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Initiation of Futures Contracts and Volatility – Using Firm-Level Data in Pakistan

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ABSTRACT

This paper investigates the impact of futures contracts (FC) on volatility of stock prices using firm-level data of Pakistan-Stock-Exchange (PSX) from 1999 to 2015. GARCH model is used in this paper to examine initiation of FC on volatility. The results propose that after the initiation of FC, the stock price volatility of 17 companies stabilizes, whereas the stock price volatility of four companies destabilizes and for the seven companies it does not change. Hence, on average, the findings support the stabilization hypothesis which asserts that introduction of derivatives stabilizes the market. The finding supports the theories that derivative securities expand investors' choices for investment. The results of the study encourage the investors to invest in derivatives and the regulators should encourage derivatives market as it stabilizes the volatility.

INTRODUCTION

The significance of the derivative securities can be seen in the fact that its total value grew 11 times to that of global gross domestic product in 2007 (The economist, 2008). A survey of International Swap and Derivative Association showed that 94% of the world largest corporations used derivative products to mitigate the risk. According to Ehlers and Packer (2013) derivative market daily turnover was $ 1.1 trillion for 32 emerging markets as of April 2013.

Stock market volatility refers to degree of variation in the existing stock prices over a period of time (Akhtar and Khan, 2016). A higher volatility means more fluctuation in share prices, whereas, low volatility means stock prices does not fluctuate drastically. A number of models have been established to evaluate the conditional volatility such as GARCH (1, 1) Model.

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Derivative markets are relatively more volatile than spot market. Hence, this study examines the impact of initiation of FC on spot market volatility, particularly in case of individual firms in the context of Pakistan.

The surge in derivatives also leads to increase in fluctuation at the stock market. Two prominent hypotheses exist to explain the phenomenon: the stabilization hypothesis and the destabilization hypothesis. The stabilization hypothesis asserts that derivatives decrease volatility and stabilize the market (Lee & Ohk, 1992; Bologna & Cavallo, 2002; Singh & Kansal, 2010; Hsiao, Ching & Wan, 2011) On the other hand; destabilization hypothesis states that derivatives increase liquidity and volatility which causes destabilization of the market (Antoniou & Holmes, 1995; Edwards, 1988; Pok & Poshakwale, 2004).

This paper tests these two contesting hypotheses in Pakistani market after commencement of FC over the period from 1999 to 2015. The contribution of the study is that it uses firm-level data instead of index data. The results have theoretical and practical implications for researchers, government officials and regulators in redesigning trading instruments and to identify particular FC specification.

LITERATURE REVIEW

Investment in financial derivative has become an important activity of many organizations in recent times. Two prominent hypotheses exist about derivative impact on stock prices. A pro-derivative hypothesis believes that derivative trading results, stabilizing effect. According to Hsiao, Ching & Wan (2011) the introduction of derivatives decreases the volatility of Chinese stock market. The study found that derivative improves efficiency and secure the investors with better risk management tools. Many other studies from different financial markets documented similar results about stabilization of stock market after the initiation of FC such as, Lee and Ohk (1992) for Greek market, Aitken and Segara (2005) for Australia, Kumar et al. (1995) for Japan, Bologna and Cavallo (2002) for Italy, Vipul (2006) and Singh and Kansal (2010) for India and Bohl et al. (2011) for Poland stock market. In Pakistan, Khan and Hijazi (2009) and Awan and Shah (2014) confirmed that initiation of FC has

impact on the market. Both these studies showed that the initiation of single stock FC (SSFC) led to decrease in volatility in the Karachi Stock Exchange.

The other hypothesis views the impact of derivatives as negative which causes destabilization in underlying market price because of speculative activities. The speculators enter to into the market for greater return without rational information which increases market liquidity as well as volatility and make the market destabilized (Antoniou & Holmes, 1995; Clarke et al., 2007). Edwards (1988) founded that the introduction of Derivative index increases volatility in short run. Similarly, Pok and Poshakwale (2004) concluded that derivative trading destabilize spot market volatility in the Malaysian market. Bae et al. (2004) found similar results for the Korean Stock Market that the volatility and efficiency increased due to initiation of derivatives. Aitken & Segara (2005) examined the impact of warrant on Australian stock exchange (ASE). The authors concluded that derivative warrant had significantly negative impact on the underlying market and causing increased volatility and liquidity. Ryoo and Smith (2004) obtained similar results about the introduction of derivatives in Korean stock market. According to Malik and Shah (2018) derivative securities does not destabilizes the spot market.

In Pakistan, companies that fail to maintain relatively high market capitalizations for a period of 6-12 months are dropped from index computation. As index is not a good representative of the whole market, it is possible that a company issuing FC may not be included or dropped from computation of KSE-100 index.

METHODOLOGY

The paper uses the data of listed individual firms in PSX, which issue FC derivatives from the time of its introduction till 2015. The share price data of the firms are collected on the basis of certain criteria in order to

maintain precision. Only those firms are included which continuously trade for: (1) 20 days in a month, (2) 240 days a year and (3) at least two years. Based on the above criteria, only 28 firms are enlisted in final sample.

In the literature review, close-to-close method is vastly used for returns calculation. However, Parkinson (1980) proposed extreme value estimator which is 5 to 14 times more efficient than close-to-close estimation. The paper adopts the Parkinson estimation where variances of High-Low intra-day returns are calculated.

Parkinson volatility = $\sigma_{pit} = 252/4_n \ln 2 \sum^{n}_{i=1} \ln (H/L)$

Where σp_{it} = Parkinson volatility of the stock I for day t.

H = high price, L = low price of the stock i for day t and Ln = natural log.

According to Predescu and Stancu (2011), GARCH family models are the most widely used model in the literature to measure the conditional variance in financial time series data. These models are suitable when the error term variance in a financial time series data follow an autoregressive (AR) model

The GARCH (1, 1) model is used to measure volatility and is the extension of ARCH model, which was developed by Bollerslev in (1986) which gives better results to measure conditional variance than ARCH model. The advancement of ARCH model into GARCH model by including p lagged values of the conditional variance leads to a GARCH (p-q) model. In GARCH model the past conditional variance is the function of its own previous lags, meaning that the GARCH model provides longer memory of the conditional variance as compared to ARCH model.

The GARCH Family model are used by number of studies such as Jorge (2007) used for Portuguese Stock Index; Floros (2008) used for Egypt (CMA General Index) and Israel (TASE-100 Index); Goudarzi and Ramanarayanan

(2010) used for Indian stock market using BSE 500 stock index as the proxy for ten years; Elsayeda (2011) used for Egyptian stock market index; Mittal, Arora, and Goyal (2012) also used for Indian stock price and investigated to test whether volatility is asymmetric using daily returns from 2000 to 2010; Adesina (2013) used for Nigerian Stock Exchange (NSE); and Banumathy and Azhagaiah (2015) also used for Indian Stock market*. GARCH model has been the most used and parsimonious demonstration of conditional variance for time series data (Akhtar & Khan, 2016).

Equation of GARCH model is as follows:

$$\sigma_{2t} = \alpha 0 + \alpha 1 \varepsilon_{2t-1} + \beta 1 \sigma_{2t-1} + u, \quad (1)$$

Where σ_{2t} = conditional variance, ε_{2t-1} = squarer error term, $\alpha 1$= ARCH parameter, $\beta 1$= GARCH parameter and u = unexplained error term. The ARCH term represents the recent news or the previous period effect while the GARCH term shows historical (or old new) effect in price change (volatility). The sum of both the term close to 1 suggests that the shocks to the conditional variance is very persistence but still mean reverting†.

Since a dummy-variable (DFC) is introduced to examine the impact of derivative introduction of stock market volatility in the conditional variance equation which is:

$$h_t = \alpha 0 + \alpha 1 \, u_{t-1} + \beta 1 \, h_{t-1} + \gamma DFC \qquad (2)$$

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* No study have taken control variable such as size, age, leverage or any other variable the reasons is the nature of the study is totally different. The study objective is to find out the initiation of future contract on volatility. If control variables are included the nature of the study will be changed, thus the paper does not include control variable in GARCH model.

† Mean reverting proposes that stock prices move around their core values and will revert to its original value in the long run (Pavelnko, 2008).

DFC takes the value of zero in pre-FC-period and 1 in post-FC-period. If the parameter coefficient is significant and negative it indicates that volatility decreases and if the coefficient is significant and positive it indicates volatility increases due to introduction of FC.

RESULTS AND DISCUSSION

To apply GARCH (1, 1), the diagnostic tests of stationarity and heteroscedasticity are conducted to know about the suitability of the models. First, Augmented-Dickey-Fuller Test is conducted to measure the stationarity of data for all periods.[‡] In all periods the companies P-value is significant at 1%, 5%, and 10% levels which fulfill the assumptions of stationarity. Secondly, the study applies heteroscedasticity test on all periods to examine the ARCH effects. Results of the study found that the P-values are significant for all the companies which imply that the data presents ARCH effects across the periods. ARCH effect is the major requirement to run GARCH family models.

TABLE 1: ***GARCH (1, 1) MODEL RESULTS***

S. No	Symbols	Pre-period			Post-Period		
		α	**β**	**α +β**	**α**	**β**	**α +β**
1	ABL	0.028*	0.011	0.039	0.127*	0.851*	0.978
2	AHCL	0.09	-0.185	-0.095	0.306*	0.598*	0.904
3	AICL	0.074*	0.832*	0.906	0.079*	0.916*	0.995
4	AKBL	0.179*	0.691*	0.87	0.288*	0.695*	0.983
5	ANL	0.110*	0.840*	0.95	0.088*	0.908*	0.996
6	ATRL	0.102*	0.772*	0.874	0.097*	0.893*	0.99
7	BAFL	0.221*	0.657*	0.878	0.148*	0.582*	0.73
8	BAHL	0.249*	0.726*	0.975	0.195*	0.608*	0.803
9	BOP	0.204*	0.488*	0.692	0.141*	0.722*	0.863
10	DGKC	0.264*	0.515*	0.779	0.263*	0.697*	0.919
11	DSFL	0.105*	0.898*	1.003	0.218*	0.437*	0.655
12	ENGRO	0.377*	0.679*	1.056	0.332*	0.395*	0.727
13	FABL	0.310*	-0.015	0.295	0.118*	0.810*	0.928

[‡] The results of stationarity, heteroscedasticity and residual graph are available on demand.

14	HUBC	0.343*	0.624*	0.967	0.319*	0.501*	0.821
15	IBFL	0.143*	0.851*	0.994	0.326*	0.323*	0.649
16	ICI	0.146*	0.853*	0.999	0.149*	0.587*	0.736
17	FCCL	0.309*	0.514*	0.823	0.123*	0.871*	0.994
18	LUCK	0.159*	0.203	0.362	0.152*	0.133	0.285
19	MCB	0.292*	0.735*	1.027	0.145*	0.675*	0.821
20	NBP	0.236*	0.566*	0.802	0.253*	0.671*	0.924
21	NML	0.140*	0.868*	1.008	0.218*	0.441*	0.659
22	NIB	0.275*	0.262	0.537	0.183*	0.787*	0.971
23	POL	0.189*	0.751*	0.941	0.233*	0.762*	0.995
24	SNGP	0.183*	0.798*	0.981	0.246*	0.580*	0.826
25	SSGC	0.289*	0.299*	0.588	0.172*	0.804*	0.976
26	TELE	0.218*	0.630*	0.848	0.216*	0.659*	0.875
27	UBP	0.288*	0.352*	0.64	0.113*	0.872*	0.985

The table shows that a high percentage of companies in Pakistan Stock market documents that old information have persistent effect than new information. A general belief is that the initiation of FC can improve the speed and quality of information, consequently, it is expected that new information have persistent effect in price changes. This contrary finding may be due to low frequency data used in previous studies, the currents study used

intraday (daily data) or high frequency data. Furthermore, there are many methods to spread the information extremely quickly; thus the previous day news may not be considered new information and price changes (volatility) would incline to be less affected by the previous day information. The results of the study are in line with the study of Xie and Huang (2014) in China; Banumathy and Azhagaiah (2015) in India. The study results are contradictory to the findings of Khan et al., (2011) in Pakistan. The reason for contradiction might be that the current study uses more robust models on firm-level data instead of index data.

Table 2: GARCH Model with Dummy-Variables (0 and 1)

1. S.no	2. Symbols	3. GARCH(1,1) 7. ω	Z	8.	9. P	4. S.no	5. Symbols	6. GARCH(1,1) 10. ω	11. Z	12. P
13. 1	14. ABL	15. 0.001	16. 4.154	17. 0.000		18. 14	19. FCCL	20. 0.000	21. 3.019	22. 0.003
23. 2	24. AHCL	25. 0.002	26. 5.679	27. 0.000		28. 15	29. HUBC	30. 0.000	31. -5.407	32. 0.000
33. 3	34. AICL	35. 0.000	36. 0.079	37. 0.937		38. 16	39. IBFL	40. 0.000	41. -5.917	42. 0.000
43. 4	44. AKBL	45. 0.000	46. 1.698	47. 0.090		48. 17	49. ICI	50. -0.001	51. -2.121	52. 0.034
53. 5	54. ANL	55. -0.001	56. -1.717	57. 0.086		58. 18	59. LUCK	60. 0.002	61. 0.002	62. 0.998
63. 6	64. ATRL	65. 0.001	66. 1.655	67. 0.098		68. 19	69. MCB	70. -0.001	71. -2.267	72. 0.023
73. 7	74. BAFL	75. 0.000	76. -0.259	77. 0.795		78. 20	79. NBP	80. 0.000	81. -1.819	82. 0.069
83. 8	84. BAHL	85. 0.000	86. 2.246	87. 0.025		88. 21	89. NML	90. 0.001	91. 2.883	92. 0.004
93. 9	94. BOP	95. -0.001	96. -2.560	97. 0.011		98. 22	99. NIB	100. -0.001	101. -4.663	102. 0.000
103. 10	104. DGKC	105. -0.001	106. -2.073	107. 0.038		108. 23	109. POL	110. -0.001	111. -4.218	112. 0.000
113. 11	114. DSFL	115. 0.001	116. 2.680	117. 0.007		118. 24	119. SNGP	120. 0.000	121. -2.174	122. 0.030
123. 12	124. ENGRO	125. 0.000	126. -5.309	127. 0.000		128. 25	129. SSGC	130. 0.000	131. -2.266	132. 0.024
133. 13	134. FABL	135. 0.000	136. -1.194	137. 0.233		138. 26	139. TELE	140. -0.001	141. -2.888	142. 0.004
143.	144.	145.	146.	147.		148. 27	149. UBL	150. -0.001	151. -2.670	152. 0.008

Table 2 shows the result for dummy variables: 16 companies have negative and significant coefficient values such as ANL, BOP, DGKC, ENGRO, HUBC, IBFL, ICI, MCB, NBP, PICB, POL, SNGP,SSGC, TELE,NML and UBL. It suggests that the volatility of these companies stabilized due to introduction of FC. Four companies

have significant but positive coefficient such as ABL, AHCL, DSFL and FCCL, which suggests that volatility of these firms destabilized due to introduction of FC. The remaining companies have insignificant coefficients such as, AICL, AKBL, ATRL, BAFL, BAHL, FABL and LUCK, which suggests that introduction of FC neither stabilize nor destabilize volatility. From the above interpretation, it is concluded that majority of the companies in Pakistan stock market stabilized volatility after the initiation of FC. The finding of the study are consistence with Bologna & Cavallo, (2002); Vipul (2006); Bohl et al., (2011); Khan & Hijazi (2009); Awan & Shah (2014);

and contrary to Antoniou & Holmes (1995); Awan and Rafique (2013). Awan and Rafique (2013); Khan (2006) used the same methodology of GARCH family model as used in this paper; the result may be contrary because the current study used firm level data while prior study was based on index analysis.

CONCLUSION

Previous studies examined futures contracts introduction on volatility of stock markets using index data. This study contributes in literature by analyzing the firm-level data. The paper concludes that old information has persistence effect in price changes and the initiation of derivatives decreases volatility. It suggests that Initiation of FC supports stabilization hypothesis. The regulators and policy makers of stock market should encourage the derivatives securities as it expands the investors' choice and stabilizes the market at same time.

REFERENCES

Adesina, K.S., (2013) 'Modelling Stock Market Return Volatility: GARCH Evidence from Nigerian Stock Exchange'. *International Journal of Financial Management 3*(3), 37-46

Akhtar, S., & Khan, N. U. (2016). Modeling volatility on the Karachi Stock Exchange, Pakistan, Journal of Asia Business Studies, 10 (3)

Awan, A., & Shah, S.M.A. (2014). The Price and Volume Effect of Single-Stock Futures Trading on the Pakistani stock market. *The Lahore Journal of Business, 2*(2), 1-32

Antoniou, A., & Holmes, P. (1995). Futures trading, information and spot price volatility: Evidence for the FTSE-100 stock index futures contract using GARCH. *Journal of Banking & Finance, 19*(1), 117–129.

Bae, S. C., Kwon, T. H., & Park, J. W. (2004). Futures trading, spot market volatility, and market efficiency: the case of the Korean index futures markets. *Journal of Futures Markets, 24* (12), 1195-1228.

Aitken, M.J., & Segara, R. (2005). Impact of warrant introductions on the behaviour of underlying stocks: Australian evidence. *Accounting and Finance, 45*(1), 127-144.

Awan, A., & Rafique, A.(2013). The Volatility Effect of Single Stock Futuress Trading on Pakistani Stock Market. *The Lahore Journal of Business 8*, 65-93

Banumathy, K., & Azhagaiah, R. (2015). Modelling stock market volatility: evidence from India. *Managing Global Transitions, 13*(1)

Bologna, P., & Cavallo, L. (2002). Does the Introduction of Stock Index Futures Effectively Reduce Stock Market Volatility? Is the 'Futures Effect' Immediate? Evidence from the Italian Stock Exchange Using GARCH. *Applied Financial Economics, 12*(3), 183-192.

Bohl, M.T., Lischewski, J., & Voronkova, S. (2011). Pension Funds' Performance in Strongly Regulated Industries in Central Europe: Evidence from Poland and Hungary. *Emerging Markets Finance and Trade, 47*(3), 80-94.

Bollerslev, T. (1986). Generalized Autoregressive Conditional Heteroscedasticity. *Journal of Econometrics, 31*(3), 307–327.

Clarke, M., Gannon, G., & Vinning, R. (2007). The impact of warrant introduction: Australian experience. School Working Paper Series No. 2007/1 I. Deakin University. Retrieved from http://www.deakin.edu.au/buslaw/aef/publications/workinupapers/2007 1 1 acf.pdf

Duque, J., Paxon, D. (1999) "Empirical evidence on volatility estimators", Working Paper, *ISEG, Portugal.*
Edwards, F.R. (1988). Futures trading and cash market volatility: Stock index and interest rate futures. *The Journal of Futures Markets, 8* (4), 421-53.
Ehlers, Torstenand Frank Packer (2013), "FX and Derivatives Markets in Emerging Economies and the Internationalization of their Currencies, "*BIS Quarterly Review*, 55-67.
Elsayeda, A.I., (2011). Asymmetric volatility, leverage effect and financial leverage: A stock market and firm-level analysis. *Middle Eastern Finance and Economics*, 165-186.
Floros C., (2008), "Modelling Volatility using GARCH Models: Evidence from Egypt and Israel", *Middle Eastern Finance and Economics, 2*.
Goudarzi, H., & Ramanarayanan, C.S., (2010). 'Modelling and Estimation of Volatility in Indian Stock Market'. *International Journal of Business and Management 5*(2), 85–98.
Hsiao, C., Ching, H. S., & Wan, S. K. (2011). A panel data approach for program evaluation-measuring the benefits of political and economic integration of Hong Kong with mainland China. Journal of Applied Econometrics.doi:10.1002/jae.1230.
Jorge C., (2006), "Modelling & Forecasting Volatility of the Portuguese Stock Index PSI-20", *Portuguese Journal of Management Studies, ISEG, Technical University of Lisbon, 0*(1), 3-21.
Khan, S. U., & Abbas, Z. (2013). Does equity derivatives trading affect the systematic risk of the underlying stocks in an emerging market: Evidence from Pakistan's futuress market. *Lahore Journal of Economics, 18*(1), 63.
Khan, S., Shah, A., & Abbas, Z. (2011). Impact of single-stock futures trading on stock price volatility of underlying stocks: Empirical evidence from Pakistan's stock market. *Journal of Basic and Applied Scientific Research*, *1*(11), 2000–2008.
Khan, S. U. (2006). Role of the futures market on volatility and price discovery of the spot market: Evidence from Pakistan's stock market. *Lahore Journal of Economics, 11*(2), 107-121.
Khan, S. U., & Hijazi, S. T. (2009). Single stock futures trading and stock price volatility: Empirical analysis. *Pakistan Development Review, 48*(4), 553–563.
Kumar, R., Sarin, A., & Shastri, K. (1995). The impact of index options on the underlying stocks: The evidence from the listing of Nikkei stock average options. *Pacific-Basin Finance Journal, 3*(2-3), 303-317.
Lee, S. B., & Ohk, K. Y. (1992). Stock index futures listing and structural change in time-varying volatility. *Journal of Futures Markets*, *12*(5), 493-509.
Malik, I.R., & Shah, A. (2018). Single Stock Futuress and their Impact on Risk Characteristics of the Underlying Stocks: A Dynamic CAPM Approach. *South Asian Journal of Management Sciences, 12*(1), 46-68.
Mittal, A. K., Arora, D.D., & Goyal, N., (2012). 'Modelling the Volatility of Indian Stock Market'. *GITAM Journal of Management 10*(1), 224–43.
Parkinson, M. (1980). The extreme value method for estimating the variance of the rate of return. *Journal of Business, 53*, 61-68.
Pavlenko, A. (2008). A mean reversion in stock market prices: evidence from Ukraine: EERC Master Thesis. National University of "Kyiv-Mohyla Academy".
Pok, W. C., & Poshakwale, S. (2004). The impact of the introduction of futures contracts on the spot market volatility: the case of Kuala Lumpur Stock Exchange. *Applied Financial Economics*, *14*(2), 143-154.
Predescu, O.M., & Stancu, S. (2011). Portfolio Risk Analysis using ARCH and GARCH models in the context of the global financial crisis. *Theoretical and Applied Economics, 2*(555), 75-88.
Ryoo, H. J., & Smith, G. (2004). The impact of stock index futures on the Korean stock market. *Applied Financial Economics, 14*(4), 243-251.
Singh, G., & Kansal. G. (2010). Impact of union budget on Indian stock Market: A case study of NSE. *Asia-pacific Journal of Social Sciences, 2*(1), 148-160.
Vipul, (2006). Impact of the Introduction of Derivatives on Underlying Volatility: Evidence from India. *Applied Financial Economics, 16*, 687-697.

Xie, S., & Huang, J. (2014). The impact of index futures on spot market volatility in China, Emerging Markets Finance and Trade, 50 (1), 167-177.