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Single Stock Futures and their Impact on Risk Characteristics of the Underlying Stocks: A Dynamic CAPM Approach

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Abstract: *The concern regarding destabilizing ability of trading in futures markets in terms of increase in risk is still unresolved in developed and developing economies. This discussion also prevailed in Pakistan after the Global Financial Crisis (GFC). To investigates this concern with respect to Single Stock Futures (SSFs) and their impact on the underlying stocks, this study made use of data from 1999 to 2008. Specifically, this study investigates the introduction of SSFs in relevance to their impact on the systematic and unsystematic risk of their counterparts. The statistical results of the study show that introduction of SSFs does not enhance the overall risk of the underlying stocks. Therefore, it can be concluded that SSFs cannot be blamed for any apparent volatility in the Pakistan Stock Exchange (PSX) at and before GFC. There could be some other reasons for change in risk level (accounting and macroeconomic fundamentals or industry specific influence etc.). The results of this study are in line with a category of earlier studies, which show that introduction of futures do not destabilize the underlying market. The study implies that flexible regulated futures markets can improve price discovery and liquidity of the market, while acting as an agent for hedgers.*

Keywords: Systematic risk, un-systematic risk, SSFs, capital asset pricing model, GJR-GARCH, leptokurtic

Introduction

Financial derivatives were introduced in early 80's, but the debate on their potential impact on the dynamics of underlying markets started before their formal introduction (Antoniou & Holmes, 1995). In this regard, activities of noise traders in the futures markets and its impact on the underlying market remained a point of concern for the stakeholders of the markets (Antoniou, Koutmos, & Pescetto, 2011; Antoniou, Koutmos, & Pericli, 2005; Laopodis, 2005). To be able to understand and check this impact, several scholars used variety of approaches to identify the patterns and influence of rational and irrational traders in relevance to the futures markets.

Several leads are used to study this matter. For example, one line of argument states that it is important to identify the intentions of traders involved in futures trading activity. There are three types of investors, who are known to use futures for their respective concerns (i.e., hedgers, speculators, and arbitragers). Futures markets are knows to enhance

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speculative activity in the overall market. This ability of futures markets is usually linked with destabilization of the market. This debate is prevailing at both theoretical and empirical contexts (Antoniou et al., 2011). This situation provide leads to the questions like: What is the magnitude of impact of derivatives on the risk characteristics of underlying spot markets in the context of developed and developing markets?

There are several studies that discuss the difference between market value of a stock and its fundamental value and the reasons of this spread. For example, Mazouz and Bowe (2006) state that one of the reasons for this difference is noise in the microstructure of the market and trading noise. This statement is in line with the argument these noise traders can be a reason for this difference. There are several studies that substantiate this argument (e.g., De Long, Shleifer, Summers, and Waldmann (1990a); Pierdzioch (2004); McKenzie, Brailsford, and Faff (2000); Salm and Schuppli (2010). Theoretically, arbitrageurs through arbitrage mechanism attempt to reduce the spread between observed market value and fundamental value of a given stock (e.g., De Long, Shleifer, Summers, and Waldmann (1990b); Antoniou et al. (2005, 2011)). The arbitragers use a substitute security for this purpose, which they short sell in the market. Quite often, it is hard for them to find a perfect substitute security. The presence of Single Stock Futures (SSFs) eliminates this issue of substitution and acts a source for reducing systematic risk. Nonetheless, arbitrageurs confront noise traders in the market, which are again a source of risk (Bradford, De Long, Summers, & Waldmann, 1991). The risk potential due to activities of noise traders' risk is unsystematic in nature. The lucrative characteristics (e.g., leverage and low cost) of SSFs attract noise traders (Chau, Holmes, & Paudyal, 2008). The presence of SSFs over a security attracts not only arbitrageurs but noise traders as well. The arbitrageurs have to deal with both systematic and unsystematic risk components caused by noise traders. Through their activities, the noise traders move the stock prices away from their intrinsic values, which arbitrageurs attempt to revert. If the noise traders get more pessimistic, then there is a possibility that they can move it further away from the intrinsic value. The presence of noise traders can exaggerate the situation. This situation creates problems for arbitrageurs, and pushes them to liquidate their positions. As a result, the noise traders create hindrance for arbitrageurs in their attempt to cope up with the dislocation in prices caused by noise traders.

In an emerging economy like Pakistan, where noise traders are known to exist along with parallel SSFs, it seems plausible to investigate presence of SSFs and their impact on systematic and unsystematic risk. This systematic risk in this study is used as a proxy for microstructure related noise, while unsystematic risk is used as a proxy for trading noise. For options markets, similar approach has been used by several other studies, e.g, (Mazouz & Bowe, 2006; Mazouz, 2004; Skinner, 1989).

There are several reasons that make this is study significant for the stakeholders of financial markets. Pakistan's financial market crashed several times (notably 2005 and 2008 in recent times). After Global Financial Crisis in 2008, the futures markets in Pakistan also witnessed huge debate and allegations on them (S. U. Khan, 2006; Naz, 2011). The role of derivatives in GFC is proven, yet in Pakistan, evidence is required for stringent regulations that were imposed on resumed SSFs. Futures markets in Pakistan are assumed to be reason of high volatility in the market (Ahmad, Shah, & Shah, 2010). The resumed

SSFs in July 2009 are known for stringent regulations [1]. These situations raise questions that whether SSFs played role in enhancing the impact of GFC in Pakistan, and whether these stringent regulations for resumed SSFs are justified or not. These questions can be answered by investigating the destabilizing ability of SSFs. In April 2012, the Securities and Exchange Commission of Pakistan (SECP) approved regulations for Options contracts for their launching in Pakistan's market. Therefore, the evaluation of SSFs can help in development of proper regulations for options as well. In their study, I. R. Malik and Shah (2016) investigated the impact of resumed SSFs on systematic and un-systematic risk of underlying stocks. The data consisted of 1 year closing prices for both SSFs and non-SSFs. The results of this study show insignificant influence on both systematic and unsystematic risk component of underlying stocks. The current study extends on the initial work of I. R. Malik and Shah (2016), while using data set from introduction episode and flexible regulations for SSFs. This might provide different results. These results are expected to help policy makers in devising and implementing regulations that can help achieve the objectives of futures markets, while avoiding instability that can result from activities of irrational traders.

The study contributes to the empirical literature on derivatives in the following manner. The econometric technique of Mazouz and Bowe (2006) is extended by taking care of Risk-free Rate (RFR), AR (1) and using GED instead of normal distribution. AR (1) is added to take care of potential market inefficiencies. Perry (1985) shows presence of non-synchronous trading in the market and attempts to gauge this presence through serial correlation. The use of AR (1) might help in that context. To account for non-normality in the data set, the study use GED as is suggested by Pasha, Qasim, and Aslam (2007) in the context of Pakistan.

After introduction, second section presents review of related theoretical and empirical literature. Section 3 presents and justifies the use of methodology to answer the research question. Later in section 4, the findings of the study are presented and discussion is elaborated in the context of results. In section 5, the findings of the study are concluded. The implications for policy makers and directions for future research on this topic are also presented in this section.

Literature Review

The relevant literature review presents the theoretical aspects as well empirical evidences on the studies in derivative markets. These studies made use of data sets from index futures, SSFs and options markets. These studies intend to figure out the destabilizing role introduction of aforesaid derivatives on underlying counterparts. Broadly speaking, depending upon the results, these studies can be categories into three types. One line of studies report increase in risk determined in terms of change in volatility. The second

[1] The newer and resumed SSFs have following differences: 1) Newer SSFs have 100% bank or cash margin, which was 50% before (controlling aspect), 2) Concentration margin takes place of special margin for newer SSFs, 3) 'Mark-to-market-profit' will be kept with the regulators. Previously it was distributed among stakeholders.

category of studies reports no change in volatility, while the third category reports that derivatives stabilize the market in a way that they decrease the volatility in the market.

Extant literature on derivatives and their impact on underlying market depicts that empirical work does not seem to always support the theoretical propositions of researchers. The following subsections provide both theoretical perspectives and resultant empirical studies.

Theoretical Perspectives on Futures Trading

Following perspectives have been adopted in the literature so far, which attempts to explain the presence of parallel futures markets and their impact on underlying counterparts. From earlier studies on this topic, scholars attempt to study this debate from bid-ask spread perspective. These arguments attempt to explain the reasons of difference between market value and their fundamental value. Mostly this difference is explained through systematic and unsystematic risk (Black, 1986; Amihud & Mendelson, 1987). With this line of studies, Danielsen, Van Ness, and Warr (2009) support the proposition that onset of futures markets, the informed traders move from spot to futures markets. This migration is depicted in decrease in trading volume, bid-ask spread and volatility in the spot market. The informed traders are attracted to futures markets due to lower transaction costs and leverage. Demsetz (1968) and Madhavan (2000) take another position on the link between introductions of derivatives and bid ask spread. They report that market makers hedge their risk and gets the opportunity enjoys quicker inventory turnaround in the spot market. This results in reduction in bid ask spread. There are some studies that discuss the relationship among spot and futures markets with respect investors. For example, Stein (1987) argues that de-stability caused by noise traders in futures markets reduces the ability of making right decisions of the informed traders in the spot market. This situation hinders their ability to accurately process information and resultantly they make bad judgment from stock prices. The intensity of noise trading is enough to offset the potential impact of higher liquidity. Consequently, bid-ask spread is observed to increase. While studying futures markets with their link to the activities of noise traders, Gorton and Pennacchi (1993) report that futures markets attract noise traders to the underlying markets because of lower transaction of futures markets. They use futures markets to hedge their positions instead of taking corresponding/offsetting positions in the spot market. The inference could be made that information asymmetry in the bid ask spread would increase, if noise trading increases in futures and spot markets. The activities of noise traders also reduce market efficiency. Glosten and Milgrom (1985) and Easley and O'hara (1987) assert that market makers will have to deal with more noise traders in the presence of futures markets, which will reduce information rent that market makers that they usually were charging, while dealing informed traders. This will result in reduction in bid-ask spread and stock price volatility.

It could be inferred from the above discussion that several premise have been put to test, while explaining the presence of parallel futures markets and their link with spot market. The empirical results are different in these situations. Following sub-sections provide few studies from developed and developing market, which makes it evident that the impact of futures on spot markets dynamics is still unresolved.

Literature Supporting Destabilizing Hypothesis

This sub-section of the study provides literature on the resultant increase in volatility due to presence of parallel futures markets. First off, Hung, Lee, and So (2003) investigate the impact of foreign listed SSFs upon domestic underlying stocks. They selected nine stocks that were listed on London International Financial Futures and Options Exchange (LIFFE). The study reports an increase in volatility post introduction of foreign listed SSFs. Earlier, Antoniou and Holmes (1995) investigate the impact of introduction of index futures on FTSE 100, with special reference to volatility and market efficiency. The study reports that introduction of futures has increased the market efficiency and volatility. To simultaneously check the impact of SSFs on market efficiency and volatility, Bae, Kwon, and Park (2004) made use of KOSPI200 stocks. They used partial adjustment model for this purpose. The study reports simultaneous increase in operational efficiency and volatility of the underlying stocks. This study was extended on the theoretical relationship between market efficiency and volatility, which was developed by Brorsen (1991). He tested this relationship by using the S&P 500 stock index. The study reports simultaneous increase in market efficiency in volatility.

Literature Supporting Stabilization Hypothesis

This section summarized the studies that show decrease in volatility due to introduction of futures markets. First off, Alexakis (2007) check the influence of index futures on the volatility of underlying spot market. He used the data from September 23rd, 1997 to June 7th, 2004 on index futures in the Athens Exchange (ATHEX). The study reports decrease in volatility post futures. The study also show increase in market efficiency and reduction in volatility asymmetries. Bohl, Diesteldorf, and Siklos (2015) examine the destabilizing impact of Chinese Stock Index Futures (CSIF) on their introduction. Their evidence shows that volatility has decreased post futures. Along with Index futures markets, there are few studies that are done using data of SSFs. De Beer (2009) investigated of introduction of SSFs on volatility underlying counterparts. He used data of 38 companies listed on South African exchange. The reported results show decrease in the volatility of underlying stocks, which imply that SSFs help stabilize the market.

BRICS have also been point of debate with respect of futures markets. Since in India and Pakistan had started using index futures market in the same year. This study overviews few studies from Indian Context for its relevance. For example, Bandivadekar and Ghosh (2003) investigate the influence of parallel index futures on volatility of underlying market. They used data of both S&P CNX Nifty and BSE Sensex. The results show decrease in post futures period. From the aspect of market efficiency and volatility, Debasish (2009) check the influence of index future trading on the spot market by collecting data from June 1995 to May 2009. The results of his study show decrease in market efficiency and volatility. Furhter, Nath (2003) checked the impact of introduction of S&P CNX NIFTY and S&P CNX NIFTY JUNIOR on volatility of spot market. They results of his study also show patterns of reduction in volatility.

In the case of Futures Index and options market, Drimbetas, Sariannidis, and Porfiris (2007) investigate the influence of said derivatives trading on the volatility of underlying markets in the FTSE/ASE 20 index by using EGARCH methodology. They report that the presence of derivatives market is the cause of reduction in volatility and increase in market efficiency. From earlier studies conducted in the USA, Galloway and Miller (1997) investigate the impact of index futures on stock return volatility. By using data on MidCap 400 stock index the study reports significant decrease in systematic risk and volatility. The study reports an increase in trading volume in both MidCap stocks and control stocks.

Literature on Neutral Effect of Futures Trading

The third category of studies shown in this subsection depicts that trading in futures markets neither stabilize nor destabilize the market in terms of change in market volatility. First off, I. Malik and Khan (2012) investigate the impact of resumption of SSFs on market efficiency and volatility. Their study make use of data of resumption episode that took place after GFC in 2009 unlike (Bae et al., 2004; Debasish, 2009). The study reports that resumption of SSFs neither increase nor decrease market efficiency and volatility in Pakistan's financial market. These results are in line with the study of S. Khan, Shah, and Abbas (2011), who investigate the influence of introduction of SSFs on volatility of their counterpart stocks. They also report that SSFs has no change on the volatility dynamics of Pakistan's market. With this line of argument, Awan and Rafique (2013) examine the influence of parallel futures trading on volatility on underlying. By collecting data on twenty four companies and using F-test and GARCH models, they found that futures' trading does not change the volatility dynamics of the underlying.

In emerging economy of India, Gahlot, Datta, and Kapil (2010) examine the influence of futures trading on volatility of underlying market. They collected data on S&P CNX Nifty. The reported results does not show any change in the volatility dynamics post-futures. As an extension to their previous study, Gahlot and Datta (2011) investigate the influence of trading in futures markets over spot market. In order to check the change in volatility structure and market efficiency, they collected data on CNX 100, CNX500, and MSCI ACWI index. They also report no change in volatility as well as market efficiency of the spot market.

Options markets are also a form of futures markets. Mazouz (2007) reexamine the influence of introduction of options' contracts on the volatility of the stocks listed on New York Stock Exchange (NYSE). He also took account of investor's learning effects, while studying the potential impact. The study reports no change in volatility dynamics of underlying stocks. Also, Darrat, Rahman, and Zhong (2002) investigate the impact of index futures trading on volatility of S&P 500 index spot market. For this, they collected data from November 1987 to November 1997. They report that introduction of S&P index futures has no impact on volatility of underlying spot index. Dennis and Sim (1999) examine the impact of SSFs on price volatility of underlying stocks in Sydney Stock Exchange. The study reports that overall futures trading have no impact on volatility of underlying spot market. Bessembinder and Seguin (1992) investigate the impact of futures trading activity on spot market volatility. By using data from S&P 500 index (i.e., from January 1978 to September 1989), the study reports that trading in futures markets cannot be linked with volatility in the spot market.

S. U. Khan and Abbas (2013) investigate the impact of SSFs on systematic risk of their counterparts stocks. They assumed underlying error term to be normal. This study is an extension to their work in the context of Pakistan. This study investigates simultaneously the influence of SSFs on systematic as well as un-systematic risk. The study also takes into account the non-normality in the variable of interest.

Following hypothesis lend them for empirical testing:

H_1: *Introduction of SSFs has impact on the systematic risk of their counterparts*
H_2: *introduction of SSFs has impact on the unsystematic risk of their counterparts*

Data and Methodology

Data Description

After introduction of SSFs in Pakistan in 2001, the continued addition and deletion of more SSFs started. This addition and deletion in the SSFs depend upon the criterion set by SECP. Risk Management department of SECP is responsible to review the progress of SSF after every six months. They take the decision of listing or de-listing of the stocks. In 2008, during the GFC, the trading in PSX was banned. This data set is from the period from 1999 to 2008. By the time GFC hit the Pakistan's market, SSFs contracts on 46 stocks from major sectors were allowed. [2] 46 stocks from the major sectors can be viewed in footnotes. From those 46 stocks, this study selected a sample [3] of 23 [4] stocks upon which SSFs contracts were allowed. The selection of these 23 stocks was based upon criterion that on these stocks two year data was available for both pre and post period. The data on closing prices is obtained from a premier business newspaper (www.brecorder.com). To add the context of risk free rate, three month daily T-bill rates are used. This data is selected from official website of State Bank of Pakistan (SBP) (www.sbp.gov.pk). KSE 100 index

[2] 17 SSFs-Commercial Banks, 5 SSFs-Cement, 4 SSFs-Refinery, 3 SSFs each for Fertilizer, Oil & Gas Marketing, Power Generation & Distribution and Oil & Gas Exploration 2 SSFs each for Technology & Communication and Synthetic & Rayon and 1 SSF each for Textile, Transport and Insurance.

[3] Following studies have used similar or lesser sample size (I. R. Malik and Shah (2017b, 2017a, 2016, 2014); I. R. Malik, Shah, and Khan (2013); Jamal and Fraz (2013); Awan and Rafique (2013); I. Malik and Khan (2012); Siddiqi, Nouman, Khan, and Khan (2012); S. Khan et al. (2011); Debasish (2009); Mazouz and Bowe (2006); S. U. Khan (2006); McKenzie et al. (2000). However, the power of the tests is somewhat limited (relative to several other papers studying other markets) relative to 'ideal' conditions.

[4] The SSFs are Askari Commercial Bank Limited (ACBL), Bank of Punjab (BOP), Dewan Salman Fibres Limited (DSFL), Engro Chemical Limited (ECL), Maple Leaf Cement Factory Limited (MLCF), Lucky Cement Limited (LUCK), D. G. Khan Cement Co. Ltd (DGKC), Sui Southern Gas Compnay Limited (SSGC), Faysal Bank Limited (FABL), Fauji Fertilizer Compnay (FFC), Hub Power Company Limited (HUBC), Ibrahim Fibres Limited (IBFL), Karachi Electric Supply Corporation (KESC), Muslim Commercial Bank Limited (MCB), National Bank of Pakistan (NBP), Pakistan International Airlines (PIA), Pioneer Cement Limited (PIOC), Pakistan Oilfields Limited (POL), Paksitan State Oil Company Limited (PSO), Paksitan Telecommunciation Limited (PTCL), Sui Northern Gas Pipelines Limited (SNGPL), Nishat Mills Limited (NML), and Telecard Limited (TELE).

is used to represent market portfolio. The data for index is collected from yahoofinance (finance.yahoo.com). Data on all these variables has been selected on daily frequencies. In order to avoid endogeneity bias, a control sample is selected. The selection of control sample is made according to criterion of matching. The matching is done by comparing companies one by one upon the, liquidity, company size, and sector related factors. This makes a sample of non-SSFs of 22 stocks [5].

Tables 1 and 2 provide descriptive statistics for SSFs and Non-SSFs, separately. These Tables show measure of central tendency, measure of dispersion, skewedness and kurtosis. Test results of: Augmented Dickey Fuller (ADF), Jarque-Berra (JB). Breusch Godffery Serial Correlation (BGLM) and Autoregressive Conditional Heteroscedasticity (ARCH) test are also presented in the Tables.

Econometric Methodology

In order to check the impact of an event (i.e., introduction of SSFs), this study employs event study methodology. In studies of futures markets, two techniques have widely been used for this purpose. [6] First technique compares pre and post period of an event (Harris, 1989). This technique is known for providing robustness in the results. The scholars argue that it is quite possible that some other cross sectional factors (e.g., firm-specific, industry-specific, or macroeconomic changes etc.) may also have an impact besides the actual event. In this case, only pre to post analysis might seem insufficient, which may make us mistakenly attribute any potential change to introduction of SSFs. This situation leads to a second technique i.e., use of control sample. The use of control sample helps in dealing with such an issue (Faff & McKenzie, 2002). Robustness and cross-sectional compensations can be taken care of by the use of both techniques at the same time.

Mazouz and Bowe (2006) made use of similar approach, while studying the impact of SSFs over underlying stocks. Following that approach, this study use the same approach and adds AR (1) term (Antoniou et al., 2011; Chau, Deesomsak, & Lau, 2011; Chau et al., 2008) in the mean equation of the model. AR (1) is added to take care of potential non-synchronous trading activity. Literature in stock markets market frictions (e.g., non-synchronous trading, thin trading and delay in price adjustment) can result in biased estimates of systematic risk. In this vein, Iqbal and Brooks (2007) support the argument of non-synchronous trading activity as a permanent feature of PSX. Perry (1985) has shown that autocorrelations can result as a result of prevailing market frictions and non-synchronous trading activity in stock markets. Empirical settings of Capital Asset Pricing

[5]The non-SSFs are Bank Al Habib Limited (BKHB01), Bank Al Habib Limited (BKHB06), Cherat Cement Co. Limited (CHERAT), CRESCENT, Dawood Hercules Textile Limited (DAWOOD), Fector Cement Limited (FECTO), Garton Company Limited (GARTON), Habib Metropoliton Bank Limited (HMBL), Karachi Electric Limited (KEL01), Karachi Electric Limited (KEL06), Kohat Cement Limited (KOHAT), Mari Gas Company.

[6]For example, Antoniou and Holmes (1995); Mazouz and Bowe (2006); S. U. Khan and Abbas (2013); Mazouz (2007); Gahlot and Datta (2011); McKenzie et al. (2000); Bae et al. (2004); Galloway and Miller (1997); S. Khan et al. (2011); Chau et al. (2008)

Table 1
Descriptive statistics for SSFs

	Variables			Residuals				Variable		Residuals			
S.No:	**Stock**	**Mean**	**S.D**	**Skewness**	**Kurtosis**	**Normality test**	**Prob.**	**Unit Root**	**Prob.**	**BGLM**	**Prob**	**ARCH test**	**Prob.**
1	ACBL	-0.002	0.013	-1.805	25.923	22414.08	0	-4.694	0	7.416	0	25.004	0
2	BOP	-0.002	0.014	-0.596	9.937	2060.835	0	-8.021	0	3.466	0	2.224	0.015
3	DGKC	-0.002	0.013	-0.6	9.937	2060.835	0	-32.396	0	1.171	0.306	1.105	0.355
4	DSFL	-0.005	0.016	-3.268	60.107	137386.9	0	-13.653	0	2.687	0.003	0.637	0.783
5	ECL	-0.005	0.012	-0.659	12.884	4134.674	0	-8.009	0	0	0	0	0
6	FABL	-0.002	0.014	-1.074	16.257	7507.206	0	-12.877	0	3.058	0.001	27.891	0
7	FFC	-0.005	0.011	-2.549	58.963	131313	0	-4.875	0	4.683	0	15.793	0
8	HUBC	-0.005	0.013	-0.623	14.112	5199.325	0	-7.279	0	2.898	0.001	14.729	0
9	IBFL	-0.004	0.013	-0.523	22.011	16404.31	0	-7.366	0	4.682	0	23.946	0
10	KESC	-0.005	0.015	1.527	13.187	4702.954	0	-26.887	0	3.757	0	10.576	0
11	LUCK	-0.002	0.012	0.465	4.984	199.701	0	-30.763	0	0.669	0.754	3.756	0
12	MCB	-0.005	0.013	-0.145	10.282	2208.661	0	-32.916	0	3.16	0.001	4.407	0
13	MLCF	-0.002	0.013	0.291	5.778	334.934	0	-9.788	0	1.35	0.199	5.073	0
14	NBP	-0.002	0.011	-1.731	21.555	14815.64	0	-5.774	0	1.43	0.162	0.499	0.892
15	NML	-0.005	0.017	0.035	15.624	6626.693	0	-8.769	0	4.214	0	19.923	0
16	PIA	-0.005	0.017	1.179	8.91	1684.011	0	-34.071	0	5.453	0	6.264	0
17	PIOC	-0.004	0.014	-0.375	7.046	703.909	0	-13.297	0	1.524	0.126	4.884	0
18	POL	-0.002	0.014	-10.332	189.987	14711686	0	-28.8	0	0.942	0.493	0.014	1
19	PSO	-0.005	0.012	-0.564	20.421	12672.91	0	-31.862	0	4.319	0	4.379	0
20	PTCL	-0.005	0.011	0.198	28.457	26953.89	0	-5.877	0	9.197	0	16.722	0
21	SNGPL	-0.005	0.016	-0.121	15.871	6891.434	0	-5.516	0	6.746	0	13.574	0
22	SSGC	-0.002	0.012	0.427	6.934	673.917	0	-29.58	0	1.107	0.354	4.196	0
23	TELE	-0.003	0.015	-0.897	14.485	10125.62	0	-23.128	0	1.456	0.151	0.603	0.812

Note: Table 1 provides descriptive statistics for SSFs. The Table shows measure of central tendency, measure of dispersion, skewedness and kurtosis. Test results of: Augmented Dickey Fuller (ADF), Jarque-Berra (JB). Breusch Godffery Serial Correlation (BGLM) and Autoregressive Conditional Heteroscedasticity (ARCH) test are also presented in this Table.

Table 2
Descriptive statistics for Non-SSFs

		Variable		Residuals				Variable		Residuals			
S.No:	**Stock**	**Mean**	**S. D**	**Skewness**	**Kurtosis**	**Normality test**	**Prob.**	**Unit Root**	**Prob.**	**BGLM**	**Prob.**	**ARCH test**	**Prob.**
1	BKHB01	-0.005	0.01	-2.889	33.315	39602.63	0.000***	-4.537	0.000***	3.802	0.000***	1.096	0.362
2	BKHB06	-0.004	0.012	-6.078	83.585	276182.1	0.000***	-13.391	0.000***	1.219	0.274	0.019	1
3	CHERAT	-0.002	0.013	-0.761	12.742	4042.613	0.000***	-12.254	0.000***	1.323	0.213	0.486	0.9
4	CRESCENT	-0.005	0.02	-0.076	32.6	36433.96	0.000***	-14.252	0.000***	4.783	0.000***	8.797	0.000***
5	DAWOOD	-0.005	0.014	-1.768	29.595	29932.48	0.000***	-9.988	0.000***	1.809	0.055	2.143	0.019*
6	FECTO	-0.002	0.016	0.401	5.674	324.019	0.000***	-4.375	0.000***	1.784	0.059	7.382	0.000***
7	GARTON	-0.004	0.019	0.611	13.409	4567.962	0.000***	-7.088	0.000***	2.44	0.007**	12.359	0.000***
8	HMBL	-0.003	0.013	-2.978	43.742	70500.55	0.000***	-5.335	0.000***	1.781	0.06	1.005	0.437
9	KEL01	-0.005	0.012	-0.349	13.442	4554.296	0.000***	-4.323	0.000***	1.171	0.132	19.628	0.000***
10	KEL06	-0.005	0.009	0.329	4.547	117.56	0.000***	-8.505	0.000***	1.218	0.275	9.863	0.000***
11	KOHAT	-0.005	0.015	-2.711	33.638	40255.68	0.000***	-32.725	0.000***	1.196	0.289	0.261	0.989
12	MARI	-0.002	0.012	0.41	3.672	46.732	0.000***	-15.64	0.000***	1.872	0.045*	12.817	0.000***
13	PKDATA01	-0.005	0.02	0.885	22.293	15608.19	0.000***	-7.868	0.000***	2.776	0.002***	4.169	0.000***
14	PKDATA04	-0.002	0.014	0.516	4.417	127.706	0.000***	-21.427	0.000***	0.594	0.82	12.447	0.000***
15	PNSC	-0.004	0.029	1.019	14.409	5596.039	0.000***	-26.437	0.000***	2.632	0.004***	2.826	0.002***
16	SECPL	-0.005	0.013	0.535	8.107	1132.129	0.000***	-12.299	0.000***	3.119	0.001***	3.695	0.000***
17	SEL	-0.005	0.012	0.051	3.608	15.793	0.000***	-11.041	0.000***	1.309	0.221	8.703	0.000***
18	SHELL	-0.003	0.01	-1.252	28.396	27080	0.000***	-9.21	0.000***	1.828	0.052	0.095	1
19	SILKBANK	-0.003	0.015	0.49	6.761	628.331	0.000***	-30.182	0.000***	1.534	0.122	14.813	0.000***
20	SONERI	-0.003	0.015	-3.519	43.029	73162.46	0.000***	-14.948	0.000***	3.591	0.000***	9.203	0.000***
21	SSGC	-0.005	0.015	1.139	29.611	29662.72	0.000***	-8.926	0.000***	8.652	0.000***	15.898	0.000***
22	TELE	-0.005	0.018	0.952	14.804	5944.721	0.000***	-11.795	0.000***	1.899	0.042	15.462	0.000***

Note: Table 2 provides descriptive statistics for non-SSFs. The Table shows measure of central tendency, measure of dispersion, skewedness and kurtosis. Test results of: Augmented Dickey Fuller (ADF), Jarque-Berra (JB). Breusch Godffery Serial Correlation (BGLM) and Autoregressive Conditional Heteroscedasticity (ARCH) test are also presented in this Table.

Model (CAPM)[7] for this study are established is as follows [8] :

$$R_{i,t} - R_{f,t} = \alpha_i + \gamma(R_{i,t-1} - R_{f,t-1}) + (\beta_{i,b} + \beta_{i,c}D_{fut})(R_{m,t} - R_{f,t}) + \epsilon_{i,t} \quad (1)$$

$$\epsilon_{i,t} = \gamma_{i,t}h_{i,t}$$

Here, α_i is constant term in this equation. $R_(i,t)$ is used to represent returns of a stock 'i' at time 't'. Further, risk free rate is shown as $R_(f,t)$. Market return is depicted by $R_(m,t)$. The coefficient $\beta_{i,b}$ measures systematic risk for pre-SSFs period. On the other hand, the coefficient $\beta_{i,c}$ is used to measure the change in beta coefficient post-SSFs period. D˙fut is added as a dummy variable (which assumes '0' value for pre-SSFs and '1' for post-SSFs). The p-value for $\beta_{i,c}$ is used to check the change in systematic risk from pre- to post-SSFs. Finally, the error term is depicted as $\epsilon_{i,t}$. The asymmetric Glosten, Jagannathan and Runkle (1993) Generalized Autoregressive Conditional Heteroskedasticiy (GJR-GARCH) is used as variance equation.

$$h^2_{i,t} = \varphi_{i,b} + \varphi_{i,c}D_{fut} + \delta_{i,1}\epsilon^2_{i,t-1} + \lambda_{i,1}h^2_{i,t-1} + \partial_{i,1}\epsilon^2_{i,t-1}I_{t-1} \quad (2)$$

In variance equation, unconditional variance is shows as $\varphi_{i,b}$, which is the coefficient for element of noise trading/unsystematic risk). This coefficient shows magnitude of noise trading for pre-SSFs period. However, change in unsystematic risk is measure through $\varphi_{i.c}$ due to contract listings of SSFs. The p-value associated with this coefficient would be significant, if magnitude of noise trading changes post-SSFs period. The dummy variable is D_{fut} in this case (which has '0' value for pre-SSFs and '1' for post SSFs). The impact of recent news on the variation is measure through $\delta_{i,1}$, whereas lagged prediction variance is captured through $\lambda_{i,1}$. Finally, the influence of asymmetric news is gauged through $\partial_{i,1}$. For this, the dummy variable $I_{(t-1)}$ is part of equation, which assumes value '0' for positive news and '1' otherwise.

The literature (Antoniou et al., 2011, 2005; Chau et al., 2008) on impact of futures markets on dynamics of underlying stock shows that the asset returns follow non-normal distribution. Few studies (e.g., Bollerslev (1987); Nelson (1991)) recommend the use of Student's t and GED, instead of normal distribution. This study also makes use of GED to take care of thick tails in stock returns similar to (Antoniou et al., 2011, 2005; Chau et al., 2011, 2008). The Probability Density Function (PDF) of aforesaid distribution is as follows:

[7] It is established that Three Factor Model (TFM) Fama and French (1993, 2004) performs better than conventional CAPM. The studies show that firm size, book-to-market (B/M) ratios and the risk premium improves the estimates. However, unavailability of the data on firm size, B/M ratios and risk premium of the market portfolio with respect to different introduction dates of SSFs limit the study to use CAPM instead of TFM.

[8] For robustness, another model (rational-irrational trading model) has been used. Results of which could be obtained from authors of the study.

$$f(\mu_t,\sigma_t,v) = v/2[\sqrt{(}3/v)]^{1/2}[\sqrt{(}1/v)]^{-3/2}(1/\sigma_t)exp\left\{-[\sqrt{(}3/v)/(\sqrt{(}1/v))]^{v/2}|\epsilon_t/\sigma_t|^v\right\} \quad (3)$$

Where, the gamma function is shown as $\sqrt{(.)}$ The scale parameter 'ν' determines the shape of the underlying distribution. The Laplace distribution or double exponential distribution takes the following form ($\nu = 1$), whereas for normal distribution it is $\nu = 2$.

Similarly, the non-parametric tests are used for comparison between pre- to post- period as well as among SSFs and non-SSFs. For example, to check the significant change in coefficients (i.e., $\beta_{i,c}$ and $\varphi_{i,c}$), Wilcoxon Signed Rank Test (WRST) is used. And Mann Whitney U Test (MWUT) is used to check that change is significant for both SSFs and non-SSFs.

Results and Discussion

The inferential statistics of this study are presented in this section. Mainly results of equations 1 and 2 constitute the major section of this section. The results are followed by discussions in a way that comparison and contrasting are presented to highlight the contribution of this study.

Tables 3 and 4 show the Maximum Likelihood Estimates (MLE) estimates for SSFs and non-SSFs respectively. The estimates of coefficients (i.e.,$\propto_i$, γ, $\beta_{i,b}$, $\beta_{i,c,}$,$\varphi_{i,b}$,$\varphi_{i,c}$,$\delta_{i,1}$, $\lambda_{i,1}$,and $\partial_{i,1}$) of CAPM-GJR-GARCH (1, 1) with p-values are presented in these tables. The results of non-parametric analysis are given in Tables 5 and 6. These Tables are divided in Panels, where panels A and B of Tables 5 & 6 shows descriptive (mean & median), count of +ve (-ve) estimates of the coefficients ($\beta_{i,b}$, $\beta_{i,c,}$, $\varphi_{i,b}$, and $\varphi_{i,c}$) at 5% level of significance, WSRT, and MWUT.

For example, Table 5 is reported as follows. In Panel A, statistics regarding SSFs is given, which comprises of summarized statistics for $\beta_{i,b}$ and $\beta_{i,c}$. The mean (median) of $\beta_{i,b}$ and $\beta_{i,c}$ are: .995 (.998), and .0397 (.034), respectively. It is important to mention that $\beta_{i,b}$ is statistically significant for all the stocks (i.e., ACBL, BOP, DGKC, DSFL, ECL, FABL, FFC, HUBC, IBFL, KESC, LUCK, MCB, MLCF, NBP, NML, PIA, PIOC, POL, PSO, PTCL, SNGPL, SSGC, and TELE) at chosen level of significance. However, $\beta_{i,c}$ is significant for 56% of SSFs stocks. This percentage can further be divided into positive change and negative change. Among these stocks, 77% (i.e., DSFL, FFC, HUBC, KESC, NBP, NML, PIA, PSO, and PTCL) depict positive change, while, 23% (i.e., DGKC, MLCF, and TELE) depict negative change. It is easy to comprehend that generally speaking, more stocks have shown an upward trend in systematic risk component of volatility. Further in Panel A, the non-parametric statistics are also presented. The WSRT Z value (p-value) is reported to be -1.510 (0.131). This shows that there is no change in systematic risk from pre- to post-SSFs period [9].

[9] Z-value for proportions is 0.604, which is insignificant.

Table 3

Maximum Likelihood estimates for SSFs,using CAPM-GJR GARCH (1, 1)

$$R_{i,t} - R_{f,t} = \alpha_i + \gamma(R_{i,t-1} - R_{f,t-1}) + (\beta_{i,b} + \beta_{i,c}D_{fut})(R_{m,t} - R_{f,t}) + \epsilon_{i,t}$$
$$h^2_{i,t} = \varphi_{i,b} + \varphi_{i,c}D_{fut} + \delta_{i,1}\epsilon^2_{i,t-1} + \lambda_{i,1}h^2_{i,t-1} + \partial_{i,1}\epsilon^2_{i,t-1}I_{t-1}$$

Sr #:	Stock	α_i	Prob.	γ	Prob.	$\beta_{i,b}$	Prob.	$\beta_{i,c}$	Prob.	$\varphi_{i,b}$	Prob.	$\varphi_{i,c}$	Prob.	$\delta_{i,1}$	Prob.	$\lambda_{i,1}$	Prob.	$\partial_{i,1}$	Prob.
1	ACBL	-0.002 (.0001)	0.000***	-0.021 (0.019)	0.469	0.060 (0.043)	0.263	0.197 (0.052)	0.002***	0.000 (1.01E-05)	0.001***	0.000 (0.111)	0.558	0.353 (1.61E-01)	0.000***	0.497 (0.103)	0.000***	0.007 (7.27E-06)	0.950
2	BOP	0.000 (8.20E-05)	0.231	-0.042 (0.010)	0.005	1.171 (0.035)	0.000***	-0.048 (0.039)	0.307	0.000 (7.42E-06)	0.000***	0.000 (0.127)	0.025**	0.475 (1.59E-01)	0.000***	0.394 (0.088)	0.000***	-0.093 (5.77E-06)	0.568
3	DGKC	0.000 (0.000)	0.180	-0.028 (0.018)	0.143	1.296 (0.048)	0.000***	-0.112 (0.063)	0.079*	0.000 (4.53E-06)	0.003***	0.000 (0.069)	0.152	0.308 (7.45E-02)	0.000***	0.580 (0.075)	0.000***	-0.205 (2.59E-06)	0.026**
4	DSFL	0.000 (0.000)	0.702	-0.029 (0.012)	0.043	1.112 (0.033)	0.000***	0.213 (0.042)	0.000***	0.000 (1.73E-06)	0.006***	0.000 (0.050)	0.700	0.244 (4.95E-02)	0.000***	0.762 (0.034)	0.000***	-0.049 (1.38E-06)	0.471
5	ECL	-0.001 (7.37E-05)	0.000***	-0.066 (0.009)	0.000	0.868 (0.032)	0.000***	0.007 (0.039)	0.829	0.000 (6.37E-06)	0.000***	0.000 (0.250)	0.026**	0.794 (2.50E-01)	0.000***	0.380 (0.098)	0.000***	-0.364 (4.72E-06)	0.100
6	FABL	0.000 (0.000)	0.337	0.005 (0.013)	0.786	0.941 (0.041)	0.000***	0.123 (0.050)	0.017**	0.000 (1.10E-06)	0.000***	0.000 (0.035)	0.964	0.295 (3.60E-02)	0.004***	0.546 (0.027)	0.000***	-0.070 (7.98E-07)	0.559
7	FFC	-0.001 (0.000)	0.000***	-0.045 (0.025)	0.001	0.817 (0.056)	0.000***	0.010 (0.078)	0.681	0.000 (1.19E-06)	0.000***	0.000 (7.16E-02)	0.251	0.254 (0.073114)	0.000***	0.750 (3.25E-02)	0.000***	-0.134 (1.07E-06)	0.094*
8	HUBC	-0.001 (7.00E-05)	0.001***	0.052 (0.009)	0.001	0.956 (0.030)	0.000***	0.064 (0.036)	0.053*	0.000 (5.78E-06)	0.000***	0.000 (0.154)	0.119	0.525 (1.67E-01)	0.001***	0.384 (0.085)	0.000***	-0.046 (4.83E-06)	0.799
9	IBFL	-0.002 (0.000)	0.000***	-0.101 (0.015)	0.000	0.932 (0.034)	0.000***	-0.047 (0.045)	0.227	0.000 (7.73E-06)	0.000***	0.000 (0.060)	0.105	0.226 (6.17E-02)	0.002***	0.615 (0.118)	0.000***	0.012 (2.90E-06)	0.909
10	KESC	-0.003 (0.000)	0.000***	-0.108 (0.020)	0.000	0.672 (0.042)	0.000***	0.078 (0.054)	0.074*	0.000 (1.22E-05)	0.000***	0.000 (0.141)	0.048**	0.421 (0.202)	0.001***	0.287 (0.899)	0.001***	0.171 (9.44E-06)	0.433
11	LUCK	0.000 (0.000)	0.425	0.010 (0.020)	0.661	1.195 (0.057)	0.000***	-0.182 (0.074)	0.014**	0.000 (2.26E-06)	0.042***	0.000 (0.022)	0.251	0.048 (4.00E-02)	0.018**	0.895 (0.037)	0.000***	0.037 (1.07E-06)	0.330
12	MCB	-0.001 (7.08E-05)	0.001***	-0.063 (0.007)	0.000	0.948 (0.020)	0.000***	0.159 (0.027)	0.000***	0.000 (1.49E-05)	0.000***	0.000 (0.191)	0.003***	0.521 (1.95E-01)	0.002***	0.238 (0.135)	0.014**	-0.332 (1.02E-05)	0.059*
13	MLCF	-0.001 (0.000)	0.060*	0.008 (0.020)	0.691	1.350 (0.059)	0.000***	-0.252 (0.074)	0.001***	0.000 (8.58E-06)	0.030***	0.000 (0.077)	0.331	0.097 (8.80E-02)	0.002***	0.877 (0.103)	0.000***	-0.078 (4.57E-06)	0.032**
14	NBP	0.000 (0.000)	0.068	-0.065 (0.014)	0.000	0.998 (0.029)	0.000***	0.072 (0.038)	0.082*	0.000 (4.28E-06)	0.001***	0.000 (0.112)	0.596	0.333 (1.77E-01)	0.000***	0.650 (0.107)	0.000***	-0.210 (3.53E-06)	0.018**
15	NML	0.000 (6.13E-05)	0.034**	-0.049 (0.008)	0.002	1.098 (0.033)	0.000***	0.287 (0.041)	0.000***	0.000 (6.31E-06)	0.000***	0.000 (0.102)	0.461	0.385 (1.09E-01)	0.000***	0.577 (0.063)	0.000***	-0.087 (4.59E-06)	0.480
16	PIA	-0.003 (0.000)	0.000***	-0.163 (0.021)	0.000	0.916 (0.052)	0.000***	0.245 (0.084)	0.001***	0.000 (1.40E-05)	0.003***	0.000 (0.065)	0.026**	0.142 (9.93E-02)	0.002***	0.680 (0.124)	0.000***	0.051 (1.29E-05)	0.570
17	PIOC	-0.001 (0.000)	0.070	0.019 (0.025)	0.458	0.936 (0.064)	0.000***	0.084 (0.091)	0.278	0.000 (2.46E-06)	0.018**	0.000 (0.047)	0.438	0.189 (4.85E-02)	0.000***	0.801 (0.037)	0.000***	-0.082, (1.67E-06)	0.153
18	POL	-0.001 (9.70E-05)	0.000***	-0.033 (0.010)	0.008	1.074 (0.028)	0.000***	-0.077 (0.036)	0.040**	0.000 (7.01E-07)	0.010**	0.000 (0.041)	0.089*	0.135 (4.10E-02)	0.000***	0.913 (0.019)	0.000***	-0.132 (5.21E-07)	0.001***
19	PSO	-0.001 (7.72E-05)	0.000***	-0.055 (0.012)	0.000	0.908 (0.020)	0.000***	0.167 (0.032)	0.000***	0.000 (1.75E-06)	0.001***	0.000 (0.080)	0.082*	0.349 (1.04E-01)	0.000***	0.605 (0.059)	0.000***	-0.037 (2.31E-6)	0.727
20	PTCL	0.000 (6.78E-05)	0.553	-0.076 (0.009)	0.000	1.099 (0.019)	0.000***	0.131 (0.026)	0.000***	0.000 (7.76E-06)	0.000***	0.000 (0.086)	0.462	0.403 (9.46E-02)	0.001***	0.542 (0.060)	0.000***	-0.099 (6.36E-07)	0.499
21	SNGPL	0.001 (9.92E-05)	0.000***	-0.086 (0.019)	0.000	1.234 (0.031)	0.000***	0.121 (0.035)	0.000***	0.000 (2.87E-06)	0.000***	0.000 (0.060)	0.200	0.327 (6.57E-02)	0.001***	0.651 (0.051)	0.000***	-0.113 (1.91E-06)	0.356
22	SSGC	0.000 (0.000)	0.058*	0.025 (0.017)	0.160	1.077 (0.040)	0.000***	0.013 (0.051)	0.799	0.000 (4.67E-06)	0.001***	0.000 (0.086)	0.052*	0.262 (1.16E-01)	0.000***	0.626 (0.100)	0.000***	-0.015 (2.87E-06)	0.882
23	TELE	-0.002 (0.000)	0.000***	-0.045 (0.017)	0.022	1.235 (0.051)	0.000***	-0.165 (0.070)	0.012*	0.000 (7.28E-06)	0.005***	0.000 (0.067)	0.051*	0.246 (6.81E-02)	0.002***	0.624 (0.090)	0.000***	-0.162 (5.33E-06)	0.044**

Here, α_i is constant term in this equation. $R_(i,t)$ is used to represent returns of a stock "i" at time "t". Further, risk free rate is shown as $R_(f,t)$. Market return is depicted by $R_(m,t)$.The coefficient $\beta_(i,b)$ measures systematic risk for pre-SSFs period. On the other hand, the coefficient $\beta_(i,c)$ is used to measure the change in beta coefficient post-SSFs period. D_fut is added as a dummy variable (which assumes "0" value for pre-SSFs and "1" for post-SSFs). The p-value for $\beta_(i,c)$ is used to check the change in systematic risk from pre- to post-SSFs. Finally, the error term is depicted as $\epsilon_(i,t)$. The asymmetric Glosten, Jagannathan and Runkle (1993) Generalized Autoregressive Conditional Heteroskedasticiy (GJR-GARCH) is used as variance equation. In variance equation, unconditional variance is shows as $\varphi_(i,b)$, which is the coefficient for element of noise trading/unsystematic risk. This coefficient shows magnitude of noise trading for pre-SSFs period. However, change in unsystematic risk is measure through $\varphi_(i,c)$ due to contract listings of SSFs.The p-value associated with this coefficient would be significant if magnitude of noise trading changes post-SSFs period. The dummy variable is D_fut in this case (which has "0" value for pre-SSFs and "1" for post SSFs).The impact of recent news on the variation is measure through $\delta_(i,1)$, whereas lagged prediction variance is captured through $\lambda_(i,1)$. Finally, the influence of asymmetric news is gauged through $\alpha_(i,1)$. For this, the dummy variable $I(i,1)$ is part of equation, which assumes value "0" for positive news and "1" otherwise.

Table 4
Maximum Likelihood Estimates for Non-SSFs using CAPM-GJR GARCH (1, 1)

$$R_{i,t} - R_{f,t} = \alpha_i + \gamma(R_{i,t-1}R_{f,t-1}) + (\beta_{i,b} + \beta_{i,c}D_{fut})R_{m,t} - R_{f,t} + \epsilon_{i,t}$$
$$h^2_{i,t} = \varphi_{i,b} + \varphi_{i,c}D_{fut} + \delta_{i,1}\epsilon^2_{i,t-1} + \lambda_{i,1}h^2_{i,t-1}\partial_{i,1}\epsilon^2_{i,t-1}I_{t-1}$$

Sr #:	Stock	α_i	Prob.	γ	Prob.	$\beta_{i,b}$	Prob.	$\beta_{i,c}$	Prob.	$\varphi_{i,b}$	Prob.	$\varphi_{i,c}$	Prob.	$\delta_{i,1}$	Prob.	$\lambda_{i,1}$	Prob.	$\partial_{i,1}$	Prob.
1	BKHB01	-0.003 (7.12E-05)	0.000***	-0.086 (0.017)	0.000***	0.470 (0.023)	0.000***	-0.013 (0.032)	0.673	0.000 (1.01E-05)	0.000***	0.000 (.01998)	0.071*	0.630 (2.33E-01)	0.000***	0.206 (.1065)	0.034*	-0.193 (7.99E-06)	0.325
2	BKHB06	-0.002 (0.000)	0.000***	0.012 (0.025)	0.363	0.565 (0.066)	0.000***	-0.066 (0.087)	0.055*	0.000 (5.37E-05)	0.010**	0.000 (0.0594)	0.055**	0.314 (5.97E-02)	0.002***	0.700 (0.5346)	0.000***	-0.314 (1.16E-05)	0.002***
3	CHERAT	-0.001 (0.000)	0.000***	-0.048 (0.026)	0.072*	0.801 (0.058)	0.000***	-0.073 (0.077)	0.322	0.000 (6.77E-05)	0.002***	0.000 (0.071)	0.785	0.322 (1.25E-01)	0.000***	0.559 (0.072)	0.000***	-0.075 (4.77E-06)	0.499
4	CRESCENT	-0.004 (1.02E-06)	0.000***	-0.110 (0.000)	0.000***	0.612 (0.001)	0.000***	-0.270 (0.009)	0.000***	0.000 (2.68E-04)	0.000***	0.000 (2.152)	0.003***	0.511 (2.08E+00)	0.014**	0.122 (0.080)	0.206	-0.182 (2.23E-04)	0.465
5	DAWOOD	-0.004 (1.22E-07)	0.000***	0.001 (3.2E-05)	0.847	0.252 (2.99E-05)	0.000***	-0.168 (2.99E-05)	0.000***	0.000 (3.73E-05)	0.000***	0.000 (19.532)	0.175	0.874 (1.33E+01)	0.003***	0.415 (0.080)	0.000***	-0.403 (1.09E-03)	0.205
6	FECTO	-0.002 (2.91E-06)	0.000***	-0.036 (0.000)	0.119	0.198 (9.73E-05)	0.004***	0.388 (0.000)	0.000***	0.000 (2.53E-05)	0.003***	0.000 (2.752)	0.078*	0.288 (2.39E+00)	0.006***	0.634 (0.089)	0.000***	-0.190 (3.37E-04)	0.088*
7	GARTON	-0.004 (2.76E-09)	0.000***	0.000 (1.46E-06)	0.994	0.291 (2.64E-04)	0.000***	-0.291 (2.64E-04)	0.000***	0.000 (7.39E-03)	0.094*	0.000 (134.333)	0.132	1.412 (1.23E+02)	0.045**	0.768 (0.073)	0.000***	-0.984 (7.06E-03)	0.136
8	HMBL	-0.002 (5.36E-07)	0.000***	-0.053 (0.000)	0.012*	0.231 (4.56E-05)	0.000***	0.254 (0.000)	0.000***	0.000 (1.01E-04)	0.014**	0.000 (0.588)	0.662	0.248 (6.09E-01)	0.019**	0.494 (0.339)	0.003***	-0.178 (1.12E-04)	0.083*
9	KEL01	-0.002 (0.000)	0.000***	-0.070 (0.015)	0.002***	0.767 (0.032)	0.000***	-0.071 (0.043)	0.115	0.000 (1.03E-05)	0.001***	0.000 (0.115)	0.036**	0.234 (1.28E-01)	0.010**	0.508 (0.117)	0.000***	0.168 (6.17E-06)	0.223
10	KEL06	-0.004 (8.43E-05)	0.000***	-0.119 (0.018)	0.000***	0.317 (0.031)	0.000***	0.042 (0.041)	0.359	0.000 (1.50E-06)	0.011**	0.000 (0.073)	0.365	0.135 (7.81E-02)	0.001***	0.847 (0.039)	0.000***	-0.036 (1.15E-06)	0.448
11	KOHAT	-0.005 (9.59E-05)	0.000***	-0.069 (0.015)	0.022**	0.059 (0.028)	0.242	0.182 (0.057)	0.008***	0.000 (1.13E-05)	0.006***	0.000 (0.131)	0.133	0.271 (1.46E-01)	0.002***	0.676 (0.119)	0.000***	-0.074 (1.22E-05)	0.498
12	MARI	-0.001 (0.000)	0.000***	0.058 (0.027)	0.037**	0.729 (0.062)	0.000***	0.036 (0.087)	0.662	0.000 (3.19E-06)	0.002***	0.000 (0.048)	0.977	0.203 (7.05E-02)	0.000***	0.732 (0.057)	0.000***	-0.077 (1.60E-06)	0.308
13	PKDATA01	-0.004 (1.57E-07)	0.000***	0.006 (1.53E-05)	0.022**	0.213 (0.000)	0.000***	-0.129 (0.000)	0.000***	0.000 (1.25E-04)	0.004***	0.000 (7.432)	0.088*	0.511 (7.05E+00)	0.017**	0.692 (0.050)	0.000***	-0.264 (9.99E-05)	0.226
14	PKDATA04	-0.001 (0.000)	0.000***	-0.057 (0.024)	0.059*	0.620 (0.063)	0.000***	0.002 (0.077)	0.983	0.000 (1.32E-05)	0.000***	0.000 (0.131)	0.652	0.365 (1.38E-01)	0.000***	0.463 (0.103)	0.000***	-0.208 (8.72E-06)	0.050**
15	PNSC	-0.006 (2.70E-09)	0.000***	-0.056 (9.05E-06)	0.000***	0.209 (9.54E-05)	0.000***	-0.129 (9.50E-05)	0.000***	0.000 (1.05E-03)	0.047**	0.000 (22.514)	0.863	0.500 (1.90E+01)	0.018**	0.723 (0.023)	0.000***	-0.175 (7.03E-04)	0.450
16	SECPL	-0.003 (0.000)	0.000***	-0.101 (0.021)	0.000***	0.728 (0.043)	0.000***	0.023 (0.070)	0.702	0.000 (1.61E-06)	0.016**	0.000 (0.029)	0.028**	0.105 (3.61E-02)	0.008***	0.817 (0.139)	0.000***	0.061 (2.64E-06)	0.249
17	SEL	-0.003 (2.73E-07)	0.000***	-0.084 (0.002)	0.004***	0.383 (0.027)	0.000***	0.121 (0.027)	0.084*	0.000 (1.05E-05)	0.039**	0.000 (0.140)	0.059*	0.121 (1.69E-01)	0.013**	0.791 (0.127)	0.000***	0.012 (1.69E-05)	0.841
18	SHELL	-0.001 (9.94E-05)	0.000***	-0.038 (0.014)	0.039**	0.611 (0.025)	0.000***	0.052 (0.035)	0.194	0.000 (4.85E-06)	0.003***	0.000 (0.144)	0.018**	0.263 (1.62E-01)	0.010**	0.542 (0.079)	0.000***	-0.064 (4.05E-06)	0.577
19	SILKBANK	-0.003 (3.77E-07)	0.000***	-0.011 (0.000)	0.611	0.095 (3.29E-05)	0.016**	0.674 (0.010)	0.000***	0.000 (2.04E-07)	0.001***	0.000 (0.187)	0.135	0.152 (1.89E-01)	0.001***	0.844 (0.040)	0.000***	-0.010 (1.64E-05)	0.851
20	SONERI	-0.002 (0.000)	0.000***	-0.063 (0.014)	0.004***	0.488 (0.038)	0.000***	0.142 (0.049)	0.002***	0.000 (4.98E-06)	0.000***	0.000 (0.104)	0.200	0.616 (1.04E-01)	0.000***	0.411 (0.093)	0.000***	-0.401 (2.70E-06)	0.011**
21	SSGC	0.000 (9.80E-05)	0.517	-0.088 (0.010)	0.000***	1.149 (0.031)	0.000***	-0.096 (0.040)	0.012**	0.000 (2.26E-06)	0.001***	0.000 (0.075)	0.578	0.269 (7.85E-02)	0.001***	0.712	0.000***	-0.089 (1.73E-06)	0.419
22	TELE	-0.001 (0.000)	0.024**	-0.056 (0.015)	0.004***	1.151 (0.048)	0.000***	0.089 (0.057)	0.090*	0.000 (1.30E-05)	0.000***	0.000 (0.140)	0.650	0.574 (1.53E-01)	0.000***	0.328	0.000***	-0.101 (1.02E-05)	0.558

Here, α_i is constant term in this equation. $\Re_{i,t}$ is used to represent returns of a stock "i" at time "t". Further, risk free rate is shown as $R_{f,t}$. Market return is depicted by $R_{m,t}$. The coefficient $\beta_{i,b}$ measures systematic risk for pre-SSFs period. On the other hand, the coefficient $\beta_{i,c}$ is used to measure the change in beta coefficient post-SSFs period. D_{fut} is added as a dummy variable (which assumes "0" value for pre-SSFs and "1" for post-SSFs). The p-value for $\beta_{i,c}$ is used to check the change in systematic risk from pre- to post-SSFs. Finally, the error term is depicted as $\epsilon_{i,t}$. The asymmetric Glosten, Jagannathan and Runkle (1993) Generalized Autoregressive Conditional Heteroskedasticiy (GJR-GARCH) is used as variance equation. In variance equation, unconditional variance is shows as $\varphi_{i,b}$, which is the coefficient for element of noise trading/unsystematic risk). This coefficient shows magnitude of noise trading for pre-SSFs period. However, change in unsystematic risk is measure through $\varphi_{i,c}$ due to contract listings of SSFs. The p-value associated with this coefficient would be significant, if magnitude of noise trading changes post-SSFs period. The dummy variable is D_{fut} in this case (which has "0" value for pre-SSFs and "1" for post SSFs). The impact of recent news on the variation is measure through $\delta_{i,1}$, whereas lagged prediction variance is captured through $\lambda_{i,1}$. Finally, the influence of asymmetric news is gauged through $\partial_{i,1}$. For this, the dummy variable I_{t-1} is part of equation, which assumes value "0" for positive news and "1" otherwise.

Table 5
The impact of future trading on the systematic risk of the underlying stock: CAPM approach

	Panel A: SSFs	**Panel B: Non-SSFs**
Mean (Median)		
$\varphi_{i,b}$	.995 (.998)	.497 (.497)
$\varphi_{i,c}$	.0397 (.036)	.0317 (.012)
WSRT Z value (P-value)	-1.642 (0.101)	-0.243 (0.808)
Number of stocks with 5% significant $\beta_{i,b}$	22 (23)	21 (22)
Number of stocks with 5% significant $\beta_{i,c}$	13 (23)	11 (22)
5% Significantly positive (negative) $\beta_{i,b}$	22 (0)	21 (0)
5% Significantly positive (negative) $\beta_{i,c}$	10 (3)	5 (6)
MWUT Z value (P-value)	-0.908 (0.364)	

It would not be plausible to conclude the results before presenting results for relatively matched non-SSFs sample. Panel B of Table 5 shows descriptive and inferential statistics for non-SSFs. Panel b presents summary statistics of the coefficients (i.e., $\beta_{i,b}$ and $\beta_{i,c}$). The mean & median of $\beta_{i,b}$ and $\beta_{i,c}$ are .497 (.497), and .031 (.012). The coefficient $\beta_{i,b}$ is statistically and significantly positive for 91% non-SSFs stocks (i.e., BKHB01, BKHB06, CHERAT, CRESCENT, DAWOOD, GARTON, HMBL, KEL01, KEL06, MARI, PKDATA01, PKDATA04, PNSC, SECPL, SEL, SHELL, SONERI, SSGC, and TELE) at chosen level of significance. On the other hand, only FECTO shows statistically and significantly negative significant $\beta_{i,b}$. The coefficient $\beta_{i,c}$ is found statistically significant results for 55% of non-SSFs. This could further be divided into positive and negative change. From all the statistically significant non-SSFs, 33% (i.e., FECTO, HMBL, KEL01, and SONERI) depict positive change. While remaining 67% non-SSFs (i.e., CRESCENT, DAWOOD, GARTON, PKDATA01, PKDATA04, SEL, and SHELL) depict negative change. It is evident from the results that similar to SSFs, more than 50% of non-SSFs depict significant change in systematic risk component of volatility. After that, non-parametric results are also provided. The calculated value of WSRT is Z value [10] (p-value), which is -0.519 (0.603) in Panel B. This shows that there is no change in systematic risk component from pre- to post- period.

The comparison of Panel A and Panel B depicts that there is insignificant change is observed in the case of SSFs as well as non-SSFs. In order to compare post-SSFs change for both SSFs and non-SSFs, MWUT is used. The results presented in Table 5 show that MWUT Z value (p-value) is -1.340 (0.180). This analysis shows that change in the systematic risk component of volatility across event date is insignificant for both for SSFs and non-SSFs.

Panel A & B in Table 6 show the results for change in un-systematic risk component of volatility for SSFs and non-SSFs. Panel A in Table 6 shows descriptive and inferential statistics for SSFs. For example, descriptive statistics for $\varphi_{i,b}$,and $\varphi_{i,c}$ are presented in terms of the mean (median), which are .000 (.000), and -.000 (.000). It is notable that $\varphi_{i,b}$ is statistically significant for all the SSFs stocks (i.e., ACBL, BOP, DGKC, DSFL,

[10]Z-value for proportions is 0.438, which is insignificant.

ECL, FABL, FFC, HUBC, IBFL, KESC, MCB, MLCF, NBP, NML, PIA, PIOC, POL, PSO, PTCL, SNGPL, SSGC, and TELE) at chosen level of significance. Among which, some show positive change, while others show negative change. The coefficient $\varphi_{i,c}$ shows statistically positively change for 22% SSFs stocks (i.e., BOP, ECL, KESC, MCB, and PIA). This affirms that the underlying event of this study has caused change in only 22% SSFs stocks. The non-parametric results are also provided for comparison. For SSFs, the WSRT Z value [11](p-value) is 0.000 (1.000). This shows that underlying event (contracts' listings) has not caused any change un-systematic risk component for SSFs.

Table 6
The impact of future trading on the unsystematic risk of the underlying stock: GJR-GARCH approach

	Panel A: SSFs	**Panel B: Non-SSFs**
Mean (Median)		
$\varphi_{i,b}$	.000 (.000)	.000 (.000)
$\varphi_{i,c}$	-.000 (.000)	-.000 (.000)
WSRT Z value (P-value)	0.000 (1.000)	-1.414 (0.157)
Number of stocks with 5% significant $\varphi_{i,b}$	23 (23)	21 (22)
Number of stocks with 5% significant $\varphi_{i,c}$	5 (23)	4 (22)
5% Significantly positive (negative) $\varphi_{i,b}$	23 (0)	21 (0)
5% Significantly positive (negative) $\varphi_{i,c}$	5 (0)	3 (1)
MWUT Z value (P-value)	-1.463 (0.144)	

The results for non-SSFs have been presented in Panel B of Table 6. Panel B depicts descriptive and inferential statistics. The descriptive statistics for the coefficients $\varphi_{i,b}$,and $\varphi_{i,c}$ are mean & medians .000 (.000), and -.000 (.000). It can be observed that the coefficient $\varphi_{i,b}$ is statistically significant for 68% of non-SSFs stocks (i.e., BKHB01, CHERAT, CRESCENT, KEL01, KEL06, KOHAT, MARI, PKDATA04, SECPL, SEL, SHELL, SILKBANK, SONERI, SSGC, and TELE) at chosen level of significance. The coefficient $\varphi_{i,c}$ is statistically significant for 18% non-SSFs stocks. Some of which are positively and others are negatively significant. There are 75% of non-SSFs stocks (i.e., KEL01, SECPL, and SILKBANK) that resulted in positive change. There is only non-SSFs stock (i.e., CRESCENT), which showed negative change. The non-parametric WSRT was also used for this purpose. The WSRT Z value [12] (p-value) for non-SSFs is -.378 (0.705). From this value, it is easy to comprehend that there is an insignificant change in unsystematic risk component of volatility in non-SSFs, due to introduction of SSFs.

In order to compare the results of un-systematic risk for SSFs and non-SSFs, MWUT is used. The MWUT Z value (p-value) is -.000 (1.000). This value affirms that potential simultaneous change in un-systematic risk for SSFs and Non-SSFs is statistically insignificant. As before, in case of unsystematic risk, it can be derived from the results presented above that no consistent evidence show that SSFs contact listings have changed the unsystematic risk component from pre- to post-SSFs period.

[11] Z-value for proportions is 1.527, which is insignificant.
[12] Z-value for proportions is 0.367, which is insignificant.

On comparison of this study with other studies, which investigated the impact of introduction of derivatives on volatility of underlying stock's market, following statements could be made. The results of this study are in same line with other studies (e.g., (Spyrou, 2005; Yu, 2001; Gulen & Mayhew, 1999; Lee & Ohk, 1992) that also show no change in volatility dynamics of underlying markets. However, there are two studies (i.e., (Mazouz & Bowe, 2006; McKenzie et al., 2000) that are similar in nature to this study in the sense that they simultaneously check impact of futures markets on systematic and unsystematic risk component of volatility. Among these two studies, the results of present study are in line with Mazouz and Bowe (2006). They investigated the impact introduction of LIFFE's of USFs on the of systematic and un-systematic risk component in LSE. They also had similar findings to this study. However, there are few studies that show contradictory results to this study as well. For example, McKenzie et al. (2000). show decrease in both systematic and un-systematic risk of SSFs. They attribute their findings to the inappropriate and costly regulations. In the context of Pakistan, the results are in contrast with S. U. Khan and Abbas (2013), who reported decrease in systematic risk component. The difference in results could be attributed to different methodology that is employed in this study (e.g., use of GED instead of normal distribution). The results are in contrast to Galloway and Miller (1997). They reported that introduction of SSFs inhibited the systematic risk for both SSFs stocks and non-SSFs stocks. Further, the results are in contradiction to the studies of Martin and Senchack Jr (1989); Damodaran (1990). They reported promotion of systematic risk after introduction of derivatives. They attribute their findings to the use of controversial techniques (e.g., program trading). From these results, it could be said that there could different reasons for the results that this study has come up with. For example, separate beta estimations for bull and bear effects, program trading, inappropriate regulations, artifacts of sample size or different methodology employed, approach of SECP for selection of SSFs, market microstructure, and development stage of market, distinction of derivative markets (i.e., options, index, USFs and SSFs) etc.

Conclusion, Policy Implications & Directions for Future Research

Conclusion

This study investigated the influence of introduction of SSFs in Pakistan's financial market in terms of risk components of underlying stocks. Specifically, this study divided the risk (i.e., volatility) into two components. The systematic risk is a proxy for microstructure related noise. On the other hand, the other component unsystematic risk is used as a proxy for noise trading. This study employed CAPM augmented GJR-GARCH (1, 1) approach to estimate and check change in both risk components. This study for the first time used GED instead of normal distribution, while discussing this aspect, in the context of Pakistan. The data is taken from PSX. The data set consists of stocks upon which SSFs contracts were written as well as the stocks, upon which SSFs contracts were not written. This is done to avoid endogeneity bias. The non-parametric WSRT and MWUT tests are also used to compare pre- to post-SSFs change as well as change across SSFs and non-SSFs. Overall, the results of this study are insignificant with respect to change in systematic and unsystematic risk components. Based upon the results of SSFs and non-SSFs it can be reported that no change is observed from pre- to post-SSFs and from SSFs to non-SSFs.

The findings of this study are in line with the idea that introduction of SSFs did not change the risk of underlying stocks. This study is important step ahead against the allegations that were charged against futures markets that they were part of destabilization caused before GFC hit the Pakistan's market. This study also concludes that appropriate methodology can show different results from previous methodologies. This study was motivated to check the allegations against futures markets as well as providing grounds for development of the derivatives markets. The results show that other forms of derivatives (i.e., options market) should be introduced with proper regulations. This will provide liquidity to the market as well as strengthen the market as well. Further, based upon the studies (I. Malik and Khan (2012); I. R. Malik et al. (2013); I. R. Malik and Shah (2016)) it could be concluded that stringent regulations for newer SSFs are not justified, and elastic rules for derivative markets can help enhancing the liquidity of the market, while making it easier for investors to use it as a risk hedging instrument. In contradiction, it is important to realize that dormant destabilizing ability of futures markets should not be underestimated while developing and updating governing rules and regulations of these markets. These results may be self -fulfilling prophecy of the traders, instead. There is a need to be vigilant enough to cope with the destabilizing potential that stakeholders can come across in the future.

Policy Implications

The conclusion of this study has significant implications for the SECP and PSX, who are responsible for the necessarily regulations for the futures markets. The following discussion highlights the need of much necessary review required for the futures markets. As mentioned earlier, contacts on SSFs were functional in July 2001 on PSX. Initially 10 stocks were selected for this purpose. As market was declared frozen, following the GFC hit the market in 2008, trading in SSFs was also discontinued. This action was a result of the recommendations of the Mark II review committee. After the GFC, On July 27th, 2009 trading in 18 SSFs was resumed with stringent regulatory framework. Apparently, strictness in the modified regulations implies that the former futures contracts played a role in destabilizing the overall stock market. Contrarily, the findings suggest that SSFs were not the reason of de-stability in the market. The findings of this study require careful interpretation. According to the results of this study, it can be observed that apparently SSFs have no destabilizing impact (in terms of increase in volatility) on underlying individual stock; nonetheless, the possibility of SECP's policy in documenting strict policy for selection of stocks for SSFs contracts cannot be ruled out.. These explanations cannot be investigated in the future research and criteria of selection of stocks for SSFs can be established in a much rational manner. Such type of analysis is required for better regulations (i.e., opening of contract, expiration date, overlapping period, taxes on transactions, margin transactions, daily price limits, contract size, contract period, position limits, and settlement markets halts etc.) of SSFs and market as a while. The findings of this study are helpful for international as well as local portfolio managers, institutional and individual investors in making decisions regarding investments in stock market.

Directions for Future Research

The findings of this study provide leads for further endeavors in this area of research. This study makes use of financial modeling of first order and second order moments (i.e., through mean and variance equation). Recent developments in econometric modeling depict that third and fourth order moments can also be modeled using different algorithms (e.g. Harvey and Siddique (2000); Guermat and Harris (2002)). Keeping in mind the specific attributes of financial and economic time series data, the modeling of patterns of skewdness and kurtosis need to be incorporated in models is suggested. This inclusion would definitely enhance the efficient use of information content held in the datasets. Second, this study makes use of only GED to address the issue of non-normality in the datasets, some other distributions (e.g., pareto distribution, log-normal distributions etc.) may also be considered for their respective effect, while modeling the said data sets.

Declaration

Competing interest

The authors declare that they have no competing interest.

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Contribution

The study addresses a financial phenomenon of role of derivatives markets and their respective regulations. This study challenges the stringent regulations for resumption episode of SSFs, after they been blamed for playing a role in destabilizing the then PSX in GFC. This study also has methodological contribution. The study adds AR (1) term in the mean equation CAPM augmented GJR-GARCH process; it makes use of non-normal distribution.

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