference between the actual and predicted returns during the event window.
- Testing whether the abnormal return is statistically different from zero.

3. Analysis Period

The analysis period is the time span of the daily series of returns on which the measurement of information content for an earnings announcement is based. The analysis period is made up of the announcement period and the comparison period, which are defined in relation to the event date.

- Event day is the day on which event takes place, or day around which effect of an event is presumed to take place, or the date around which a diffused effect is presumed to be distributed. The event day is assigned time t_0 . Researchers generally use the date on which the first public announcement of an event took place.
- Event period or window is period over which significant effect of the event is presumed to be reflected on share prices and needs to be studied. The announcement period may contain only the event date, or it may contain additional days. The additional days may be arranged either symmetrically or asymmetrically around the event date. The length of the announcement period is an important methodological issue.
- It is not always possible to know with certainty the exact date on which a piece of information first reached the market. The information may become known to a wide segment of the market prior to the first public announcement through a news leak or it may be released in a form which effectively communicates the information but which is not considered to be a public announcement of the event itself. For example, Foster (1973) reported that announcement of an "earnings estimate" by a company official effectively usurped the information content of the subsequent earnings announcement.
- The length of event window is an important methodological and debatable issue closely related to event date uncertainty. Different researchers have used different event window lengths. A small event window is used in the analysis to exclude confounding events and noise which may be created due to occurrence of other corporate announcements which may affect company's valuation.
- The expected returns are estimated outside event window over the 'estimation period' to ensure

that event does not influence parameter estimates of normal model. The estimation period also termed as comparison period is the period which is used as the basis for estimating what the values of the observed time series during the announcement period would have been if the announcement had not occurred. The comparison period excludes the announcement period, and can be symmetrical or asymmetrical around the announcement period. Kiger (1972) used a five-day period beginning eight days prior to the earnings announcement. Eades, Hess, and Kim (1984) used 30 days on each side of the announcement period. Zeghal (1983, 1984) used all of those days of the calendar year which did not fall within an announcement period.

For example if event windows proposed are:

1. AD (-) 20 to AD (+) 20
2. ED (-) 20 to ED (+) 20

So, an event window of 41 days is used i.e.20 days before and 20 days after the event day. The event day is t_0 .Twenty days before event day are designated as t_{-20} to t_{-1} and 20 days after event day are designated as t_{+1} to t_{+20} .

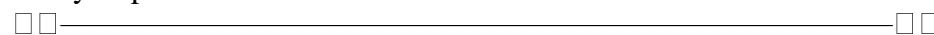
Estimation period or window will be any period used for estimating values which observed time series would have attained during the event period if the event had not occurred. The estimation period excludes the event period and the length of same may vary in 100-300 days if daily and 240-360 days if monthly data or even up to a few months. A pictorial representation defining the analysis period is given below:

4. Defining the Analysis Period

Time series of daily excess returns

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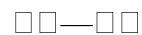
Analysis period



Comparison period



Announcement period



Event date



$t=0$

FIGURE 1: Defining the Analysis Period

5. Advantages of Event Study Methodology

- Event study methodology uses security prices and the expected effects of event are reflected immediately in security prices.
- It is a powerful and easy design.
- It has the ability to detect abnormal performance.
- It can be used in less than perfect conditions.
- It is easy to interpret and share.
- It is more accurate than accounting-based measures.
- It is an unbiased estimate of risk and return on investments.

6. Disadvantages of Event Study Methodology

- The basic assumptions are not clear.
- It is not easy to ascertain likely implications.
- Results have independent events impact.
- Results have unexpected events impact.
- It uses abnormal returns which is partial measure of firm's performance.
- It requires current knowledge of cause-effect relations.
- The selection of sample not easy.
- It requires determination of abnormal returns (AR).
- It only explain effect on abnormal returns (AR)
- Important requirement is that market must be efficient.

7. Areas of use

- Stock market information or recommendations
- IPO, Stock splits, Right issue, Cross listing
- Mergers and acquisitions
- Dividend announcements
- Audit reports ,financial statement and ratings
- Insider trading
- Political event or macroeconomic announcements
- Investment strategies, index revision and corporate announcements

The sample obtained and used for the methodology may have an impact of following.

- Confounding events.
- Multiple announcements.
- Anticipation of events (event window)/Leakage of event information.
- Self-reported data.
- Publicly-traded firms.

8. Methods used in Event Study Methodology

There are several methods that may be used to estimate abnormal returns. Some of them are:

- Mean return model: This method uses differences in actual returns in event window and mean returns in estimation period in order to estimate the abnormal returns.
- Market return model : This method uses difference in actual returns in event window and mean returns of the market in estimation period in order to estimate the abnormal returns.
- Control portfolio return: This method uses difference in actual return in event window of sample firms and actual return of the portfolio firms in event period in order to estimate the abnormal returns.
- Multiple index market model: This method uses includes additional indexes for study of impact of other factors other than the market index in order to estimate the abnormal returns.
- The Market model or risk adjusted returns model is used to estimate normal returns.

9. Market Model or Risk Adjusted Returns Model

The Market model is suggested as most popular and powerful² model of event study to measure ARs for the event window. The ARs, AARs, CAARs and other measures are computed for event window using following:

9.1 Step a: Daily returns for each sample company

The daily return for each sample company is computed for estimation window and for event window using:

$$R_{it} = \log(P_{it} - P_{i(t-1)}) \quad (1)$$

Where, P_{it} and $P_{i(t-1)}$ are respective daily closing share prices for company i at day t and $t-1$,

R_{it} is actual return for company i at day t .

9.2 Step b: Daily returns for market

The daily returns for market are computed using daily values of BSE sensex (proxy for market portfolio) for the same period using:

$$R_{mt} = \log(I_{it} - I_{i(t-1)}) \quad (2)$$

Where, I_{it} and $I_{i(t-1)}$ are respective daily index values at time t and $t-1$ respectively,

R_{mt} is Return of Market portfolio for the period.

9.3 Step c: Abnormal returns calculation

Abnormal return is defined as actual return (R_{it}) minus normal return (NR_{it}).

$$AR_{it} = R_{it} - NR_{it} \quad (3)$$

Normal Return is calculated using Market model which is –

$$R_{it} = \alpha_i + \beta_i R_{mt} + \epsilon_{it}$$

$$\text{And, } NR_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt} \quad (4)$$

R_{mt} is return on market index for day t . α_i measures mean returns not explained by the market. β_i measures sensitivity of return (company i) to the market return and ϵ_{it} is the statistical error whose expectation is assumed to be zero.

Using Eq. (1.3) and Eq. (1.4), abnormal returns are defined as residuals or prediction errors of model which is as under:

$$AR_{it} = R_{it} - NR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \quad (5)$$

Where, $\hat{\alpha}$ and $\hat{\beta}$ are OLS estimators of the regression coefficient estimated over estimation window.

9.4 Step e: Average Abnormal returns (AARs)

To eliminate effect of any one or group of shares on ARs, ARs (Abnormal returns) are aggregated and averaged for each day in event window. The un-weighted cross-sectional AARs in period t are calculated using:

$$AAR_{it} = \frac{\sum_{i=1}^N AR_{it}}{N} \quad (6)$$

Where, N is number of shares for which ARs are present on day 't' in the event window.

² Brown and Warner (1985) concluded that methodology based on Market model is well specified and relatively powerful under a variety of conditions.

9.5 Step f: Significance test for AAR

Large deviation of AARs from zero indicates abnormal performance.

The null hypothesis tested is –

$$H_o : E (AAR_{it}) = 0$$

Z-test³ is used to test statistical significance of AARs on an event day. σ is unknown and estimator of σ can be constructed from cross-sectional variance of ARs in period t. The Z-statistics is calculated as under:

$$Z = \sqrt{N} \left(\frac{AAR_{it}}{s_t} \right) \approx N(0,1) \quad (7)$$

If AARs are other than zero and statistically significant it indicates that share prices on an average behave positively or negatively to stock splits and have an impact on shareholders wealth.

9.6 Step g: SAR and Significance Test

The assumption that variance of all ARs is equal for all companies is not likely to be true. Some shares may be more volatile than others lowering power of Z-test. Therefore, weighted average of ARs can be taken which puts lower weight on ARs with high variance.

Reciprocal of estimated standard deviation⁴ of ARs of estimation window can be used as weight to calculate SARs of individual company in following way:

$$SAR_{it} = \sum_{i=1}^N \frac{AR_{it}}{s_i} \quad \text{And(8)}$$

$$ASAR_{it} = \frac{1}{N} \sum_{i=1}^N SAR_{it} = \frac{1}{N} \sum_{i=1}^N \frac{AR_{it}}{s_i} \quad (9)$$

9.7 Step h: Significance Test for SAR

The $ASAR_{it}$ is cross sectional average of SARs. The $ASAR_{it}$ is assumed to be uncorrelated across companies and used to test the null hypothesis:

$$H_o : E (ASAR_{it}) = 0,$$

For which following Z-statistic is constructed:

$$Z_s = \sqrt{N} (ASAR_{it}) = \frac{1}{\sqrt{N}} (\sum_{i=1}^N SAR_{it}) \quad (10)$$

9.8 Step i: Cumulative Average Abnormal Return (CAARs)

The cumulative effect of AARs on days around the event is calculated using CAARs.

CAAR can be obtained by aggregating AARs for event day t_1 through t_2 time using:

$$CAAR_{it} = \sum_{t=t_1}^{t_2} AAR_{it} \quad (11)$$

Where, t is number of days for which AARs are cumulated in the event window. The null hypothesis tested is that CAAR at the end of period over which AARs are aggregated is zero. If CAARs is greater than zero with significant positive values it implies that there is significant impact of stock

³ Z-test assumes that AARs are independently and identically distributed, have same mean and variances and are cross-sectionally uncorrelated

⁴ Standard deviation of ARs for each sample company is computed for estimation period starting from t_{-181} and till t_{-21} days. The purpose of standardization is to ensure that ARs of a particular share has same variance. Each residual (AR) will have estimated variance as 1. The hypothesis to be tested is that Average Standardized ARs aggregated for all companies across time are equal to zero. The method of standardization is often attributed to Patell (1976).

splits on ARs.

To examine impact of stock splits over different time intervals CAARs values are calculated by aggregating AARs over event window of 41, 21,11,5 and 3 days in order.

9.9 Step j: Significance Test - CSAR

For testing statistical significance of CAARs for N number of companies over t days (t₁ through t₂) Z_{CS}-statistic is calculated using:

$$Z_{CS} = \frac{1}{\sqrt{N \cdot T}} \left(\sum_{i=t_{1i}}^{t_{2i}} SAR_{it} \right) \quad (12)$$

10. Conclusion

An event⁵ study analyses presence or absence of statistically significant reaction to past occurrences or events of a given type in financial markets that is assumed to affect company's market value. The focus in event study lies on whether reaction of market is significantly different from what it normally should be in case no event occurs in the market. Standard Event study methodology, as developed by Fama, Fisher, Jensen and Roll (1969) and Brown and Warner (1985), can be used to find the impact of stock splits on share prices. Lo and MacKinlay (2004) and Binder⁶ (1998) claim that the event study has most successful application in area of corporate finance. Ball & Brown (1968) and Fama et al.(1969) are credited with seminal work to examine the impact of an economic event or news on share prices in response to the event using this methodology. The most often cited resources relating to event study are - Brown and Warner (1980), Brown and Warner (1985), Corrado (1989), Cowan (1992), Kothari and Warner (1997), Campbell (1997) and Binder (1998).

References

1. Acharya, A. (1993). Value of latent information: alternative event study methods. *Journal of Finance*, 48, 363-386.
2. Binder, J.J. (1988). The event study methodology since 1969. *Review of Quantitative Finance and Accounting*, 11, 111-137.
3. Boehmer, Musumehr, E.J. and Poulsen, A.P. (1991). Event Study Methodology under conditions of event induced variance. *Journal of Financial Economics*, 30, 253-72.
4. Campbell, J., Lo, A. and MacKinlay, A. (1997). *The Econometrics of Financial Markets*. New Jersey: Princeton University Press.
5. Conover, W.J. (1984). *Practical Nonparametric Statistics*. Wiley.
6. Corrado, C.J. (1993). Testing for Abnormal Security - Price performance under conditions of Event-Period. *Review of Quantitative Finance and Accounting*, 3, 127-148.
7. Corwin, S.A. and Schultz, P. (2009). An Application of the High-Low Spread Estimator to Daily Event Studies: Stock splits from 1926–1982. *Journal of Financial Economics*.
8. Cowan, A.R. (1992). Non parametric event study tests. *Review of Quantitative Finance and Accounting*, 2, 343-58.

⁵ Most of early event study work is focused on examination of share prices behavior in relation to corporate announcements like mergers and acquisitions, dividend announcements, stock splits and changes in accounting rule as stated by Binder (1998). According to him event study has become standard methodology in any strategic and financial economic research in order to measure the effect of event on share prices

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9. Craig, M. (1997).Event studies in economics and finance.Journal of Economic Literature, 35(1), 13-39.
10. Dimson, E. and Marsh, P. (1986). Event study methodologies and the size effect. Journal of Financial Economics, 17, 113-142.
11. Khatua, S. and Pradhan, H.K. (2013). Examining Overreaction in BSE using Event Study Approach for Stock Split Announcements. International journal of Engineering and Management Research, 3(1), 47-56.
12. Kothari,C.R.(2004).Research Methodology. New Delhi: New Age International (P)Ltd,2th edn.
13. Lo. and Mc Kinley.(2004).Event study analysis- Chapter 4.Book of Financial Economics.
14. Mac Kinlay, C. A. (1997). Event studies in Economics and Finance. Journal of Economics literature,35, 13-39.
15. MacKinlay,A.G.(1997).Event Studies in Economics and Finance. Journal of Economic Literature, 35(1), 13-39.
16. Marshall, J.F. and Bansal, V.K. (1992). Financial Engineering: A Complete Guide to Financial Innovation. Prentice Hall of India.
17. McLaney, E. (2005). Business finance: Theory and practice. Essex: Prentice Hall.
18. McWilliams, A. and Siegel, D. (1997). Event Studies in Management Research: Theoretical and Empirical Issues. Academy of Management Journal, 40, 3, 626-657.
19. Muscarella, C.J. and Vetsuypens, M.R.(1996). Stock Splits: Signalling or Liquidity? The case of ADR ‘Solo Splits., Journal of Financial Economics, 42, 3-26.
20. Prabhala, N.R. (1997). Conditional methods in event-studies and an equilibrium justification for using standard event-study methods. Review of Financial Studies, 10, 1–38.
21. Saens, R. and Sandoval, E. (2005). Measuring Security Price Performance Using Chilean Daily Stock Returns: The Event Study Method. Cuadernos De Economia, 42, 307-328.
22. Sallinger, M. (1992).Standard errors in event studies. Journal of Financial and Quantitative Analysis, 27, 39-53.
23. Serra, A. P. (2002). Event Study Tests: A brief survey. Working Papers.
24. The Event Study Webpage - MIT. (n.d.). Retrieved from <http://web.mit.edu/doncrum/www/eventstudy.html>
25. Thompson, R. (1985).Conditioning the return generating process on firm specific events: a discussion of event study methods. Journal of Financial and Quantitative Analysis, 20, 151-168.
26. Van Horne,J.C.(2000).Financial Management. New Delhi: Prentice Hall of India Pvt.Ltd.
27. Wong Shou Woon. (2002).Introduction to the Event Study Methodology. Singapore :Singapore Management University
28. Yague, J., Gomez-Sala, C.J. and Poveda-Fuentes, F. (2009). Stock split size, signaling and earnings management: Evidence from the Spanish market. Global Finance Journal, 20 (1), 31-47. An Event Study of the Zimbabwe Stock Exchange(ZSE... (n.d.).Retrieved from <http://www.mcserr.org/journal/index.php/mjss/article/download/2142/2129>