Index Re-Composition Effects: Comparison of Different Models[1]

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ABSTRACT

In this study analysis are made by giving empirical evidence on the stock prices reaction to the declaration of first time inclusion / exclusion of firms from KSE-100 index. The study has covered the sample period of 10 years from 2001 to 2010 by taking 207 firms listed on Karachi Stock Exchange. The study highlights the comparison of different models (Market adjusted model, market model and CAPM) to capture the event study effects regarding abnormal returns, ARs and cumulative abnormal returns, CARs. The effect of trading volume in the different event window is also documented by using volume ratio. This study reveals that Pakistani firms also reward positive abnormal return of 1.43%, 1.36% and 1.31% to investors on the event of inclusion of firms in KSE-100 index by using Market adjusted model, market model and CAPM respectively. On the other hand, no significant positive or negative abnormal returns were observed by using these models on the exclusion of firms from the index. On average, no significant results of ARs and CARs were observed in different event days of 15th, 10th, 5th prior/after the event day of inclusion /exclusion of firms from the index, by applying these models. However, some contradictory results were also observed while comparing these models in different event days. On the other hand, interestingly, systematic risk of included firms increased from 0.3555 to 0.3692. The overall results suggest that the announcement of inclusion /exclusion of firms from the index make it difficult for investors to earn positive abnormal returns.
KEY WORDS: Inclusion, exclusion, KSE-100, Market adjusted model, Market model, CAPM.

I. INTRODUCTION

The index re-composition effects provide an excellent opportunity to observe the behavior of stock prices in the stock markets. If market follows semi-strong-form efficient, according to efficient market hypothesis, then these effects of an event (public information) is reflected in the security prices instantly that is, the behavior of stock prices can be observed. Thus a measure of the impact of economic event can be made using these observed security prices over a quite short window of time period.

Although, the effects of index re-composition as a result of inclusion / exclusion has attracted the majority of researchers and extensive literature is available in this context. An event study methodology is widely used to observe the behavior of stock prices. However, mainly the developed markets are focused by these studies, particularly US and some other developed markets of the world. The existing literature lacks in the stock market of the developing countries. There is only one study by Hacibedel and Bommel (2006) to our knowledge about the developing countries, in which Pakistani stock market is also analyzed. However they have taken very small sample size of only 14 firms. So, this study is the first one that is conducted on KSE to observe the index re-composition effects by taking the sample of 207 firms for the period 2001-10. It is here worth mentioning that KSE is said to be the most volatile market of the world. So this study is also interesting that how security prices observed upon the event of index re-composition.

Having looked on the literature, the earlier prominent studies of re-constitution of index, Shleifer (1986) and Harris & Gurel (1986), documented an amazing fact. They documented ARs of 3.5% after the addition of firms to the index. Shleifer (1986) quoted yahoo firm, which awarded 24% ARs to its investors on the event day. Four main theories (Information Content, Downward Sloping Demand Curve, Liquidity Increases and Price Pressure) exist that may explain reaction of market when new firm added / deleted from index. Most of the earlier studies were based on these theories, whereas most of the recent studies disagreed with these theories. This study focus only price pressure theory by using different models.

Number of explanations brought up by the researchers to analyze the effects of price and volume linked with index re-composition events, however, the existing literature has not yet explored a number of other markets, specially developing, in

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which the mixed results are expected. Therefore, lack of research in the area of index re-composition effects in Pakistan provided incentive to carry out the study in this regard. Furthermore, no study has evaluated and compared index re-composition effects by use of different models. Therefore, this study is expected to fill this gap. The main objectives of this research include:

- To analyze the index re-composition effects for the period of 10 years from 2001 to 2010 using different models
- To evaluate the effect of trading volume in the different event window.
- To analyze the results of ARs and CARs in different event window days of 15th, 10th, 5th prior/after the event day of inclusion /exclusion of firms from the index, by applying these models.
- To help the investor in decision making regarding investment due to index re-composition effects in Pakistani market.

II. LITERATURE REVIEW

The announcement effect documented in majority of the earlier studies, specifically, the mean announcement-day excess return was found to be positive for included stocks and negative for excluded stock. In the same line, study by Jain (1987) portray that both included stocks and excluded stocks from the S and P 500 for the period 1977-1983 For 87 included stocks, the mean excess return on the announcement day, was greater than 3% (by market model), at the same time as for 22 excluded stocks, the mean announcement day excess return was greater than -1%.

Lynch and Mendenhall (1997) study for the period 1990-1995 showed, inclusions/exclusions were allied with significant positive (negative) abnormal returns on the announcement day of inclusions/exclusions. Madhavan (2003) investigated statistically significant ARs liked with annual Russell indices reconstitutions for the period 1996-2001. Mazouza and Saadouni (2007) observed positive ARs for added firms, while negative ARs for deleted firms in the pre-announcement event window of the FTSE 100 index. On the other hand, Kappoua, Brooks and Ward (2007) witnessed contrast results as reported by Mazouza and Saadouni (2007). They used 3-factor Fama French model to calculate abnormal returns and observed no evidence for the Price Pressure Hypothesis of Harris and Gurel (1986). They also observed a temporary increase in trading volume.

Sadeghi (2008) examined the impact of the introduction of Shariah-compliant index in Malaysia stock market. Bildik and Gülay (2008) supported the hypotheses of price-pressure & down ward sloping and examined the effects of price and volume on firms linked with the re-constitution of value weighted index of 2-indices, of the Istanbul Stock Exchange. Zhai and Fang (2008) had also showed no support for price pressure hypothesis and volume ratio for added stock. However, CARs for deleted stocks can be explained by asymmetric change of investors' awareness as earlier proposed by Chen (2006). Similarly, Bechmann (2004) documented the effects of changes in the re-composition of the Danish blue-chip KFX index. Similarly, Shankar and Randhawa (2006) also found mixed results in two stock markets.

However, all these studies except few, mainly concerned with the developed markets like Haneda and Sarita (2001), Masse et al. (2000), Liu (2000), Lynch and Mendenhall, (1997), Beneish and Gardner (1995), Jain (1987), Harris and Gurel (1986), Brown and Barry (1984) and Dhillon and Johnson (1991). In view of these facts, the mixed results of ARs, CARs and volume volatility that are witnessed in the world wide in response to index re-composition, present study aims not only at evaluating the effects of changes in index-re-composition of Pakistani market, but also will show the comparison of different models.

III. MATERIAL AND METHODS

The basic objective of this study is to observe abnormal returns and trading volume effects after reconstitution of KSE-100 index by use of different models.

3.1 Sample and Data Set

The sample period is based on all firms that are included / excluded during the year 2001-10. The re-constitution of KSE index take place each year, by-annually, usually in February & September. KSE-100 index is the largest capitalization stock index amongst the three index of Pakistan stock market that covers about more than 87% of the total market capitalization of the KSE.104 out of 138 added firms while 103 out of 138 deleted firms are taken as a sample, which makes 75% of the total population. 25% of the stock is not taken due to M&A, delisting and non availability of the data of these firms. Daily stock returns and market returns are calculated on the basis of closing prices of stocks and KSE-100 index, respectively.

3.2 Research Methodology

This section discusses the main variables, models and hypothesis included in the study. Specifically, three models (Market adjusted model, market model and CAPM), volume ratio and systematic risk analysis are discussed. The price effects of KSE-100 index re-constitution are examined by ARs and CARs on the announcement day, pre-announcement and after announcement days. ARs are calculated by the three models.

First, we use marked adjusted model, which is the difference between the stock return and the market return; this measure is widely used in event studies. This model is also used by Lynch and Mendenhall (1997) and Chen, Noronha and Singal (2004) and others.

Second, the market model is used to calculate these ARs. Brown and Warner (1985) and others used this methodology to capture event study effects.

Third, CAPM is also used to calculate ARs. In Market model and CAPM, first parameters are estimated using daily data of stock prices and index for the period of six months before announcement day prior to fifteen days. Then different ARs and CARs for different event windows are calculated.

For the announcement date, variable AD is used. AD is following day to the actual announcement day of re-constitution of index. As, in KSE-100 index Announcement date and Effective change date is same in most of the cases of re-constitution of index. Therefore analysis is made regarding announcement date. ARs, CARs and AV (abnormal volume) are calculated for 3 event window, prior to announcement and 3 event window after the announcement i.e. it covers the days between (AD-15) and (AD+15). This study will use seven smaller event windows: AD-15, AD-10, AD-5, AD, AD+5, AD+10 and AD+15, in order to analyze the price / volume changes as a result of index re-constitution.

The Abnormal Returns using Market Adjusted Model, Market Model and CAPM are calculated as:

$$ar_{it} = R_{it} - R_{mt} \qquad (A)$$
$$ar_{it} = R_{it} - \acute{R}1_{it} \qquad (B)$$
$$\acute{R}1_{it} = \alpha_i - \beta1_i\,R_{mt} + \varepsilon_{it}$$
$$ar_{it} = R_{it} - \acute{R}2_{it} \qquad (C)$$
$$\acute{R}2_{it} = R_f + (R_{mt} - R_f)\,\beta2_i + \varepsilon_{it}$$

Where ar_{it} are the ARs of stock i at day t, R_{it} are the actual returns of stock i at day t, and R_{mt} is the market returns of the KSE-100 Index. $\acute{R}1_{it}$ & $\acute{R}2_{it}$ are expected returns estimated by OLS regression model on the estimation period using daily data of stock prices and index for the period of six months before announcement day prior to fifteen days. This regression uses observed returns in a time frame earlier to the event period in order to avoid any biased results for the estimation of these expected returns. The average abnormal returns on a sample of n stocks for the tth day are calculated as:

$$\overline{AR}_t = \frac{1}{n}\sum_{i=1}^{n} ar_{i,t}$$

The cumulative abnormal returns (CARs) from event day *q* to event month *s* are the summation of the average daily abnormal returns are calculated as:

$$CAR_{q,s} = \sum_{t=q}^{s} AR_t$$

To calculate abnormal volume (AV) as a result of index re-constitutions due to addition / deletion of firms, methodology consistent to Harris and Gurel (1986) is applied:

$$AV = (V_{i,t} / V_i) / (V_{m,t} / V_m)$$

Where $V_{i,t}$ is the volume of stock i in day t, V_i represents the average volume turnover for stock i, $V_{m,t}$ represents the market volume in day t and V_m represents the average market volume. Market volume is the volume of all stocks that are traded on KSE-100 index. After calculating the ARs, CARs in event window of different days, the null hypothesis that the cross sectional averages for sample of n firms for different from zero is tested by using t-statistic. In the same way, t-test is also employed to check whether AV equal to unit, statistically or not. Suppose AV is bigger than unit significantly, it indicates that trading volume is higher than normal level during that event date.

IV. RESULTS AND DISCUSSION

4.1 Event study results using different models

The price effects for KSE-100 index changes of added firms are reported in Table 1 while deleted firms are reported in Table 2. The significant positive returns are found on the announcement day of added firms to the index using all the three models; the market-adjusted model, market model and capital asset pricing model. These results reveal that Pakistani firms also reward positive abnormal return of 1.43%, 1.36% and 1.31% to investors on the event of inclusion of firms in KSE-100 index by using Market adjusted model, market model and CAPM respectively. These results are found to be highly significant at 1% level.

These results also show some consistent performance of these models and suggest that by use of any of these models, the results might be the same that is at least positive in all the three cases. However the results of market adjusted model are

slightly higher than that of market model and capital asset pricing model, as market adjusted model does not account for risk factor. These results support price-pressure hypothesis reported in earlier studies. However, there is a reversal of prices after the event day of announcement when these returns twist to negative. Interestingly, again the results from all the three models are same but not found to be statistically significant, although fully reversed within short event window of 5 days. These returns turn negative to 10 days and continuing to 15 days after the announcement day. Another time, these models suggest that by use of any of these models, the results might be the same that is at least negative in all the three cases.

On the other hand, the CARs after the announcement day (starts with the after announcement and ends at 5th day) and (start with 6th day and ends at 10th day) is not found to be statistically significant by all the three models. However, at the end of 15th day, CARs from day 11th to 15th are found to be significant at 10% level of significance for only the market adjusted model. The residual models; Market and capital asset price models give identical insignificant CARs in that period. This is somewhat contradictory results by these models. Risk factor might be the reason because market adjusted model is not account for risk factor as compared with the other two models that are considering risk factor while calculating expected returns.

The results of addition are displayed graphically. See figure-1 that represents ARs, CARs of added stocks to KSE-100 index for pre-announcement window, event day and after announcement window event. On the other hand, no significant positive or negative abnormal returns are observed at the event day (after the announcement of deletion of these firms from the index) by using these models as reported in table 2. These results reveal that abnormal return of 0.22%, 0.43% & 0.41%, almost 0%, but still non negative, are observed on the event of exclusion of firms from KSE-100 index by all the three models; Market adjusted model, market model and CAPM respectively. These results are contrary to most of the studies. But, nonetheless, these results are found to be insignificant, unexpectedly. Again, these results also show some consistent performance of these models and suggest that by use of any of these models, the results might be the same that is at insignificant in case of KSE-100 index.

For 5th day of these deletions, after the announcement the deletions at KSE-100 index continue to show positive returns as price reversal expected in the post announcement period. However, except for marked adjusted model, the other two models show positive but insignificant results, unexpectedly. On the other hand, after the announcement of deletions at KSE-100 index persist to show positive returns for 10th day by all the three models, but insignificant. This might be some reaction after the announcement day of the deletions of firms from KSE-100 index. Contrary to returns of 5th and 10th day the insignificant positive returns are observed at the end of 15th day by the three models. A further time, these models suggest that by use of any of these models, the results might be the same although insignificant.

Thus additions and deletions with KSE-100 index, reversal of the price effects but not significant is observed. These results also support and are consistent with price reversal phenomena. On the other hand, no significant results are found in case of CARs of deleted firms from KSE-100 index by applying the three models. The results of deletion are displayed graphically. See Figure-2 that represents ARs, CARs of deleted stocks from KSE-100 index for pre-announcement window event, event day and after announcement window event.

4.2 Event study results using Volume Ratio

The effects of index re-constitution of KSE-100 on the trading volume of the added and deleted firms are also examined. The results of volume ratio of added / deleted firms to the index that are calculated according to methodology adopted Harris and Gurel (1986), represented in Table 3 and 4 respectively. In case of added firms, abnormal volume at event day is observed that is found to be significant different from unit at 5% level of significance. It envisage that after the announcement of addition of new firms into the index, volume transaction exceed and not remains normal. On the other hand no significant results of abnormal volume are observed on the event day when firms are deleted from the KSE-100 index.

4.3 Event study results: systematic risk analysis

On the other hand, interestingly, systematic risk of included firms to KSE-100 index increased from 0.3555 to 0.3692, while in the same way the systematic risk of excluded firms from KSE-100 index also increased from 0.2656 to 0.2871. This might suggest that investors of added firms to KSE-100 index demand for higher returns, while the risk of deleted firms from the index is increased.

V. CONCLUSION

In this study the price effect with the help of three models; market adjusted model, market model & capital pricing model while volume effects with the help of volume ratio is investigated as a result of re-constitution of KSE-100 index due to additions / deletions of new firms into the index. The significant positive returns on the announcement day of added firms to the index using all the three models are observed. The results are consistent with price-pressure hypothesis. On the other hand insignificant ARs (negative) and CARs on the announcement day are observed as a result of reconstitution of KSE-100 index due to deletions of firms from the index. Consistent but insignificant results are observed by all the three models. All these price effects are confirmed by the trends in the abnormal trading volume which shows significant results in case of addition of firms and insignificant results in case of deletion of firms on announcement day and seems to be reverting to its normal level in

the post announcement period after reconstitution of index. Systematic risk analysis suggest that, investors of added firms to KSE-100 index demand for higher returns, while the risk of deleted firms from the index is increased.

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APPENDIX

Table 1: Addition of firms to KSE-100 index (comparison of different models)

Event day(s)	Mean ARs	t-statistic	Sig. (2-tailed)	SD	CARs	t-statistic	Sig. (2-tailed)	SD
A-Market Adjusted Model, test value 0								
AD-15	-0.0017	-0.4486	0.6547	0.0395				
AD-10	-0.0051	-1.7940	0.0758	0.0289	0.0058	0.8062	0.422	0.0736
AD-5	-0.0069	-2.2184	0.0287	0.0318	-0.0057	-0.8494	0.3976	0.0689
AD	0.0143	3.2314	0.0017	0.0451	0.0064	0.6598	0.5109	0.0989
AD+5	-0.001	-0.1938	0.8467	0.055	-0.0092	-0.9148	0.3624	0.1028
AD+10	-0.0006	-0.2015	0.8407	0.0308	-0.0001	-0.0129	0.9897	0.0865
AD+15	-0.004	-0.7504	0.4547	0.054	-0.0135***	-1.6848	0.0951	0.0818
B-Market Model, test value 0								
AD-15	0.0005	0.1311	0.896	0.0352				
AD-10	-0.0039	-1.5119	0.1336	0.0263	0.0006	0.0893	0.929	0.0665
AD-5	-0.0064	-2.0042**	0.0477	0.0327	-0.0017	-0.1972	0.8441	0.0864
AD	0.0136	3.2003	0.0018	0.0433	0.0077	0.798	0.4267	0.0983
AD+5	-0.0017	-0.39	0.6974	0.0434	-0.0084	-1.0677	0.2881	0.0807
AD+10	-0.0022	-0.6756	0.5008	0.0325	0.012	1.4889	0.1396	0.0824
AD+15	-0.0012	-0.2634	0.7927	0.0475	-0.0075	-1.1199	0.2654	0.0684
C-Capital Asset Pricing Model, test value 0								
AD-15	0.0017	0.4979	0.6196	0.0352				
AD-10	-0.0026	-1.0557	0.2936	0.0255	0.0069	0.9956	0.3218	0.0707
AD-5	-0.0052	-1.6592	0.1001	0.0318	0.0047	0.6556	0.5136	0.0724
AD	0.0131	3.0511	0.0029	0.0438	0.014	1.4774	0.1426	0.0967
AD+5	-0.0021	-0.4856	0.6283	0.0446	-0.0108	-1.2015	0.2323	0.0915
AD+10	-0.0026	-0.8275	0.4099	0.0323	0.0097	1.0416	0.3	0.0947
AD+15	-0.0017	-0.357	0.7218	0.0484	-0.0098	-1.2574	0.2115	0.0798

Table 2: Deletion of firms from KSE-100 index (comparison of different models)

Event day(s)	Mean ARs	t-statistic	Sig. (2-tailed)	SD	CARs	t-statistic	Sig. (2-tailed)	SD
A-Market Adjusted Model, test value 0								
AD-15	-0.0024	-0.7562	0.4512	0.0327	-0.002			
AD-10	-0.0002	-0.0372	0.9704	0.0479	0.0069	-0.2447	0.8072	0.083
AD-5	-0.0055	-1.9141	0.0584	0.029	-0.0082	0.4829	0.6302	0.1446
AD	0.0022	0.7711	0.4424	0.0291	0.0022	-0.8699	0.3864	0.0951
AD+5	0.0075	1.8880	0.0619	0.0405	0.0106	1.0889	0.2787	0.0984
AD+10	0.0018	0.6144	0.5404	0.0294	-0.0075	-0.8947	0.373	0.0856
AD+15	-0.0012	-0.4277	0.6697	0.0296	-0.0058	-0.8784	0.3818	0.0671
B-Market Model, test value 0								
AD-15	0.0004	0.0923	0.9267	0.0424	-0.0022			
AD-10	0.0017	0.3255	0.7455	0.0541	0.0186	-0.1372	0.8911	0.1648
AD-5	-0.0032	-0.8207	0.4138	0.0399	-0.0023	0.9939	0.3226	0.1897
AD	0.0043	1.394	0.1664	0.0315	0.0043	-0.1386	0.8901	0.1667
AD+5	0.0044	1.1984	0.2336	0.037	0.0103	1.5631	0.1211	0.0667
AD+10	0.0014	0.5029	0.6161	0.0273	0.0042	0.6154	0.5396	0.0687
AD+15	-0.0005	-0.1822	0.8558	0.0254	-0.0076	-1.3484	0.1805	0.0573
C-Capital Asset Pricing Model, test value 0								
AD-15	0.0013	0.4285	0.6692	0.0306	0.0023			
AD-10	0.0026	0.5693	0.5704	0.0471	0.0231	0.2966	0.7674	0.0799
AD-5	-0.0023	-0.7967	0.4275	0.0295	0.0023	1.5761	0.1181	0.149
AD	0.0041	1.3957	0.1658	0.0302	0.0041	0.2358	0.8141	0.0982
AD+5	0.0042	1.0958	0.2758	0.0389	0.0094	1.0907	0.278	0.0877
AD+10	0.0012	0.4408	0.6603	0.0274	0.0033	0.4091	0.6834	0.0827
AD+15	-0.0006	-0.2348	0.8148	0.0269	-0.0084	-1.3972	0.1654	0.0611

Table 3: Addition of firms to KSE-100 index (Volume Ratio)

Event day(s)	ariable Nam	Mean AVs	t-statistic	Sig. (2-tailed)	SD
Test Value 1					
AD-15	vr_t_-15	0.7737	-2.772	0.0066	0.8327
AD-10	vr_t_-10	0.8266	-2.4229	0.0171	0.73
AD-5	vr_t_-5	0.8404	-1.8336	0.0696	0.8874
AD	vr_t_0	1.2595	2.4060	0.0179	1.0998
AD+5	vr_t_+5	0.9203	-1.0123	0.3138	0.8027
AD+10	vr_t_+10	0.8656	-1.5995	0.1128	0.8572
AD+15	vr_t_+15	0.9725	-0.3171	0.7518	0.8848

Table 4: Deletion of firms from KSE-100 index (Volume Ratio)

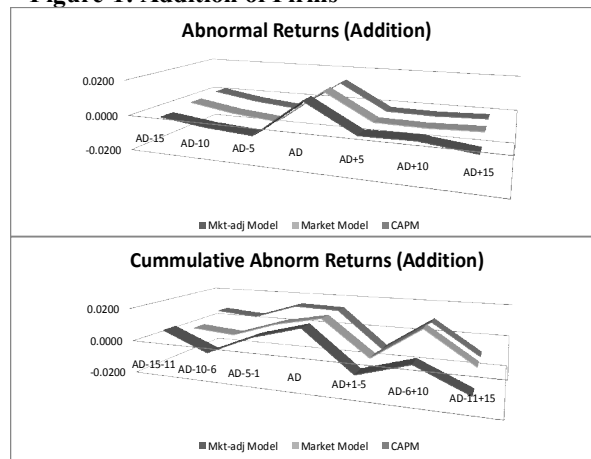| Event day(s)	ariable Nam	Mean AVs	t-statistic	Sig. (2-tailed)	SD
Test Value 1					
AD-15	vr_t_-15	0.8596	-1.8986	0.0604	0.7504
AD-10	vr_t_-10	0.921	-0.8741	0.3841	0.9168
AD-5	vr_t_-5	0.9361	-0.7264	0.4692	0.8927
AD	vr_t_0	1.0809	0.843	0.4012	0.9736
AD+5	vr_t_+5	0.9895	-0.1234	0.9021	0.8646
AD+10	vr_t_+10	0.7558	-3.3504	0.0011	0.7397
AD+15	vr_t_+15	0.7932	-2.6878	0.0084	0.7808

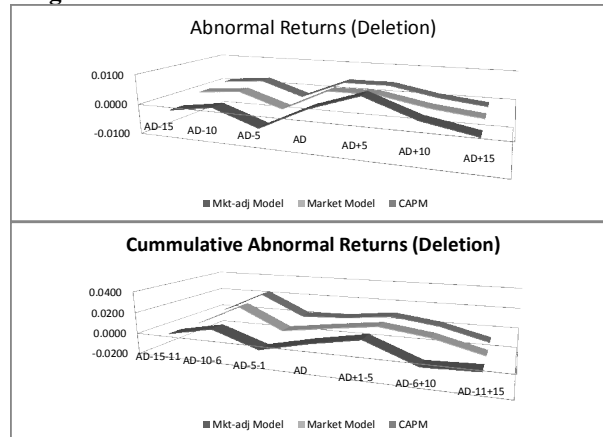## Figure-1: Addition of Firms

Figure-2: Deletion of Firms

Figure-3: Comparison in context of Volume Ratio

Volume Ratio

■ Volume Ratio (addition)   ■ Volume Ratio (Deletion)