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The Effects of Index Changes on Stock Trading: Evidence from the EGX

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Abstract: We examine the effects on firm price, volume and liquidity following changes in the composition of the Egyptian Stock Exchange main market index EGX30 over the period 2005-2015. The indexing methodology of the EGX30 is independent from performance criteria and allows us to test competing hypothesis that explain behaviors accompanying index changes. We find an asymmetric effect on deleted versus added firms supporting the downward slopping and investor awareness hypothesis. Firms added to the index experience significant price increases in the run-up window, trading volume effects in the run up and post change windows and enhanced liquidity which are not reversed in the post change period. Price and liquidity effects are not evident in deleted firms.

Keywords: Abnormal return; Abnormal volume; Liquidity; Index change

JEL Classifications: G10, G12, G14, G15

1. Introduction

There has been a long standing empirical debate regarding the response of stock prices to information-free trading. The efficient market hypothesis (EMH) predicts that any information-free shocks to supply and demand should not affect prices, given the perfectly elastic demand on securities. One setting that has been used to test this prediction is that of changes in a market wide stock index. The efficient market hypothesis predicts that additions and deletions from a stock index are information free and should not affect prices, thereby providing a natural framework for testing elasticity of pricing and demand. Several academic studies empirically examine the effect on firms' stock price, volume and liquidity when added or deleted from a market index in various markets. Most of the empirical evidence contradicts the EMH predictions, with predominant evidence of price and liquidity increases following additions and mixed results regarding the effect on deleted firms.

The objective of this study is to examine the price, volume and liquidity effects on stocks newly added or deleted from the Egyptian Stock Exchange (EGX) main market index EGX30. This study contributes to the literature in various ways. First, it is the first study on an Arab stock market, with the EGX being one of the largest and most actively traded exchanges in the Arab region, with active annual foreign participation averaging 25% of the value traded over the last decade. Second, and to the best of our knowledge, our study comprises the largest data set for a single emerging market as we examine the effect of index changes over a long period of time (2005-2015) using unique hand collected data that comprises 128 additions and 128 deletions. Finally, theEGX30 indexing methodology is fully disclosed and performance free allowing us to evaluate competing theories explaining the effect of index changes. Unlike popular indices such as the S&P500;changes in the constituents of the EGX30 are scheduled on a specific publicly known date every six months and follow pre-specified set of known criteria. These include ranking eligible firms in terms of activity and liquidity and do not include firm size, financial or trading performance for selection. Therefore, additions/deletions to the EGX 30 are information free, allowing us to properly control for the information component that has been confounding the results of studies assessing impact of additions and deletions on other indices such as the S&P500.

We find that that added stocks experienced a significant increase in price, volume and liquidity during the run up window from the announcement to change date of the index constituents. Our analysis for deleted stocks indicates an asymmetric effect on index deletions where we find an insignificant effect on price and liquidity but a significant effect on volume levels during the post change window.

This paper is organized as follows: Section 2 presents a summary of the literature; Section 3 describes the institutional framework, and the data description of our sample, as well as the methodology used; Section 4 presents the results of our analysis; Section 5 concludes this paper and discusses how the results fit with existing theories on index changes.

2. Main Hypotheses on the Price Effects of Index Changes

The literature on the effects of index changes on price movements can be summarized around five hypotheses that offer various explanations for such a phenomenon.

2.1 Price Pressure Hypothesis(PPH)

PPH argues that index changes are information free and any observed price and volume effects accompanying index changes are temporary short term price pressure associated with index fund trading or institutional rebalancing; it proposes that no permanent shifts should be observed as any excess demand should disappear once it is satisfied and therefore supports the EMH in long term. Long-term demand is perfectly elastic at full-information price. If stock prices reverse to their ex-ante level after the index change, then non-information-motivated demand shifts may be costly and, consequently, the short-term demand curve may be less than perfectly elastic. Empirical tests that support the PPH find positive effect between announcement and inclusion that is reversed in following days.

Harris and Gurel (1986) study on the S&P500 is considered amongst the earliest studies on the issue and find that immediately after an addition is announced to the S&P500, prices increase by more than three percent. This increase is nearly fully reversed after two weeks and can be explained by temporary price pressure from index fund rebalancing that causes price changes associated with large transactions attracting passive suppliers of liquidity who are compensated for liquidity service when price moves. This is further supported by Dhillon and Johnson (1991) and Blouin *et al*. (2000) also on the S&P500 as well as Vespro (2006) on European stock indices.

2.2 Long term Downward-Sloping Demand Hypothesis (DSDC)

Also referred to as the Imperfect Substitute Hypothesis is the furthest from the EMH as it argues that securities are not close substitutes and that long term demand inelastic causing a downward sloping demand curve. Empirical tests supporting the DSDC find that the impact of additions and deletions on stock prices is both symmetric and long term; prices increase (decrease) significantly for stocks added (deleted) with no significant post-event reversals and therefore a new equilibrium distribution for security holders is established following index change. When a company is included in an index and if there are downward sloping demand curves, individual investors will require a price above equilibrium price to induce a sell to a passive index fund.

Shleifer (1986) assumes inclusion in the index is information free and thus a clear test of demand curve slopes. He finds that stocks added to index earn significant positive abnormal returns that do not disappear after 10 days. The initial price pressure created by index fund rebalancing is not reversed since stocks are not perfect substitutes. Based on different sample periods following the surge in popularity of indexing as an investment vehicle, Beneish and Whaley (1996), Lynch and Mendenhall (1997), and Wurgler and Zhuravskaya (2002) continue to find support for the downward sloping demand curve. The same evidence corroborated on indices around the globe including Canada's TSE300 (Kaul *et al*., 2000); Japan's Nikkei 500 (Liu, 2000) and Nikkei 225 (Hanaeda and Serita, 2003), the KFW Danish blue-chip index (Bechmann, 2004) and Turkey's ISE (Bildik and Gülay, 2008).

2.3 Information/Certification Hypothesis (ICH)

Several studies challenge the premise that index changes are information free and argue for an 'Information or Certification Hypothesis' that assumes that the impact of additions or deletions on stock price can be attributed to valuable information and therefore is reflected in a new equilibrium price upon the announcement. Jain (1987) was amongst the first to argue that the price reactions of the S&P500 index changes are not due to temporary price pressures but are rather have long term effects that can only be explained by added information that such events brings to the public. Index additions by the S&P500 will magnify the investment appeal of such firms as S&P500 which will be perceived as stable and their information environment will be improved as they will be more closely monitored by analysts. Denis *et al.* (2003) support this view in a later study and find that companies added to the index experience significant increases in EPS forecasts and significant improvements in realized earnings by analysts relative to pre inclusion forecasts.

Liu (2011) focuses on changes in the Nikkei 225 and attribute the permanent price increase and volatility decrease to better information. Yun and Kim (2010) find similar pattern in price and also increase in volume on Korean KOSPI200 Stock Market Index and attribute such changes to the indexing methodology of the index which has performance based measure for additions and inclusions and therefore conveys valuable information.

2.4 Information Cost and Liquidity Hypothesis(ICL)

Changes to stock index can affect liquidity and cost of trading of stocks. Stocks included in an index are exposed to a higher demand and attention and therefore have a lower cost of trading. Several studies find that inclusion in the index has an effect on liquidity and the bid-ask spread. This asserts that adding a stock to an index leads to a higher market scrutiny and information available, and that this raises the attractiveness and the liquidity of the stock and has a positive effect on the price. Reduction in liquidity is also observed for deleted stocks. Studies that support such hypothesis include Beneish and Whaley (1996) on DJIA, Hedge and McDermott (2003) on the S&P500, Yu *et al*. (2015) on NASDAQ 100, Madhavan (2003) on the Russell index, Gregoriou (2011) on CAC40, and Bechman (2004) on the Danish KFW stock index.

2.5 Investor Awareness Hypothesis (IAH)

Merton's (1987) model of market segmentation provides the backdrop for the investor awareness hypothesis. Investors hold suboptimal portfolios since they only hold stocks that they have information on and therefore demand a premium or shadow cost for such information. Within the context of the effects of index change, Merton's model can be used to interpret the asymmetric effect that is observed between stock additions versus deletions. When stocks are added to the index, investor awareness is now increased and this increased demand therefore reduces the required rate of return on such stocks thereby increasing their price. While this is similar to the downward slopping curve hypothesis in prediction, it differs in that they impact is asymmetric between additions and deletions. This is supported by the results of Chen *et al*. (2004) as well as Eliott *et al*. (2006) on the S&P500.

3. Data Description and Methodology

3.1 Market and EGX30 Index Description

The EGX is considered one of the oldest exchanges dating back to the to 1883 and was one of the active exchanges until a series of nationalization efforts in the 1950's resulted in the closure of the market for several decades. Following various IMF recommendations in the early 1990's and a series of economic liberalization and privatization acts, the EGX was reopened 1992 and was considered one of the world's best performing stock exchanges from 2003 until 2005. The EGX is an order-driven market that relies on an electronic order book, in which orders are matched to determine equilibrium prices and all orders are entered via terminals on the main trading floor through one of the licensed brokers.

The main market benchmark index is the EGX30: a market value weighted index adjusted for free float of the most active and liquid 30 companies on the EGX. The EGX30 started on first of January 1998 with a base value of 1000 points. Constituents of the index are determined by the EGX Index Committee according to a public and defined set of criteria for review twice a year and index changes are reflected in the EGX30 on the first trading day of February and the first trading day of August. The most important criteria for selecting the constituents is liquidity as measured by the total value traded for the period prior to the next rebalance; companies considered for inclusion have to fulfill the following rules: traded for at least 50% of the trading days in the prior rebalancing period; have a 15% free float or more; have market capitalizations that are above the median of the free float adjusted market capitalization for all traded companies during the review period and do not have more than 30% of cross holding with other firms in the index. The minimum free float and cross holding criterion ensures that our sample of added or deleted stocks are not confounded by intervention by family or government which is the case in samples from other emerging markets (Avzevedo *et al*., 2014). TheEGX30 index rules avoid concentration on one industry and therefore have a good representation of various industries/sectors in the economy.[1]

3.2 Sample Construction

The sample period begins in 2005 to 2015. Changes in constituents are obtained from the EGX and Announcement dates of the changes (AD) and effective change dates (CD) are obtained from the EGX news feed service. The effective change date for the index is unchanged throughout the sample: first trading day in February and first trading day in August. The date for announcement date of change is not constant as it can range from 3 weeks and up to 1 day before the actual effective change. Our sample includes 21 changes with the first bi-annual change in the sample on February 1st2005 and the last change on February 1st 2015. We have a total of 130 additions and deletions to the EGX30 during this period, but our final sample includes 128 additions and 128 deletions after excluding companies due to lack of data availability or companies that were either acquired or merged. The final number of firm additions is equal to the number of deletions and is presented in Table 1. Our sample extends previous studies on emerging markets as it has a considerably large set of changes as compared with other studies on emerging markets like

[1] For a list of full criteria please visit: http://egx.com.eg/getdoc/af3ffc66-152c-4a54-9c95-ddf09f465670/EGX30_Index_Rules.aspx

Malaysia that only analyzed 15 additions and 13 deletions (Azevedo *et al*., 2014) and India that only had 40 additions and deletions (Rahman and Rajib, 2014). We retrieve trading data related to added and deleted firms as well as the index data from Data-stream and this data includes daily open, high, low and closing prices; bid and ask prices; as well as trading volume and value.

Table 1. Number of firm additions (deletions) for every index change

Year	February Index Change	August Index Change
2005	3	4
2006	6	6
2007	6	5
2008	7	8
2009	6	7
2010	3	8
2011	7	9
2012	7	6
2013	6	6
2014	5	7
2015	6	-
Total	128	

3.3 Methodology

We examine the effect of index changes on added and deleted stocks by analyzing changes in their returns, volumes and liquidity around the change. We employ a standard event study methodology in line with prior literature (Lynch &Mendenhall, 1997; Azevedo*et al*., 2014) around the two main event dates for each sample: the announcement date for the addition or deletion which we label AD as well as the effective change date of the addition or deletion which we label CD. We construct five event windows: Pre-announcement window that runs from 15 days up to one day before the announcement date; Announcement Date (AD); Run Up window which runs between the announcement and change date; Change date (CD) and Post change window that runs one day up until 15 days post change date. Table 2 summarizes the various event windows as well as summarizes the various predictions from the literature that are expected for each window under each hypothesis which will help analyze and explain the results on the effect of index change on stock prices, volume and liquidity.

Table 2. Event Window Definitions and Hypotheses Predictions

Event Window	Title	Prediction
AD-15 to AD-1	Pre-Announcement	No significant effect if no anticipation
AD	Announcement Day	-Price Pressure: Positive (Negative) Effect on Returns and Volumes for Additions (Deletions);
AD+1 to CD-1	Run Up Window	-Downward Slopping: Positive (Negative) Effect on Returns and Volumes for Additions (Deletions);
CD	Effective Change Date	-Investor Awareness: Asymmetric Effect- Positive for Additions and None for Deletions -Information Cost and Liquidity: Positive (Negative) Effect on Liquidity for Additions (Deletions)
CD+1 to CD+15	Post Change Window	Price Pressure: Reversal of effects on Returns and Volumes; Downward Slopping: Zero Effect on Returns and Volumes for Additions (Deletions)

The following sections will present the methodology used to examine the effect of index changes on each of the three stock characteristics: returns, volumes and liquidity.

3.4 Abnormal Returns

We measure the effect on stock prices using the stock's abnormal returns (AR) for each day *t* measured as the difference between each stock *i* return and the EGX30 market index *m* return as follows:

$$AR_{i,t} = R_{i,t} - R_{m,t} \qquad (1)$$

While more sophisticated market models of the return generating process can be used, previous studies have found that the results do not improve on those of raw market adjusted returns. (Lynch and Mendenhall, 1997; Yun and Kim, 2010)

The sample mean abnormal return (MAR) for event day *t* is used as a measure of the abnormal price movement on that day. It is measured as:

$$MAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t} \qquad (2)$$

The mean abnormal returns are then summed over each of the five event windows outlined in Table 2 in order to calculate a cumulative mean abnormal return (CMAR):

$$CMAR_t = \sum_{t=1}^{NT} MAR_t \qquad (3)$$

The CMAR is the main measure used to determine any effect of index additions and deletions on the stock prices and will help to identify whether such effects are short term, on and around the announcement or change dates, or permanent and persist beyond the change dates.

3.5 Abnormal Volumes

We use the measure of abnormal trading volume of Harris and Gurrel (1986) and more recently used in Azevedo *et al*. (2014) to assess the impact of changes on volume:

$$VR_{i,E} = \frac{V_{i,E}}{V_{m,E}} / \frac{V_{i,e}}{V_{m,e}} \qquad (4)$$

where $V_{i,E}$ and $V_{m,E}$are the volume of the stock *i* relative to the market index *m* over the event days *E* and $V_{i,e}$ and $V_{m,e}$ are the volumes of the stock *i* relative to the market over a prior estimation period *e* defined as AD-60 till AD-40. The resulting ratio $VR_{i,E}$ allows us to examine the effect on trading volumes of the added and deleted stocks by comparing their trading volume relative to the market around the change event windows to those before any change. A ratio significantly different from one during the event windows *e* signifies a change relative to the estimation period *E*. We average the volume ratios across the added or deleted firms to identify the duration and persistence of any volumes changes.

3.6 Liquidity

Finally, we examine the effect of index changes on the added or deleted stock's liquidity. We measure liquidity using a common proxy which is the "log quoted spread", Log*Spread,* defined as the log of the average daily quoted bid-ask spread. For robustness, we also use the "effective spread" *Espread*, which is defined as twice the absolute difference between the price and the midpoint of the bid-ask spread. We use our liquidity proxies as the liquidity dependent variable, $Liq_{i,t}$, to run two pooled panel regressions, one for additions and another for deletions, in line with Hedge and McDermott (2003) and Azevedo *et al*. (2014) and compare liquidity effects before and after the index additions or deletions through the following specification:

$$Liq_{i,t} = \beta_0 + \delta_0 D\_EGX30_t + \delta_1 \log Vol_{i,t} D\_EGX30_t + \beta_1 \log Vol_{i,t} + \beta_2 \log Price_{i,t} + \beta_3 \log Stdev_{i,t} + \varepsilon_i \quad (5)$$

where for the stock additions i = (1, 2, . . ., 128) and for the stock deletions i = (1, 2, . . ., 128), we have two periods t = (1, 2), where t = 1 represents the period between CD-45 and CD-15 (before the index change) and t = 2 represents the period between CD + 15 and CD + 45 (after the index change). To assess the effect on liquidity between the two periods, we construct a dummy variable D_EGX30_t which takes the value of "1" for the period after the index change and "0" otherwise. We are interested in the sign and significance of the coefficient δ_0, since a positive (negative) and significant value signifies a decrease (increase) in liquidity following the change. We are also interested in any change in the slope of trading volume to provide estimates of the elasticity as a result of index revisions which we capture with the coefficient δ_1 of the interactive variable $\log Vol_{i,t} D\_EGX30_t$. We control for the average daily trading volume, $\log Vol_{i,t}$; the average daily closing stock price, $\log Price_{i,t}$; and the daily volatility of the stock return, $\log StdDev_{i,t}$.

4. Results

4.1 Abnormal Returns

We present the results of abnormal returns over the various event windows in Figure 1 for additions and deletions. Panels A and B of Table 3 presents the abnormal return over various event days and event windows. For stock additions, we find that for the run up window AD+1 to CD-1, the MCAR is around 1.6%, and is statistically significant. Our results show no significant impact for index changes on abnormal returns for stock deletions. These results suggest an asymmetric response to index composition changes on returns as index additions solicit a positive market response that is not reversed in the post change period CD+1 to CD+15 while deletions have no significant impact in all event windows.

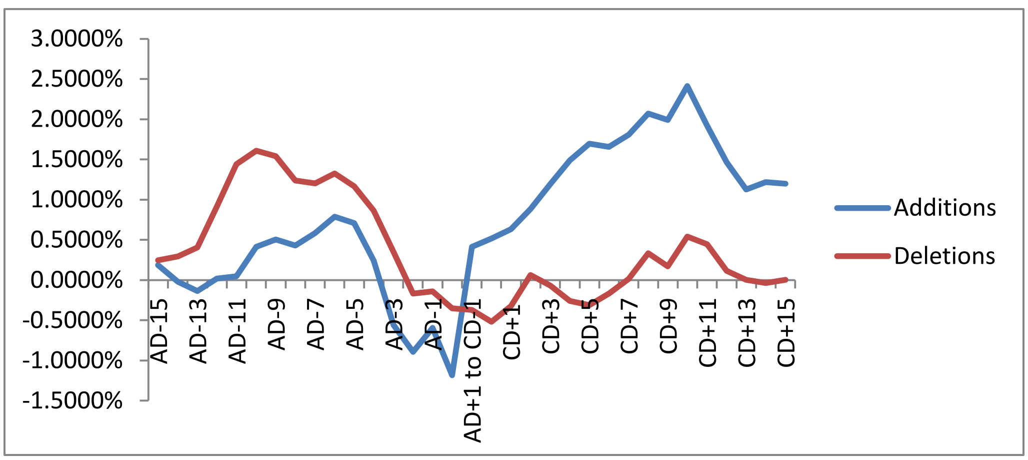

Figure 1. Cumulative abnormal returns over event windows

Such a result rules out the price pressure hypothesis and supports the downward slopping demand hypothesis but the asymmetry suggests that such permanent shift is due to increased investor awareness and institutional managers rebalancing their portfolios which also supports the investor awareness hypothesis. We rule out the information criterion hypothesis as EGX30 index changes are scheduled and its criteria predictable and do not rely on performance measures. The insignificant result for the period after that index change (CD+1 to CD+15) also suggest that the price adjustments already took place in the AD+1 to CD-1 period where investors anticipation is already included in the price by the time the change happens.

Table 3. Abnormal Returns and Volume Ratios

	Abnormal Return				**Volume**			
	Additions		Deletions		Additions		Deletions	
Panel A: Event Day	MAR/%	t	MAR/%	t	VR	t	VR	t
AD-15	0.188	0.622	0.245	0.731	1.342	1.584	1.362	2.360**
AD-14	-0.208	-0.932	0.050	0.281	1.733	1.438	1.366	1.948*
AD-13	-0.117	-0.373	0.108	0.369	1.374	1.9079*	1.704	1.985*
AD-12	0.155	0.515	0.512	1.6710*	1.074	0.565	9.790	1.053
AD-11	0.030	0.125	0.526	1.230	1.104	0.755	1.370	1.628
AD-10	0.365	1.329	0.164	0.788	1.246	1.578	1.246	1.693
AD-9	0.092	0.277	-0.067	-0.284	1.137	1.124	1.454	1.732
AD-8	-0.075	-0.156	-0.302	-1.358	1.192	1.094	1.219	1.295
AD-7	0.154	0.521	-0.037	-0.115	1.305	1.619	2.406	1.443
AD-6	0.204	0.646	0.125	0.380	1.341	1.682	1.352	1.568
AD-5	-0.079	-0.476	-0.159	-0.626	1.206	1.352	1.219	1.588
AD-4	-0.467	-1.589	-0.301	-0.856	1.010	0.083	1.200	1.576
AD-3	-0.800	-2.666**	-0.516	-1.525	1.052	0.385	1.391	2.816***
AD-2	-0.337	-1.555	-0.517	-1.989**	1.053	0.498	1.276	1.736
AD-1	0.300	1.085	0.029	0.104	0.994	-0.069	6.126	1.038
AD	-0.591	-1.128	-0.214	-0.820	1.308	1.531	1.783	1.922*
CD	0.105	0.398	-0.146	-0.748	1.680	1.507	1.214	1.129
CD+1	0.115	0.341	0.196	0.336	1.249	1.244	1.192	0.805
CD+2	0.250	0.632	0.383	1.457	0.947	-0.594	1.030	0.234
CD+3	0.311	1.037	-0.128	-0.624	1.653	1.088	1.502	2.341**
CD+4	0.296	1.086	-0.192	-0.665	1.194	1.503	1.058	0.550
CD+5	0.208	0.885	-0.051	-0.141	1.213	1.318	1.619	2.329**
CD+6	-0.042	-0.119	0.143	0.599	1.170	1.700	1.318	2.449**
CD+7	0.150	0.458	0.183	0.727	1.206	1.344	1.473	1.770
CD+8	0.265	1.045	0.317	1.099	1.346	1.846*	1.208	1.818*
CD+9	-0.081	-0.485	-0.162	-0.347	1.470	2.358**	1.239	1.357
CD+10	0.421	1.549	0.370	1.301	1.892	2.414**	1.390	2.843***
CD+11	-0.494	-1.693	-0.095	-0.406	1.353	1.872*	1.120	0.984
CD+12	-0.454	-1.853*	-0.332	-1.298	1.706	1.165	2.196	1.224
CD+13	-0.336	-1.670	-0.113	-0.532	1.180	1.619	1.515	2.678**
CD+14	0.091	0.378	-0.040	-0.183	1.192	1.949*	1.358	2.404**
CD+15	-0.020	-0.1	0.042	0.234	0.997	-0.042	1.231	1.531
Panel B: Event Window	CMAR/%	t	CMAR/%	t	VR	t	VR	t
AD-15 to AD-1	-0.595	-0.361	-0.139	-0.084	1.211	1.573	2.299	1.695
AD+1 to CD-1	1.599	2.129**	-0.020	-0.032	2.890	3.233***	1.140	0.720
CD+1 to CD+15	0.681	0.513	0.523	0.337	1.341	2.846***	1.363	2.637**

Note: ***, **, and * indicate statistical significance at the level of 1%, 5%, and 10%, respectively.

Results of abnormal return and volume for index additions and deletions are presented. Panel A presents the Mean Abnormal Return (MAR-equation 2) and Volume Ratio (VR-equation 4) for each event day from AD-15 till CD+15 for additions and deletions with t-statistics and significance results reported. Panel B presents the results over the various event windows. Cumulative average abnormal returns (CMAR-equation 3) and Volume Ratios (VR) are reported for additions and deletions.

4.2 Abnormal Volume

The results of the abnormal trading volumes are also presented in Table 3. If additions or deletions from the index are not accompanied by any changes in volume, we would expect the ratio to be insignificantly different from one. We present the results for different event windows for both stock additions and deletions. For stock additions we find that the results are significant for the run up event window AD+1 to CD-1 and the post change window CD+1 to CD+15. Volume ratio equals 2.89 and 1.34 respectively, which indicates an evidence of abnormal volume as a result of index change. Our results show that volume ratio peaks in event window AD+1 to CD-1, indicating the impact of news of index change on the traded volume. We conjecture that this increase in traded volume is because of anticipation of increase in stock prices driven by the demand of portfolio managers rebalancing their index fund as well as increased awareness of the added stocks in fund managers' portfolios. Moreover, this result is supported by our finding of abnormal return in same period as discussed above. The results for stock deletions show a significant volume ratio for event window CD+1 to CD+15 of 1.36, thus indicating that news about stock deletions has more impact after the change of the index as institutional managers balance their portfolios .

4.3 Liquidity

Tables 4 and 5 quantify the impact of index changes on liquidity. We use a pooled times series-cross sectional multivariate analysis of spread to test impact of index changes on liquidity changes. We use two measures of liquidity log quoted spread and effective spread. The main objective is to examine the impact of index changes on the market liquidity controlling for trading volume, the average daily closing price and daily volatility of stock return. Table 4 presents the result of regression of equation 5 for stock additions. Our results show a significant and negative impact of dummy variable δ_0 on stock liquidity, which indicates that the market decreases the bid-ask spread as a result of the news for stock additions. In addition, we find a significant and negative δ_1 which suggest that this increase in liquidity causes the trading volume to increase in the post index revision period. The results are consistent across the two different measures of liquidity in table 4.

Table 4. Liquidity Effect for Additions

Variables	log$Spread_{i,t}$	$ESpread_{i,t}$
Const.	-1.842***	0.059***
D_EGX30_t	-1.054***	-0.052***
$logVol_{i,t}D\_EGX30_t$	-0.307***	-0.007**
log$Price_{i,t}$	0.154***	0.008**
log$Stdev_{i,t}$	1.901***	0.003
log$Vol_{i,t}$	-0.387***	-0.006
R^2	0.550	0.002

Note: *** indicates significance at 1%; ** indicates significance at 5%.

This table 4 presents results of equation 5 for the stock additions. Our dependent variable is liquidity, which is measured by either the "quoted spread" log$Spread_{i,t}$ or the "effective spread" $ESpread_{i,t}$. The main explanatory variables are D_EGX30_t, a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise; log$Vol_{i,t}D_EGX30_t$ which is an interaction term between stock volume and the dummy variable; and our controls log$Vol_{i,t}$

measuring the average daily trading volume; log$Price_{i,t}$ for the average daily closing stock price and log$Stdev_{i,t}$ for the daily volatility of the stock return.

Table 5 presents results of the impact of index changes on the quoted and effective spread of stock deletions. The results are different from those reported in table 4 for stock additions. We find an insignificant impact (δ_0) of stock deletions on stock liquidity using the different liquidity specifications. We believe that this difference in results suggest that liquidity for trades occurring within bid and ask quotes remain unchanged as a result of companies being excluded from the index and supports the insignificant result on abnormal returns for stock deletions. Similar to the results on volumes in the previous section, deletion from the index increases stock trading since the coefficient δ_1 is found to be significant.

Table 5. Liquidity Effect for Deletions

Variables	log$Spread_{i,t}$	$ESpread_{i,t}$
Const	-0.073	0.116***
D_EGX30_t	0.024	-0.027
$logVol_{i,t}D\_EGX30_t$	-0.450***	-0.014***
log$Price_{i,t}$	-0.006	0.002
log$Stdev_{i,t}$	1.728***	-0.020***
log$Vol_{i,t}$	0.230***	0.067*
R^2	0.550	0.002

Note: *** indicates significance at 1%; and * indicates significance at 10%.

This table presents results of equation 5 for the stock deletions. Our dependent variable is liquidity, which is measured by either the "quoted spread" log$Spread_{i,t}$ or the "effective spread" $ESpread_{i,t}$. The main explanatory variables are D_EGX30_t, a dummy variable that takes the value of "1" for the period after the index change and "0" otherwise; $logvol_EGX30$which is an interaction term between stock volume and the dummy variable; and our controls log$Vol_{i,t}$ measuring the average daily trading volume; log$Price_{i,t}$ for the average daily closing stock price and log$Stdev_{i,t}$ for the daily volatility of the stock return.

5. Conclusion

This paper examines the effect of index changes on stocks' prices, volumes and liquidity. We provide empirical evidence of the asymmetric effect on prices and liquidity between additions and deletions from the EGX30 index using a much larger dataset than that recently used for emerging markets in Azevedo *et al*. (2014) and Rahman and Rajib (2014). More specifically, our results indicate a positive impact on MCAR for added stocks and no effect on deleted stocks. We find that for the run up window AD+1 to CD-1,the MCAR is 1.6%, and is statistically significant. While, deleted stocks showed insignificant abnormal returns over various event windows. This supports the investor awareness hypothesis that argues that when stocks are added to the index this might provide higher level of interest by institutional investors which add the stock to their investment consideration set which is not applicable in the case of deletions.

The significant CMAR for the additions during the run up window support the downward slopping demand curve hypothesis as well, although our results for this case are statistically insignificant for the stock deletions. The lack of reversal of the CMAR in the post change period rules out the price pressure hypothesis and suggests a permanent increase in the prices level for added stocks.

Analyzing the impact of index change on volume, we find that added stocks experienced a significant increase in volume during both the run up window (AD+1 to CD-1) and the event window (CD+1 to CD+15). The increase in volume in the run up window is not reversed in the post change period; whereas the deleted stocks experienced significant volume levels in the post change window. We find that the volume ratio peaks in event window AD+1 to CD-1, indicating the impact of news of index change on the traded volume. Moreover, our results show a higher impact on deleted stocks' volume for event windows window CD+1 to CD+15 which reflects the trading of institutional managers to rebalance their portfolios

The impact of index change on liquidity differs for added versus deleted stocks and also indicates an asymmetric effect. We find an increased level of liquidity following additions which is not significant in deletions. Our results show a significant impact of dummy variable (δ_0) on stock liquidity; which indicates increased liquidity (reduced spread) following the change. While, for deleted stocks our results indicate insignificant dummy variable (δ_0), which affirms the asymmetric impact of index change. In addition, the increased level of liquidity for added firms also supports the liquidity and information criterion hypothesis. We can exclude the Information/Certification hypothesis as possible explanation for our results as the EGX30 index methodology does not contain financial or market performance measures marking them predominantly information free events.

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