GAINS AND COSTS ASSOCIATED WITH RESUMPTION OF SSFs WITH STRINGENT REGULATIONS: A MODIFIED APPROACH

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Abstract

To curb the negative effects of Global Financial Crisis (GFC) in 2008, the regulatory bodies of Pakistan Stock Exchange (PSX) banned trading in the stock market. Trading in several financial instruments suffered due to this unavoidable situation. On the recommendations of CFS MK II review committee, trading in futures markets were also halted. As the situation got better, trading in the stock market resumed. With this, trading in Single Stock Futures (SSFs) resumed on July 27, 2009 with stringent regulatory requirements than before. This situation makes it important to investigate the role of newer SSFs with stringent regulations. This study investigates the stakeholders' claims on destabilizing ability of futures markets in this crucial stage. This is done by examining the impact of resumption of trading in SSFs contracts with stringent regulations on the market efficiency and volatility of the stock prices of the underlying counterparts. The results of this study do not present any significant change in the market efficiency and volatility of SSFs' underlying stocks and Non-SSFs' stocks. This study has two implications. First, the SSFs did not play any part in destabilization of Pakistan's Stock market during GFC. Second, the stringent regulations have helped mitigate the destabilizing ability of futures markets in Pakistan.

Keywords: Resumption, Stringent, Modified Approach, Stock, Market Efficiency.

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Introduction

Equity derivatives[4] are newer financial instruments, which have different trading regulations from other already available financial instruments in the market. As a rule, the introduction of futures markets in any economy provides solution to two concerns. First, it provides the investors/traders with an opportunity to hedge the risk inherent in the future. The participants of the market are always interested in transferring the risk to others. Second, futures as a product provide much necessary liquidity to the market. This argument leads the researchers to hypothesize that the presence of parallel futures can enhance the market efficiency of the stock market as well. The introduction of futures markets and their impact on different dynamics of the market has gained attention of the regulators, practitioners and academicians alike since their formal introduction in 1970s. Several methodological approaches and econometric techniques have been used to answer the question of their destabilizing ability for the financial market as a whole.

With respect to market efficiency, a theoretical explanation against future markets is the destabilization aspect of future trading. It is argued that parallel futures markets provide an additional channel of information. This channel not only helps in development of new information but also routes this information to the underlying spot market. This increment in magnitude and speed of information can result in hyper volatility in the market (Cox 1976; Ross 1989). They assert that the new information takes lesser time to adjust in futures prices than their underlying counterparts. Through arbitrage mechanism, this information flows to the underlying market. This adds to market efficiency of the underlying market, while enhancing the volatility of the prices. Bae, Kwon and Park (2004) studies this relationship in Korean Market by using Partial Adjustment Model. The same was replicated in Indian Context by Debasish (2009). Both used index futures for the subject purpose.

This study derives its significance from the following aspects: Malik and Shah (2017) report that former SSFs did not play any role in destabilizing (in terms of market efficiency and volatility) the overall market. This study extends on that study and takes into account the case of resumption of SSFs. Further, the debate on alleged destabilization caused by SSFs intensified in Pakistani market after the financial crisis of 2005 and 2008. Consequently, prevailing futures markets were blamed as one of the factors of the crisis (Khan 2006; Naz 2011). With respect to GFC of 2008, similar claims were made by international authors. For example, Simkovic (2009) asserts that Credit Default Swaps (CDS), Collateralized Debt Obligations (CDOs) and Mortgage Backed Securities (MBS) had their share in the GFC. Recent Studies[5] show that financial crisis in one country has spill over impact, and it affects the financial markets in other economies. These studies assert that misuse of derivatives provides basis for financial crises, and become reasons for accelerated capital outflows. This enhances

[4] Throughout this study, the terms derivatives and futures are used interchangeably
[5] Lien and Zhang, 2008, Krugman (2003), De Bandt and Hartmann (2000) and Wolf (1999) etc

the flow in the international capital, which sets the tone of crisis by making uncertain. Several studies [6] in emerging markets provide mixed characteristics of futures markets. These studies highlight their positive and negative roles before and amid crisis. Ahmad, Shah, and Shah (2010) point out the relevance of this debate in local context. These situations warrant investigation for the role of futures in the market.

The introduction of SSFs in Pakistan Stock Exchange (PSX) goes back to July 1, 2001. SSFs with different maturities were launched at different time intervals. First off, SSFs with maturity of one month were introduced. Later SSFs with maturity of 60 days and 90 days were also introduced. The investor/trader of the market took some time to realize the value and importance of trading in SSFs. The trading volume grew significantly after first few years of low levels of trading volume in SSFs. In 2004 and 2005, trading in SSFs constituted 40% of the overall trading volume of PSX. The pros and cons of trading in futures remained an important topic before, amid and after the GFC. The Pakistan's local market also witnessed the shocks of GFC.

Following GFC, the trading in PSX was also halted for some time. The trading in SSFs were resumed on July 27, 2009. The newer SSFs had different features[7] and improved risk management measures. The tightening of rules for SSFs is not backed by any empirical study. To decrease the effect of futures markets on stock market volatility, stringent regulations have been adopted for resumed SSFs. While these stringent regulations may or may not reduce the overall volatility of the market, they definitely will add costs to the market participants of futures markets. Since regulations are costly, it is important to study the potential impact of parallel futures markets on stock market volatility. Therefore, there is a need to assess this transitional situation. The outcomes of this study will be important to regulators and officials in improving contract specifications and trading mechanism for derivatives contracts. This will improve the features of futures as a better risk management tool. The objective of this study is to investigate the impact of resumption of SSFs contracts trading on market efficiency and volatility (tradeoff between gain & loss).

This study contributes to the literature of futures markets in the following ways. First, in their studies (Bae et al., 2004; Debasish 2009) used the futures index data to investigate the simultaneous change in market efficiency and volatility (Following the arguments of Cox 1976; Ross 1989) in Korean and Indian stock markets, while this study makes use of SSFs for the said purpose. The use of SSFs over index futures by this study has following rationales, which could be confirmed from the study of McKenzie, Brailsford, and Faff (2001). 1) Exact impact would be more evident by the use of SSFs over Index, which cannot be traded directly. 2) Easy/flexible application of rules on SSFs than

[6] IMF (2002), Dodd (2000), Kregrel (1998) and Garber (1998)
[7] Strictness in regulations for re launched SSFs from former SSFs are. 1) Costly bank/cash margin 2) Application of special margin instead of concentration margin, and 3) Holding of mark to market profit by exchange.

index. Second, unlike (Bae et al., 2004; Debasish 2009) this study makes use of ARIMA-EGARCH specification to measure the volatility for pre and post SSFs periods. They used partial adjustment model to study the relationship between market efficiency and volatility. Third, this study makes simultaneous use of Generalized Error Distribution (GED), student's t along with normal distribution[8] to incorporate the fat tails of financial time series data first time ever. Fourth, some studies[9] have been performed in the context of Pakistan (with different institutional settings than other economies), when the equity derivatives were first introduced. Here the data has been used for resumption period with modified contract specification and expected more informed trader in the market than before.

Following the introduction, this study is divided into the following sections. Section 2 provides related literature review. Section 3 presents the data description and methodology. Section 4 presents results, while discussing them separately for SSFs and non-SSFs. The study is concluded in section 5 by presentation of conclusion and policy implications.

Literature Review

Although Ross (1976) and Hakansson (1982) had proposed in their respective studies that value of a stock should be influenced by the introduction of its own derivative, still SSFs contracts were not traded. In the 1990s, SSFs were introduced in Australia and Hong Kong. They were later introduced in other countries as well, e.g., UK, USA, South Africa, India, Pakistan and Malaysia etc.

Several studies have been conducted in different markets in order to understand the influence of parallel futures markets on dynamics of the underlying spot market. These studies report diverse set of results. The reasons for varying results depend on the geographical locations, methodology employed, data used for analysis, and period used for studying the impact. For example, Bae et al. (2004) investigate the impact of introduction of futures index on spot index. They made use data of KOSPI 200 constituent and non-KOSPI 200 stocks. In order to check the relationship between market efficiency and volatility across introduction of futures markets, they used partial adjustment model. This model theorizes that there is a direct relationship between market efficiency and volatility. They report that higher spot price volatility and lower market efficiency in non- KOSPI 200 stocks in relation to KOSPI 200 index stocks. On similar lines, Debasish (2009) also used partial adjustment model for this purpose in Indian context. He checks the introduction of NSE Nifty index futures trading and their consequent influence on underlying 10 stocks taken from underlying spot market. He

[8] Bollerslev (1987), Baillie and Bollerslev (1989), Kaiser (1996) and Beine, Laurent and lecourt (2000), suggested the use of student's t distribution. On the other hand, Nelson (1991), and Kaiser (1996) recommend generalized error distribution for such an instance, on hand.
[9] Malik and Shah (2017), Khan and Abbas (2013), Khan, Shah and Abbas (2011), Khan and Hijazi (2009) and Khan (2006).

reports that futures trading decreases market/ trading efficiency and volatility simultaneously. This simultaneous decrease in market efficiency and volatility is characterized as gain and cost of introduction of futures markets. On similar lines, Malik and Shah (2017) study the introduction of SSFs on market efficiency and volatility in Pakistan's context by using data from introduction episode. The study made use of CAPM augmented GJR – GARCH approach and conclude that introduction of SSFs have no impact on market efficiency and volatility. Tarique and Malik (2018) also report mixed results for economies abbreviated as BRICs.

On the basis of empirical results regarding destabilizing impact of derivatives trading, previous studies could be divided into three categories. First category of studies[10] suggests that introduction of futures trading increases volatility in the spot returns. This destabilizes the overall spot market. Second category of studies[11] depicts inverse relationship between introduction of trading in derivatives markets and volatility of underlying spot markets. This could be interpreted as introduction of futures market decreases the volatility and stabilizes the market. Finally, the third category of studies[12] reports no influence of introduction of futures trading on underlying spot market.

Studies[13] in Pakistan's market are inconclusive on SSFs trading and its relationship with underlying stocks. Generally speaking, at theoretical as well as empirical levels, the presence of parallel futures markets and their relationship with underlying spot markets is still under debate.

Data & Methodology

In order to investigate the impact of futures markets on the dynamics of underlying spot market, several approaches have been used in event study methodology. Among these, two approaches have received considerable attention among the investigators and has been used by numerous studies[14]. One approach analyzes the pre- and post-futures data sets of SSFs stocks/ index futures /

[10] Harris (1989), Damodaran (1990), Schwert (1990), Lockwood and Linn (1990), Hou and Li (2014) and Xu and Wan (2015)
[11] De Beer (2009), Brown Hruska and Kuserk (1995) Santoni (1987) and Nath (2003)
[12] Bohl and Siklos (2015), Board, Sandman and Sutcliffe (2001), Darrat and Rahman (1995), Becketti and Roberts (1990) Smith (1989) Conrad (1989) Grossman (1988) and Edwards (1988a, 1988b) Illueca and Lafuente (2003), Bessembinder and Seguin (1992), Darrat, Rahman and Zhong (2002), and Kyriacou and Sarno (1999)
[13] Tarique and Malik (2018) Malik and Shah (2017), Malik and Shah (2016), Malik and Shah (2014), Malik and Shah (2013), Khan and Hijazi (2009), Khan (2006) and Khan, Shah and Abbas (2011)
[14] For example, Malik and Shah (2017), Khan and Abbas (2013), Khan, Shah and Abbas (2011), Gahlot and Datta (2011), Chau et al. (2008), Mazouz (2007), McKenzie, Brailsford & Faff (2001), Bae et al. (2004), Galloway and Miler (1997), Antoniou and Homes (1995) etc.

options etc. While, other approach considers non-SSFs stocks as a control sample. Both of these approaches have pros and cons. In order to take benefit of both the approach, this study makes use of both approaches, while employing econometric technique of Mazouz and Bowe (2006). This study makes use of aforementioned approach to investigate the potential impact of resumption of SSFs on market efficiency and volatility.

Market Efficiency Modeling

Cox (1976) argue that existence of parallel futures markets creates and enhances the information flows in the market. He asserts this argument with the help of and empirical evidence. Specifically, he claims that futures prices quickly adjust to the new information. Arbitrage mechanism in the market helps transfer this information to the spot market. Further, he argues that this will result in simultaneous increase in market efficiency and volatility. This argument is supported by the work of Ross (1989), who claims that under the assumption of arbitrage free economy, volatility is directly proportional to the rate of new information approaching the market. The study of Brorsen (1991) is also important with respect to this line of argument. Basically, he extended the argument of Brorsen, Oellermen, and Farris (1989), that futures market affects spot markets. This helps in adjustment of new information in speedy manner, which results in hike in price volatility in the short run. From the above studies, it can be hypothesized that while futures trading provides an additional venue for information generation/ transmission, and that this information set is transferred /reflected in the spot prices, then this would be apparent in spot price volatility. Brorsen (1991) and Brorsen et al. (1989) provided a mathematical expression, which reflects the relationship between the spot prices ($\emptyset t$) and equilibrium prices ($\emptyset^* t$). They named it partial adjustment process model, which is as follows:

$$\Delta\emptyset_t = \emptyset_t \quad \emptyset_{t \ 1} = \gamma \ \emptyset_t - \emptyset_{t \ 1} \quad \text{.........} \quad (3.1.1)$$

$$\emptyset_t = \emptyset^*_{t \ 1} + \mu \qquad \mu_t \sim \mathrm{N}\,(0, \sigma^2_\mu) \quad \text{.........} \quad (3.1.2)$$

Here, prices are measured using logarithms. $\Delta\emptyset_t$ represents the change in stock price. The μ_t is a disturbance term. Gamma γ is a constant, which assumes values between 0 and 1. Further, γ is represents the rate of speed. The speed with which market prices move towards equilibrium prices. Price adjustments are immediate, when γ takes the value 1, otherwise not. Decrease in γ with increase in market frictions is tantamount of market efficiency of any stock. Autoregressive model of the order 1 for stock returns R_t (price changes $\Delta\emptyset_t$) could be rearranged as follows:

$$\Delta\emptyset_t = R = (1 - \gamma) R_{\gamma-1} + \gamma U_t \quad \text{.........} \quad (3.1.3)$$

In the equation 3.1.3, Rt-1 and μ_t are independent of each other, and unconditional variance of Rt and Rt-1 are same, and variation in R_t could be formulated as follows:

$$Var(R_t) = \left[\frac{\gamma}{2-\gamma}\right] Var\,(U_t) \quad \text{.........} \quad (3.1.4)$$

$Var(\mu_t)$ is the variation in equilibrium prices. This is used as a measure of information flow in prior studies[15]. Brorsen (1991) proposed that variance of equilibrium prices could be best estimated by

[15] Bae and Jo 1999; Jones, Kaul, and Lipson 1994; Ross, 1989; Skinner 1989

measuring variation in weekly/monthly price changes.
The first order partial derivative of Var (R_t) with respect to γ can be written as follows:

$$\frac{\delta \mathrm{Var}(Rt)}{\delta\gamma} = \left[\frac{2}{(2-\gamma)^2}\right]\mathrm{Var}(\mu_t) \quad \text{……… (3.1.5)}$$

Equation (3.1.5) is a mathematical expression of direct relationship between market efficiency and spot price volatility. This could be interpreted as if market efficiency increases, the spot market volatility of the underlying stock will also increase.

This study calculates calculation of Degree of Market Efficiency (DME) for each stock in pre and post periods separately. For comparison from pre- to post-futures change in market efficiency, paired sample t-test is used.

Volatility Modeling

The Exponential[16] Generalized Autoregressive Heteroscedasticity (EGARCH) process framework was introduced by Nelson (1991). As an extension of GARCH genre of models, EGARCH takes care of asymmetric effect induced by negative and positive shocks. Nelson's EGARCH model could be expressed as follows:
Let Y_(t)depicts the day end closing price at time t, which assumes values t=1, 2, 3….T. As a general rule, the rate of return is computed as follows:

R_t=log (Y_t/Y_{t-1})……… (3.2.1)

In equation 3.2.1, R_t is the rate of return from holding the stock from time t-1 to time t. To calculate the volatility of the returns, this study makes use of The ARMA (k, l)-EGARCH framework, which could be presented as follows:

$$R_t = \phi_0 + \sum_{i=1}^{k} \phi_{t-i} R_{t-i} + \sum_{j=1}^{l} \theta_{t-j}\varepsilon_{t-j} + \varepsilon_t \quad \text{……… (3.2.2)}$$

$$ln\sigma_t^2 = \omega + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2 + \sum_{i=1}^{q} (\alpha_i |\eta_{t-i} - E(\eta_{t-i})| + \gamma_i \eta_{t-i}) + \phi dummy + \quad \text{……… (3.2.3)}$$

Underlying Error Distribution

Engle (1982) assumed the error term to follow normal distribution in the GARCH process. Bollerslev (1986) extended the work of Engle (1982). He added lagged conditional variance in the variance equation of the framework. He pointed out that lagged condtional variance should also be

[16] GARCH stands for Generalized Autoregressive Conditional Heteroscedasticity. This model is used to estimate and predict variation in the asset series. EGARCH is an asymmetric extension of GARCH genre of models.

accounted for, while estimating or predicting the conditional variance. Both used Maximum Likelihood (ML) approach for estimation purposes. ML approach states that parameters are conditional upon sample information. And that, probability density is a function of parameters. Normal distribution is widely used. However, the stock returns rarely follow normal distribution. This could be observed by checking the descriptive statistics of the stock returns and its normality tests. Weiss (1986) Bollerslev and Wooldridge (1992) are of the opinion that Quasi Maximum Likelihood (QML) is consistent, if and only if, the conditional mean and conditional variance are specified correctly. This situation changes on departure of error term away from normality. With this line of argument, Engle and Rivera (1991) established that QML provides consistent results. However, it becomes inefficient for non-normal distribution. The degree of inefficiency is more when the distribution of a variable departs away from normal distribution. This has raised serious concerns over the normality assumption of error term in estimation of models. This situation has led the researchers for consideration of other non-normal distributions in parametric analysis. Some other distributions (e.g., GED, student's t etc.) have been used in the literature to take care of this issue. For this study Student's t distribution (Bollerslev 1987) and GED (Nelson 1991) have also been utilized. This has helped in taking care of thick tails.

Finally, Z-test will be used to compare the proportions of simultaneous increase or decrease of DME and volatility.

Data Description

SSFs were launched on July 10, 2001 in PSX. This started with contract listing of ten stocks. However, SECP kept on reviewing the contracts' listing on timely basis, which resulted in listing of more contracts on PSX. By 2008, the total contracts listed as SSFs amounted to 46. When GFC hit the PSX, the whole market remained suspended for few months. Trading in SSFs also remained suspended few months. After recovery from the critical situation caused by GFC, the market was resumed. Alongside others, trading in 18 SSFs were relaunched on July 27, 2009. This time regulation for trading in SSFs were stricter than before. This study focuses on resumption episode, which had stringent regulations thatn former SSFs. For analysis purpose, the study makes use of one year daily closing prices' observations are used. This dataset is used to investigate the impact of SSFs on market efficiency and volatility of the underlying stocks. This data is collected from online database (www.brecorder.com).

Analysis & Discussion

GARCH stands for Generalized Autoregressive Conditional Heteroscedasticity. This model is used to estimate and predict variation in the asset series. EGARCH is an asymmetric extension of GARCH genre of models. The results are presented in descriptive and inferential statistics form. Table 1 reports the descriptive of SSFs and non-SSFs. Skewedness and kurtosis are presented along with Jarque Berra (JB) and Augumented Dicky Fuller (ADF) tests, which are used to examine the normality and stationarity of the underlying stock returns distribution. The skewedness, kurtosis and JB report that null hypothesis of normality of underlying distribution was rejected or not in each case. The aforementioned tables also indicate the absence of unit root in each return series using ADF test. Box and Jenkins methodology was used for selection of mean equation ARIMA-EGARCH model. Several provisional equations with varying ARMA orders have been estimated. This order was used after carefully examining the depending upon the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF). For each stock, ARMA equations with least Akaike Information Criterion (AIC) and Schwarz's Bayesian Information Criterion (SIC) are selected for later incorporation in ARMA-EGARCH model to measure volatility change. In addition, skewedness, kurtosis, JB test and ARCH effect were examined for further analysis of normality and heteroscedasticity effect.

Results for the market efficiency model are reported in Table 2A, using the partial adjustment process model (equation 3.1.1). The Table reports that degree of market efficiency "γ" (for each stock, it is calculated for pre and post periods for both SSFs and Non SSFs). Comparison of "γ" shows that out of eighteen SSFs, market efficiency has increased for 10 stocks, while it has decreased in the remaining eight stocks. On the other hand, application of similar approach to non-SSFs, resulted an increase in seven stocks, and decrease is observed in remaining nine stocks. Table 2B reports comparison between degree of market efficiency for pre and post periods. Paired sample t-test show insignificant difference between pre and post periods for both SSFs and non-SSFs. On the other hand, volatility is measured using ARIMA- EGARCH model (3.2.2 & 3.2.3), underlying different distributional assumptions for both SSFs and non-SSFs.

Finally, ARIMA-EGARCH model (equations 3.2.2 & 3.2.3) is applied with dummy variable assuming value "1" for pre and value "0" for post period, on each stock, using normal, GED, and t distribution, which ever fitted the best on the basis of JB, skewness and kurtosis. Results are shown in Table 3 and 4. For SSFs, an insignificant increase is observed for 15 stocks while an insignificant decrease is seen in remaining three SSFs stocks. Moreover, for Non-SSFs, an insignificant increase is evident in case of 11 stocks and significant increase in only one stock while insignificant decrease in remaining four Non-SSFs stocks.

Therefore, it may be interpreted that an insignificant change has been observed, both, in DME and volatility. Furthermore, Z test is used to check whether proportion of simultaneously increasing DME and volatility is different from simultaneously decreasing DME and volatility. For SSFs, Tables 5 and 6 report the proportion of stocks with increasing DME and volatility are significantly different (greater) than the ones with decreasing DME and volatility at 10% level of significance. The same test resulted in an insignificant difference for Non-SSFs. This study reports contrasting results from Bae et al. (2004) and Debasish (2009) that report simultaneous increase in former case and simultaneous decrease in later case for both market efficiency and volatility. The study provides similar results, as were provided by Becketti and Roberts (1990) that increased regulations might increase the costs to the market participants, when their destabilizing impact has not been substantiated.

Conclusion

Primarily, this study examined the influence of relaunching of SSFs on market efficiency and price volatility of counterparts in the spot market in PSX. The study used several econometric specifications for ARIMA – EGARCH process. Overall, the results of the study do not show consistent patterns in potential change in market efficiency and volatility. This study employed control sample methodology while examining the influence of resumed SSFs. Once again, the results of the study fail to report consistent pattern in the price volatility and efficiency of non- SSFs stocks. By analyzing both SSFs and non-SSFs, it could be narrated that the results of this study are in line with some of the prior studies. Further, it could be concluded from the discussion that trading in SSFs should not necessarily be linked with futures markets. There could be two potential reasons for these results. First, the stringent regulations of newer SSFs helped in reducing the beneficial destabilization of the market. Second, the allegations against former SSFs did not have any value. Apart from these two main reasons, there could be other reasons for potential changes as well. For example, stock, industry or macroeconomic factors.

This study reports little or no impact of parallel futures markets in destabilizing the underlying market. It can be concluded that circuit breakers and high margin rates can be useful for some other reasons, while their depressing impact on the trading volume of futures is unlikely to reduce the stock market volatility.

It is important to highlight that futures are still in its infancy phase. The rules and regulations for cash settled index options contracts are under review. The findings of this study might have implications for both of these situations. Yet, the findings of this study should be interpreted with care. It is possible that SSFs have no destabilizing effect on spot market as our results recommend; still, it is also conceivable that the SECP is very conservative in its strategy for selection of SSFs' stocks and designing stringent regulations for futures' trading, thereby restraining the role of futures in destabilizing the underlying spot market. Such alternative explanations for no-destabilizing effect of futures on underlying spot market in KSE can be investigated in future research studies. Such an investigation is imperative because if futures are not the reason for destabilization in the spot market, then excessive stringent regulations are not desirable because they reduce the liquidity and efficiency of the overall market.

Table 1

Descriptive statistics for SSFs and Non-SSFs stocks

Panel A: Descriptive statistics for SSFs					Panel B: Descriptive statistics for Non-SSFs				
SCRIP	Sk	KT	JB	ADF	SCRIP	Sk	KT	JB	ADF
OGDC	-0.32554	2.873254	0.209805	-12.4669*	ABL	-0.2625	3.0211	2.8535	-13.3071*
MCB	-0.154395	2.381254	4.9438***	-13.6362*	APL	0.1652	81.4152	63540.26*	-18.0055*
PPL	-1.677695	15.19358	1652.735*	-17.0239*	ARL	-0.1526	2.0358	10.5683*	-12.1561*
HUBC	0.095563	4.456982	22.31304*	-15.1798*	DHC	0.0549	2.4916	2.7953	-12.1904*
PSO	0.147066	2.550685	2.980098	-14.2804*	EFU	-0.0481	2.0631	9.1661**	-11.7300*
POL	0.138458	2.416299	4.313023	-14.0836*	FCCL	0.3725	6.6229	141.3641*	-18.03002*
NBP	-1.260473	11.12095	747.1521*	-13.7522*	HBL	-1.2601	11.8496	874.8940*	-15.0500*
UBL	-0.039292	2.531193	2.334877	-14.5948*	MGCL	-8.7403	114.123	130757.8*	-13.8483*
EC	0.27347	3.111065	3.218608	-12.6299*	MLCF	0.5801	6.9346	173.8759*	-17.0440*
DGKC	-0.10744	2.166987	7.64755**	-13.1086*	NRL	0.174	2.6543	2.4861	-11.9650*
PTCL	0.1528	3.076405	1.025373	-13.1244*	BAHL	5.3597	61.7473	36850.25*	-17.0949*
BAF	0.291715	3.302951	4.465763	-14.9085*	ACBL	-0.8461	8.8369	381.6455*	-15.3538*
FFBQ	-0.320218	5.128466	51.0521*	-17.7165*	KTM	0.6371	4.6822	46.0182*	-17.3644*
LUCK	-0.104442	2.391584	4.275965	-13.6604*	KAPC	0.0568	4.1279	13.2787*	-15.4637*
NM	-0.145648	2.051902	10.16534*	-14.7131*	TEL	0.1584	12.9416	1022.3390	-18.3480*
AJI	-0.216157	2.267449	7.47644**	-12.8236*	NCL	0.11090	2.86462	0.697779	-14.86816*
FFC	-2.892661	25.4679	5562.188*	-13.9002*					
AN	-0.247365	2.694462	3.493817	-11.9587*					

Note. This Table presents Descriptive statistics for SSFs and Non-SSFs in Panel A & B. Skewness (Sk), Kurtosis (KT), Jarque – Berra (JB) and Augmented Dicky Fuller (ADF) test are presented in this Table.

Table 2A

Degree of Market Efficiency for SSFs and Non-SSFs

	Degree of Market Efficiency					**Degree of Market Efficiency**		
SCRIP	BEFORE	AFTER	INC/(DEC)		SCRIP	BEFORE	AFTER	INC/(DEC)
OGDC	1.875	1.896	0.02137		ABL	1.893	1.961	0.06759
MCB	1.895	1.925	0.02974		APL	1.99	1.948	-0.04216
PPL	1.932	1.912	-0.01963		ARL	1.855	1.89	0.03488
HUBCO	1.914	1.952	0.03755		DHC	1.899	1.746	-0.1433
PSO	1.904	1.904	-0.00004		EFU	1.895	1.931	0.03541
POL	1.845	1.912	0.06758		FCCL	1.965	1.943	-0.02263
NBP	1.836	1.883	0.04618		HBL	1.895	1.935	0.04069
UBL	1.93	1.906	-0.02462		MGCL	1.794	1.821	0.0266
EC	1.753	1.943	0.1897		MLCF	1.922	1.945	0.02328
DGKC	1.901	1.897	-0.00373		NRL	1.879	1.924	0.04513
PTCL	1.935	1.875	-0.06037		BAHL	1.932	1.899	-0.03362
BAF	1.927	1.962	0.03501		ACBL	1.979	1.872	-0.10692
FFBQ	1.983	1.907	-0.07538		KTM	1.954	1.955	-0.00131
LUCK	1.887	1.886	-0.00009		KAPC	1.901	1.853	-0.04759
NM	1.906	1.847	-0.0592		TELE	1.966	1.966	-0.11264
AJI	1.903	1.962	0.05973		NCL	1.936	1.875	-0.06101
FFC	1.939	1.968	0.02926					
AN	1.745	1.903	0.1575					

Note. This table presents the Degree of Market Efficiency for both SSFs and Non-SSFs. The Panel A & B present DME for before and after the event date, while depicting the change in the form of increase/decrease.

Table 2B

Paired Sample T Test for Pre to Post Degree of Market Efficiency Change

Category	**Exact Significance (two-tailed)**
SSFS	2.1098
Non-SSFS	2.1314

Table 3

ARIMA-EGARCH MODEL FOR SSFs

	OGDC	**MCB**	**PPL**	**HUBCO**	**PSO**	**POL**	**NBP**	**UBL**	**EC**
AR		0.114533(1)**	0.771633(1)*	-0.16435(3)**	0.016453(19)	0.72499(28)*	0.04636(1)	-.15168(14)*	0.13325(1)** *
				-0.02455(17)				0.100435	0.137716(10)**
				0.11032(18)**					-.11064(17)**
									-.13792(29)*
MA	0.172821(1)*		-0.78882(1)*			-.67475(28)*			
	-0.13649(23)**								
Ω	-6.99E-01	-0.01194	-0.26025	-1.26582	-0.67348	0.226795**	-0.10636*	-0.06303	-2.63649***
Β	0.1277	-0.0443	0.165277***	0.29373**	0.208451**	-0.05629*	-0.02538**	-0.02402	0.49329*
Α	0.011194	0.031145	0.106754**	0.067343	-0.00564	0.949092	0.056622**	0.06523	0.073967
Γ	0.939111*	0.995391*	0.985529*	0.893942*	0.946693*	1.000605*	0.986445*	0.991525*	0.76614*
Dum	0.025405	0.002263	-0.00807	0.020609	0.009692	0.002856	0.00154	0.006801	0.148475
Dist	Normal	Normal	GED	GED	Normal	Normal	GED	Normal	Normal
	DGKC	PTCL	BAF	FFBQ	LUCK	NM	AJI	FFC	AN
AR		0.092912(1)	0.096685(22***	-0.59651***	0.121457(1)**	0.158186(7)**		0.013708(1)	0.129226***
		-0.15015(3)**				-0.12732(26)***		-0.13623(4)*	
		0.214805(7)*						-0.04334(5)	
								-0.07525(8)	
MA	0.189049(1)*		-0.20844(9)*	0.528285			0.238619(1)*		
			-0.09569(18)***				-0.1125(21)**		
							-0.18849(23)*		
Ω	-0.12875	-0.23007*	-0.06454	-0.24189	0.038815	-0.74745	-4.69854	-1.07655***	-3.33112
Β	-0.05236	-0.11272*	-0.03289	0.081865	-0.00629	0.153171	0.339896	0.202964	0.335041
Α	-0.03981	0.096733**	0.101677*	0.17267*	0.04361	0.024043	-0.04209	0.212384**	-0.0644
Γ	0.98224*	0.966118*	0.991345*	0.980359*	1.003706*	0.929444*	0.508973	0.911948*	0.66189
Dum	0.026055	0.020546*	0.013844	0.008368	-0.01344	-0.00454	0.370167	0.122625	0.302411
Dist	Normal	Normal	Norma	GED	Normal	Students' t	Students' t	GED	Normal

Note. This Table presents the results of ARIMA – GARCH model for SSFs only. The underlying error distributions are Normal, student's t and GED.

Table 4

ARIMA-EGARCH MODEL FOR Non-SSFs

	ABL	APL	ARL	BAHL	EFU	FCCL	HBL	MGCL
AR	-0.0632(14)			-0.0700(6)**	0.2013(1)*	-0.2104(1)*	0.1279(1)**	0.6113(1)*
	-0.1250(20)			0.0678(11)**	-0.1280(4)***	-0.1635(2)*		
				-0.0903(13)*		0.1442(15)*		
				-0.0606(14)***		-0.1237(23)*		
MA		-0.0698(1)***	0.1985(1)**		-0.2488(16)*			-0.2698(1)**
Ω	-0.7001***	-1.2032***	-5.6394	-6.3755*	-0.2913***	-15.7605*	-10.5293*	-5.347318
Β	0.2840**	0.3384*	0.4101	0.8527*	0.0356	-0.1646	0.5537*	0.2483
Α	0.0559	-0.0017	0.0442	-0.2765**	0.0569	-0.0266	0.1391	-0.0171
Γ	0.9496*	0.8965*	0.4026	0.3854**	0.9685*	-0.7289***	-0.1061	0.3763
Dum	-0.0082	0.1018	0.2325	-0.1402	-0.0092	1.4878**	0.5312	0.0425
Dist	Normal	GED	Students' t	GED	Normal	GED	GED	GED
	MLCF	NRL	DHC	ACBL	KTM	KAPC	TELE	NCL
AR		0.1110(1)	0.1179(1)**	-0.1082(4)		0.0847(10**		-0.09129(21)
		-0.1826(2)**		0.0012(22)				-0.08523(25)
		0.0597(13)						
		0.1623(24)*						
MA	0.0551(1)				-0.0784(30)		-0.2174(1)*	
							-0.0104(26)	
Ω	-0.324	-1.4296	-1.3300*	-0.5298***	-1.73861**	-3.3499	-0.7355**	-1.801833
Β	0.0453	0.2355***	0.5368*	0.1953***	0.284487***	0.4781***	0.3112**	0.330684**
Α	0.0692	0.0112	0.1162	0.1294**	0.225197**	-0.0466	0.1346	-0.03184
Γ	0.9684*	0.8708*	0.8980*	0.9608*	0.808448*	0.7008*	0.9337*	0.811708*
Dum	0.0333	0.0584	-0.0598	0.0056	0.049501	0.0772	0.0482	0.015306
Dist	GED	Normal	Normal	GED	GED	GED	GE	Normal

Note. This Table presents the results of ARIMA – GARCH model for Non-SSFs only. The underlying error distributions are Normal, student's t and GED.

Table 5

Simultaneously Increasing and Decreasing Volatility and DME

VOL & DME	SSFs (No.)	NON-SSFs (No.)
Increased	10	6
Decreased	3	2
Opposite	5	8
Total	18	16

Note. This Table presents number of stocks with simultaneous changes in volatility and DME changes.

Table 6
Comparison of simultaneously increasing and decreasing Volatility and DME

		Category	N	Observed	Test Prop.	Exact Sig. (2-tailed)
SSFs	Group 1	1.00	10	.77	.50	.092*
	Group 2	0.00	3	.23		
	Total		13	1.00		
NONSSFs	Group 1	1.00	6	.75	.50	.289
	Group 2	0.00	2	.25		
	Total		8	1.00		

Note: This Table shows results of Z test. Z test is used to check that whether proportion of simultaneously DME and volatility is different from simultaneously decreasing DME and volatility

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