

Impact of Foreign Institutional investment on Stock Market Volatility



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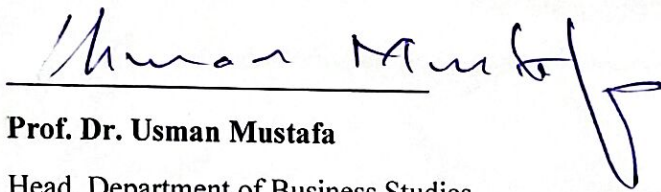
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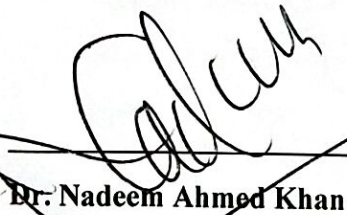
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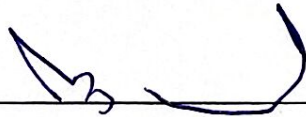
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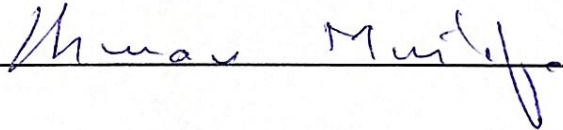
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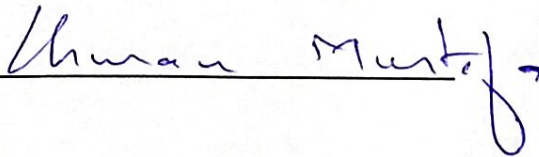


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Abstract

The purpose of this study is to examine the impact of FII on stock market volatility. For this purpose we collect monthly frequency data from Jan-2005 to June-2016 from state Bank of Pakistan and stock market of Pakistan. We check the volatility of the series, auto correlation and distribution of the series through visual inspection. Then we perform pre-estimate test for both series. ARCH test suggest that there is ARCH effect in the return series of Stock Market and FII. Then we apply GARCH (1, 1) from the model result we concluded that stock market return volatility depends on its own previous shock as well as depends on its own previous volatility, or we can say that today stock market return is affected by its own previous information as well as affected by its own previous volatility. Result also shows that volatility of stock market return of Pakistan is also affected by the volatility of foreign portfolio investment.

Chapter 1

Introduction

Foreign Institutional Investment are the capital inflows done by the institutions in the countries. Pakistan Financial market has its own unfold stories. Pakistan Financial markets have been grown by leaps and bounds over the last decade. Role of FII has increased and changed the face of Pakistan Stock Markets. For a developing country like Pakistan, FIIs contribute to the foreign exchange inflow from multi finance institutions and give edge to the economic growth. As it lowers the cost of capital by accessing to cheap global credit and leads to higher asset prices in the Pakistani markets. It also leads to reforms in the capital market and financial markets. It had also increase the depth and breadth of the financial market. Foreign Investments play a vital role in the country economy. Foreign investment support and promote sustainable development in the developed countries whereas for the developing countries, it creates the condition for economic growth by increasing the rate of investments.

Per economics and finance, there are several implications regarding the estimation of volatility in the equity markets. If there is high volatility in the stock prices, then there is adverse in the economy. Due to high volatility, the investor can change the investment decision and resultantly can decline the capital flows from the foreign. Investment done by the FIIs are different in extent, magnitude and nature. Different studies viewed FIIs investment on different angles like emerging economies. Pakistan view that FIIs are believed to lowering the cost of capital and improve the market efficiency. On the flip side, when volatility is increasing in the stock markets, it is viewed that FIIs responsibility. Different studies investigated that volatility in the stock markets are caused by the FIIs. However different studies cited that volatility and stock markets are two different statistics. For promoting growth foreign capital flow is one of the important factor (Akinlo, 2004).

Pakistan is the next emerging economy so FIIs has viewed differently by the policy makers and academics and consider it as major players. FIIs is perceived as speculators and their investment is like short-term gains. Corporation management has been influenced by the institutional investors to exercise their voting rights and actively involved in the corporate governance. Due to economic activities in the emerging economies, the world economy has been almost recovered. However, factors like fiscal deficits, high debts, inflation and unemployment which are still headache for the developed economies and result in slow economic growth.

Pakistan Stock Exchange is one of the stock market which play an important role in the circulation of currency where high volatility is maintained. The allocation of the surplus saving to investment opportunities is challenge for the economy. Foreign capital inflows fulfil the gap if own country capital falls of short of required capital. Poshakwale and Thapa (2010) conclude that FIIs have both negative and positive impact on domestic economy and revealed that there is significant impact on stock market, foreign exchange reserves and exchange rate. The economic growth increases due to the flow of foreign equity investment. This integration lead to equity markets with global equity markets.

Foreign portfolio investment is the form of FIIs, which widening the market capitalisation and trading volume. The direct impact on the secondary markets which diversified risks, liquidity and returns and will attract the investment opportunities. FIIs may increase inflation and may also create asset bubbles which create financial instability. Frankel (1984) used international capital asset pricing model (CAPM) and concluded that foreign investment has negative correlation of their returns with own country's assets returns by reducing portfolio risks. FDI and FII is one of the measure of the economic development in both developed and developing countries. The world is a global village so for international economic integration and stimulation, FDI and FII are the instruments for it.

For the emerging and growing economic globalization, foreign investment is one of the best measure. Foreign investment is a problem for the developing economies like Pakistan and such countries must liberalize the policies to welcome investment from countries which abundant in the capital resources. For the Pakistan economy, foreign investments are also critical component because domestic institutions like hedge funds, insurance funds, mutual funds channelize the domestic saving into the financial markets

1.1 Objective of the Study

The main purpose of the study is to test the relationship between FII flows and KSE 100 Index movement in the Pakistan Stock Exchange.

- To know whether the stock market is affected by the foreign investment
- To examine and evaluate whether FIIs have any impact on KSE
- To know the Volatility of KSE 100 index due to FIIs
- To analyse the trend in FII investment in Pakistan during the sample period

1.2 Hypothesis of the Study

- There is no significant relationship between KSE 100 index Volatility and FIIs
- There is no significant difference in FII investment flow in Pakistan during the period of study.
- There is no significant relationship between KSE 100 indices and FII investment flow during the period of study.

1.3 Significance of the Study

The study will explain clearly the impact of foreign institutional investment on the Pakistan stock indices. The study will give a clear picture of the market trends due to FIIs inflows and outflows. This work will help the analyst and policy maker to formulate policies that uncertainty can be minimized. From the policy point of FIIs in Pakistan, are important. The research focuses on pattern of the FII investment in the Pakistan capital market especially KSE 100 Index.

Chapter 2

Literature Review

Foreign Institutional Investments playing a crucial role in building up foreign reserves. There are different studies which explained the Foreign Institutional Investments (FII) at different time periods. Most of the studies have been conducted across the globe give insight of cross economies and its transmission of volatility in different economies.

Srivastava (2013) examined the impact of FIIs on Indian stock market by using daily FIIs and daily returns data of Sensex and Nifty from the period 2001-2010. It was shown that FIIs investments have positive and significant impact on stock market and on major stock indices by using correlation and regression techniques. Jain et al., (2012) using Karl Pearson's coefficient of correlation investigated the impact of FIIs on stock market. It was reported that there is high positive correlation between FIIs and Sensex. Sinha et al. (2011) used vector auto-regression (VAR) model focusing on foreign investment and real economic growth. It was observed that FIIs flows to real economic growth in bidirectional causality. Mukherjee and Roy (2016) investigated the investment decision of mutual funds determinants and in comparison with FIIs. It was reported that determinants of mutual funds influence the decision of FIIs in case of equity while not influence in case of mutual funds.

Poshakwale and Thapa (2010) reported that FIIs have positive and negative on the economy. It was studied that rapid growth in the flow of foreign investments will create integration of Indian equity markets with global markets. Singh & Paliwal (2010) reported that foreign investments enhances the market depth and breadth. Ahmad et al., (2005) studied the relation between foreign institutional investments and equity returns in India. It was found that FIIs flows are due to equity returns. It was also indicated that there is significant volatility in FII investment but no effect in transmission or destabilizing.

Behera (2010) by using ordinarily least square GARCH model studied the impact of FIIs investment on volatility and equity returns. It was stated that FIIs investment have positive and significant impact on returns and liquidity. It was further added that GARCH estimates suggest volatility increase in the Indian stock exchange due to FIIs investments.

Bansal & Pasricha (2009) conducted a study on the impact of FII's on Indian stock market behaviour and found that there is no significant changes in the market average returns. However when India open it market for foreign investments then volatility is reduced to significant level. Sumanjeet (2009) examined the foreign capital flows in India and stated that there is increase in capital flows for achieving the accelerated growth in the developing countries since early 1990. Mishra (2009) used the data from the period of 1993-2009 empirically investigated the impact of net FIIs on stock returns. It was indicated that there is positive correlation in the movements of FIIs and stock returns.

Makwana, Chetna R. (2009) studied that how market influence on FIIs. It was reported that FII and volatility of Indian Stock market has positive relation and move in the same direction. Chittedi (2008) studied that FIIs had a strong significant impact on liquidity and volatility in the stock market prices.

P. Krishna Prasanna (2008) suggested that foreign investors take interest in those companies which are owned by general public and have high volume of shares. Badani & Tripathi (2009) investigated the impact of FIIs on Indian stock market by using the autoregressive integrated moving average (ARIMA) model. It was reported that past FIIs have significant impact on current index while no significant impact on current FIIs on current index. Anokye and Tweneboah (2008) investigated the impact of foreign direct investment (FDI) on the stock market development in Ghana by using cointegration and error correction model. The

results showed that development in stock market had been significantly influence by shock of FDI.

Bahmani-Oskooee & Sohrabian (1992) used cointegration and Granger causality for describing the relation between exchange rates and stock prices. It was indicated there is indirect relation between stock prices and exchange rates. Bohl et al., (2009) empirically investigated in the Polish stock market that when increase occur in the institutional ownership, it changes the volatility structure of stock returns. It was also added that institutional investors are the supporting force for stabilizing the index stock returns.

Douma, Kabir & Rejie (2006) investigated the impact of FIIs on emerging markets performance and reported that there is a positive and significant impact of foreign ownership on firm performance.

Kulwantraj (2004) conducted a study and showed that contingent event risk and stock market returns are the major factors of the FIIs investments. It was also stated that the impact on real economy is not positive when FIIs came. Nair and Trivedi (2003) investigated that most of the literature on FIIs in India shows that FIIs has a positive and significant impact on equity returns and has positive correlation with stock returns. Gordon and Gupta (2003) used data from 1992 to 2001 to examine the impact of portfolio flows and its impact on domestic fundamental factors. It was reported that portfolio flows has a strong relation with the domestic fundamental factors.

MT Raju et al., (2004) in their paper found that in mature markets there is less volatility but returns are high. They quoted that India & China publicly display high returns while low returns in emerging economies. Equity return has a positive significant impact on FII have been reported by Chakrabarti et al., (2003). They also investigated that link between equity returns and FII are bi-directional. Raj Chaitanya (2003) examined the FIIs and their impact on Indian

economy and reported that stock market performance has been the sole driver of FIIs stream. In 1997 World Bank conducted a study and reported that the emerging economies whose receive higher foreign investments will improve the stock market liquidity.

Batra (2003) examined the FIIs trading behaviour and its effect on stock market stability. It was found that FIIs were the positive feedback investors and foreign investors have tendency to herd on equity markets. Stanley Morgan (2002) reported that FIIs have strong impact on short-term market movement. It was stated that foreign inflows and market returns have strong correlation during bear markets. Li (2002) examined the Taiwan stock market behaviour for checking the impact of market opening to foreign investors. It was found that there is no significant changes in market return after opening.

Bonser-Neal et al., (2002) examined that foreign trading behaviour on Jakarta stock exchange from 1995-2000 and concluded positive correlation but had no significant impact of foreign investors to destabilized the market prices. Chakrabati (2001) analysed the impact of FII on stock returns and are relevant variables and reported that driving force behind FII is the market returns.

Kumar (2001) examined the impact of FII on Indian stock market by using monthly data from 1993 to 1997. It was reported that FII are driven by fundamentals and do not responding to short term changes. Folkert et al., (1995) studied the volatility on Mexico stock prices in different periods and reported that intensity of portfolio generated mixed results and is less volatile. On the other hand, the same study was conducted in Hong Kong and reported that stock prices are more volatile. Roy (2007) conducted a study and analysed empirically the foreign capital flows in India and reported that foreign capital flows are due to capital gain motive and also explored that several legalisation pertaining to foreign investments led to the significant impact on the FII.

Rene and Stultz (1997) found out that when FIIs comes to the stock market, it is not necessary to its volatility. Berko & Clark (1997) studied the relation between FIIs investment and equity returns by using monthly data and reported that when the market falls then FIIs sell and buy when rise, so this behaviour create a dilemma in stock prices and push it from the fundamentals.

Agarwal (1997) examined that overall world market capitalization had a fruitful impact on the FIIs. Richards (1996) estimated the volatility of emerging markets by using two sets of data and three methodologies and reported that no increase in volatility after the economy is opened to the foreign investors.

Warther (1995) investigated the effect of fund flows on stock market returns by using monthly data of mutual funds from the period 1994-1993. It was found that there is positive and significant relationship between funds flows and stock market returns. Fortune (1998) using the mutual fund data from the period of 1984-1996 to investigate the relationship between funds flow and stock returns employed a VAR model. It was reported that there is bi-directional relationship between market returns and funds flows.

Kim & Singal (1993) investigated that arrival of the FIIs have to destabilize the price of the various stocks. Frankel (1992) used CAPM, gives a utility-maximization model for international asset diversification and showed that keeping the foreign assets having negative correlation of their returns with own country's assets then the portfolio can be reduced.

Grinblatt and Titman (1989) studied that if institutional investors play a stabilize role then the institutional holding will reduce the market volatility and vice versa. Treynor (1965) reported that the institutional investors effectively suspect the stock market movements.

Chapter 3

Data and Methodology

3.1 Model Specification

As volatility in the financial data is common so to capture this volatility with respect to time. A study has been conducted by Engle (1982) and introduced the autoregressive conditional heteroskedastic ARCH model. ARCH type model contribution to econometrics tools cannot be neglected but also have some short comes like non-negativity and lag length restrictions of parameters. Auto regressive conditional hetroskediastic GARCH type model was proposed by Bollersley (1986) and extend this model with the lag value of conditional variance. On one hand GRACH model only consider positive and does not absorbs the negative shocks. GJR has been introduce which is the extension of standard GARCH model introduced by Glosten, Jagannathan & Runkle (1993).

Every data has some characteristics and trends and tries to estimate best predictable model. We will use the log difference return series to deal with trends.

$$R_t = l_t/l_{t-1}$$

l_t = financial series at level

l_{t-1} = First difference of financial

The conditional variance depends upon the predicted past value of return series was reported by Granger and Andersen (1978).

$$\gamma_t = \varepsilon_1 r_{t-1} \dots\dots\dots (3.1)$$

The conditional variance is

$$\gamma_t/r_{t-1} = \sigma^2 r_{t-1}^2 \dots\dots\dots (3.2)$$

There is no restriction for the conditional variance, either it is unspecified or zero. Then another approach came to find the ARCH effect in return series.

3.2 ARCH (q) Model

ARCH model is Conditional mean equation for the general description

$$R_t = \alpha_0 + \beta X_t + t \quad \dots\dots\dots (3.3)$$

Where $t \sim N(0, \sigma_t^2)$

Conditional variance equation

$$\sigma_t^2 = \theta_0 + \sum_{i=1}^q \theta_i \varepsilon_{t-1}^2 \quad \dots\dots\dots (3.4)$$

Where $\theta_0 > 0, \theta_i \geq 0 \quad i= 1, 2, \dots, q$

In conditional mean equation R_t represent return series where β is the vector of parameter βX_t is ARMA (m n) process. In conditional variance equation the restriction on coefficients must be non-negative. σ_t^2 shows conditional variance, σ_t^2 depend upon lags of squared value ε_t process.

3.3 GARCH (p, q) Model

$$R_t = \alpha_0 + \beta X_t + t \quad \dots\dots\dots (3.5)$$

Where $t \sim N(0, \sigma_t^2)$

Conditional variance equation

$$\sigma_t^2 = \theta_0 + \sum_{i=1}^q \theta_i \varepsilon_{t-1}^2 + \sum_{i=1}^p \phi_i \sigma_{t-1}^2 \quad \dots\dots\dots (3.6)$$

In GARCH (p, q) model the σ_t^2 depends on ε_{t-1}^2 process and lag of conditional variance.

3.4 Data

Monthly data for the period (jan-2005 to June-2016) of KSE-100 and FII was obtained from Pakistan Stock Exchange and State Bank of Pakistan's websites respectively.

3.5 Test Analysis

First step visual inspection of both return series, Jarque Bera test for Normality test, Q-stat of return series employs that there no serial autocorrelation in standardized residuals. Q2-stat of the return series there is no serial autocorrelation in squared standardized residuals. LM-ARCH for ARCH effect in return series. Due to convergence problem we check Q-stat and Q2-stat up to 10th lag. LM-ARCH test up to 5th lag.

Chapter 4

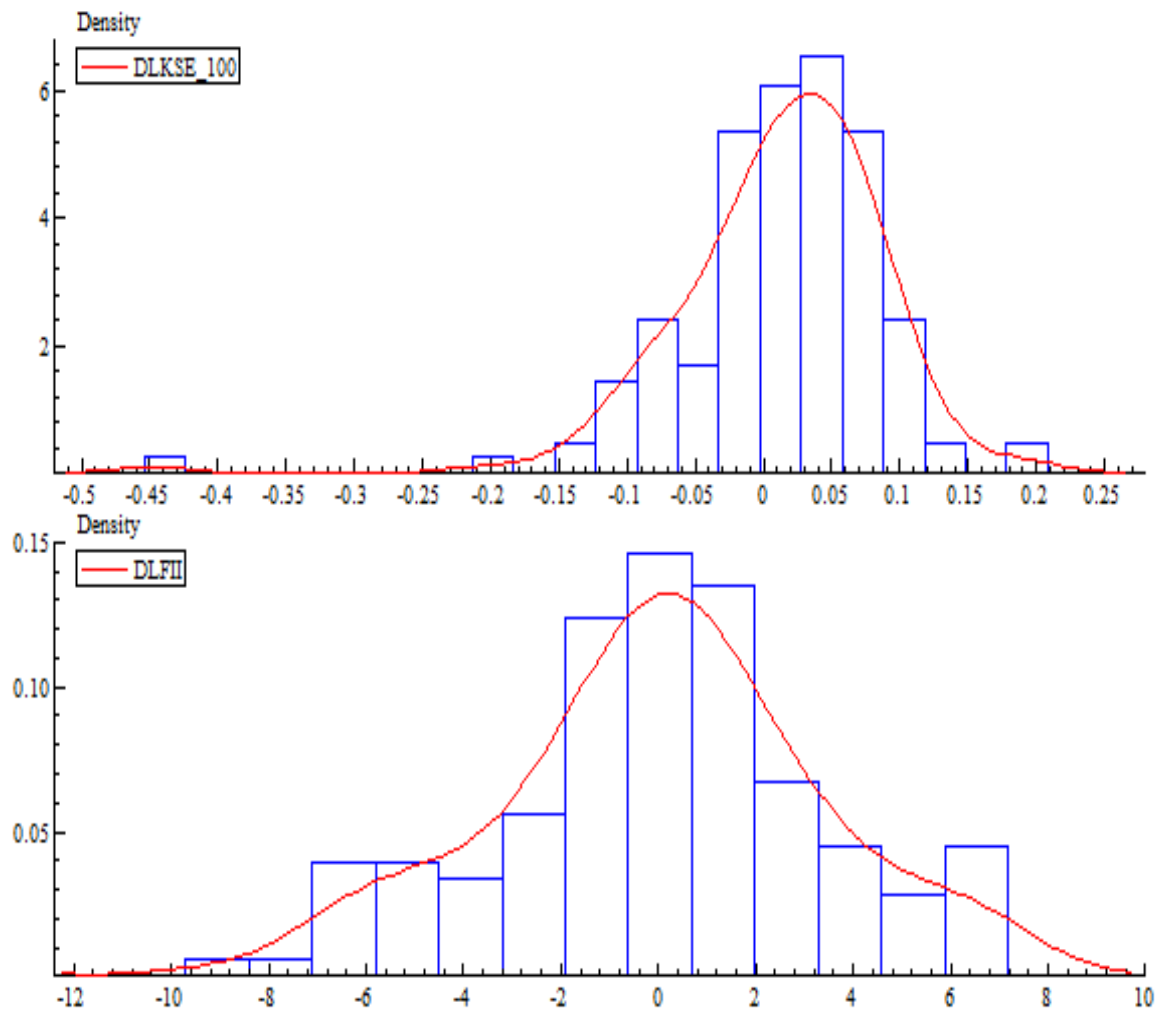
Result and Discussion

4.1 Visual Inspection of the Return series



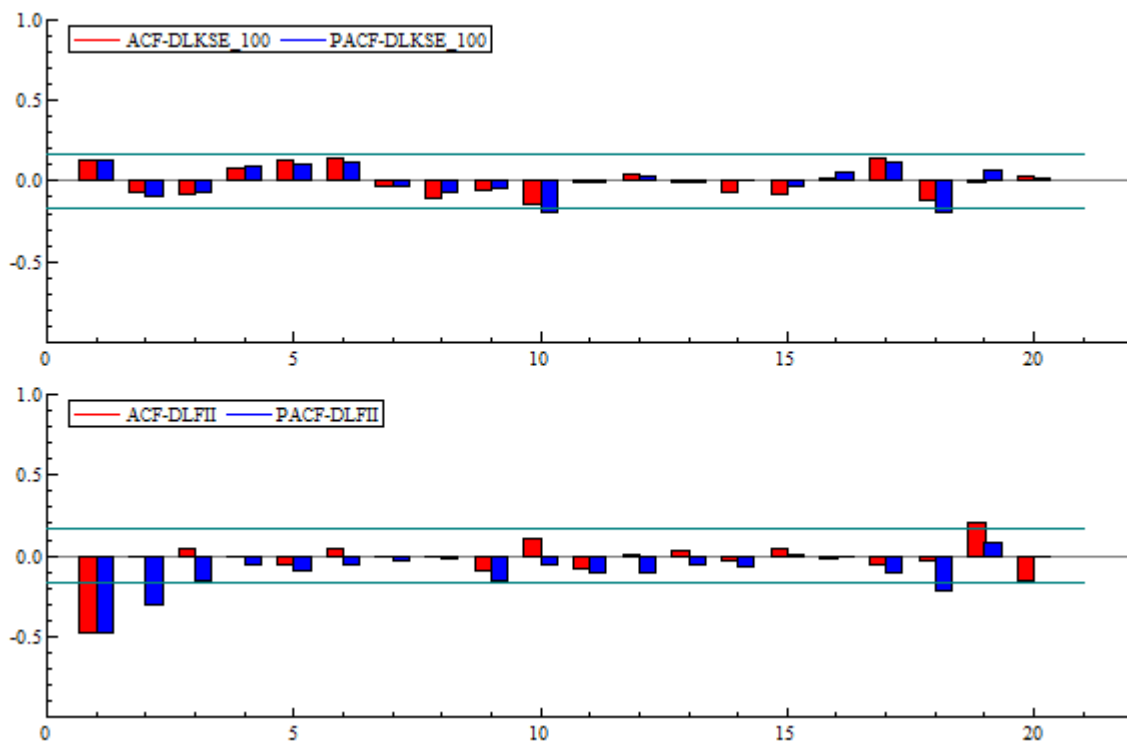
Above figure (4.1) shows the return series of the KSE-100 index of Pakistan and Foreign institutional investment in Pakistan. From the visual inspection we observe that both series have mean constant, variance of the series are in some way constant but due to clustering the variance become inconsistent. We also observe that there is volatility clustering in the series, mean low volatility follow low volatility while high volatility follows high volatility which show that there is autocorrelation problem in the series.

4.2 Density of the Return Market



The above graph shows the distribution of the return series of KSE100 index and foreign portfolio investment. From the visual inspection we observe that both series have some bumps and have peak point which describe the series is leptokurtic and multi models because both market have same information and different response to the market.

4.3 PACF and ACF Plot of the Return Series



The PACF and ACF plot give idea about the ARMA process of the series, which follow by the series. Also give the idea about the autocorrelation of the series. from the above two PACF and ACF plot we observe that KSE100 index series all the ACF and PACF values is under band line of which shows that series have no auto correlation and having not long memory. We observe that Series follow ARMA (10, 0) process.

In the case of foreign institutional investment ACF and PACF values is out at first lag from band line, which shows that the series have autocorrelation problem and have long memory. We observe that foreign institutional investment follow (1,1) ARMA process.

4.4 Descriptive statistic of the Return Series

Table 4.1

Variables	Skewness	Jarque Bera	Excess Kurtosis	Q-stat (5)	Q2-stat (10)	ARCH 1-5
DKSE100	-1.7910 (5.1160e-018)	517.41 (4.4170e-113)	8.8211 (4.4848e-102)	7.37153 (0.01944428)	2.45959 (0.0782568)	0.88875 (0.0069)
DFII	-0.12992 (0.00530)	0.38581 (0.00983)	0.0086 (0.00824)	32.9163 (0.0000)	10.2686 (0.067972)	
Null Hypothesis for the nth return series Skewness H0: The series is symmetric. Excess Kurtosis H0: Excess kurtosis is zero. Jarque Bera H0: The series is normal. Q-Statistics on raw data and Q-Statistics on squared raw data. H0 : No serial correlation ARCH LM-ARCH the H0: there is no ARCH effect. The rule of the rejection is that when the probability of the series is less than at 5% confidence interval we reject the null hypothesis. The (probability) p-values are in the parenthesis						

Table 4.1 is the summary of the descriptive statistic of the two return series; Stock market returns and foreign portfolio investment. From the result we observe that both series have excess kurtosis and leptokurtic because p-value is less than 5% level of significance so we reject the null hypothesis it means the series is leptokurtic. The null hypothesis of Skewness is rejected at 1 % level of significance so both the series are not symmetric. Jarque Bera test of normality is also rejected at 5 % level of significance mean that the series are not normal. The autocorrelation test indicate that there is autocorrelation of these series because the Q-Statics values are highly significance which rejecting the null of no autocorrelation. Q-statistics squared series confirm that there is auto correlation in series. ARCH test statistic reject null hypothesis at 5 % level of significance which propose that there is ARCH effect in the series.

4.5 Unit Root Test of the series

Table 4.2

ADF Test with 2 lags No intercept and no time trend
H0: DLKSE_100 is I(1)
ADF Statistics: -6.78077
H0: DLFII is I(1)
ADF Statistics: -10.1148
Asymptotic critical values, Davidson, R. and MacKinnon, J. (1993)
1% 5% 10%
-2.56572 -1.94093 -1.61663

Table 4.2 shows ADF test statistic of two series; Stock market return and foreign portfolio investment along with critical values at 1 %, 5 %, and 10 %. The null hypothesis of the ADF test is that the series is unit root. If the calculated statistic of ADF is greater the critical values then we reject null hypothesis and suggest that there is no unit root in the series mean the series is stationary. in the Table 4.2 ADF calculated statistic is **-6.78077**, **-10.1148** of both series which are less than tabulated value **-1.94093** at 5 % level of significance so we reject null hypothesis and conclude that both series are stationary at level.

4.6 GRACH (1, 1) Model

From the result we observe that Pakistan stock market return (KSE100) depends on its previous return, which is shown in the mean equation where AR(3) coefficient is less than 10 % or significant at 10 % the probability value is 0.0805 which is less than 10 % level of significance.

In the variance equation ARCH term is significant at 1 %, such as probability of the ARCH coefficient is 0.0010 which less than 1 % level of significance. Result shows that today stock market return is affected by its own previous information

Table 4.3

Dependent Variable: RKSE100				
Method: ML - ARCH (Marquardt) - Normal distribution				
Date: 01/11/18 Time: 07:24				
Sample (adjusted): 2005M05 2016M06				
Included observations: 134 after adjustments				
Convergence achieved after 77 iterations				
Presample variance: backcast (parameter = 0.7)				
GARCH = C(3) + C(4)*RESID(-1)^2 + C(5)*GARCH(-1) + C(6)*RFII				
Mean Equation				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	0.020406	0.004767	4.280322	0.0000
AR(3)	-0.167748	0.095985	-1.747655	0.0805
Variance Equation				
C	0.000114	0.000128	0.890703	0.3731
RESID(-1)^2	0.168418	0.051169	3.291410	0.0010
GARCH(-1)	0.834567	0.046816	17.82648	0.0000
RFII	-0.000327	0.000138	-2.369401	0.0178
Model Diagnostic				
R-squared	-0.015165	Mean dependent var		0.012471
Adjusted R-squared	-0.022856	S.D. dependent var		0.074466
S.E. of regression	0.075313	Akaike info criterion		-2.435373
Sum squared resid	0.748704	Schwarz criterion		-2.305619
Log likelihood	169.1700	Hannan-Quinn criter.		-2.382645
Durbin-Watson stat	1.708792			

GARCH term is also significant at 1 %, mean that probability of the ARCH coefficient is 0.0000 which less than 1 % level of significance. We can say that today stock market return risk is affected by its own previous information about risk, or today stock market return volatility is affected by its own previous volatility. One exogenous variable; foreign portfolio investment is also include in the variance equation which also significant at 5 % level of significance mean that probability value of the return of foreign portfolio investment is 0.0178 which is less than 5 % which shows that Pakistan stock market return volatility is not only affected by its own pervious day return information and previous volatility but also affected by foreign portfolio investment.

Finally, we concluded that stock market return volatility depends on its own previous shock as well as depends on its own previous volatility, or we can say that today stock market

return is affected by its own previous information as well as affected by its own previous volatility. Result also shows that volatility of stock market return of Pakistan is also affected by the volatility of foreign portfolio investment.

Chapter 5

Conclusion and Recommendation

5.1 Conclusion

We perform GRACH (1, 1) model to examine the impact of FII on stock market volatility. For this purpose we collect monthly frequency data from Jan-2005 to June-2016 from stat Bank of Pakistan and stock market of Pakistan. We check the volatility of the series, auto correlation and distribution of the series through visual inspection. Than we perform pre-estimate test for both series. ARCH test suggest that there is ARCH effect in the return series of Stock Market and FII. Then we apply GARCH (1, 1) from the model result we concluded that stock market return volatility depends on its own previous shock as well as depends on its own previous volatility, or we can say that today stock market return is affected by its own previous information as well as affected by its own previous volatility. Result also shows that volatility of stock market return of Pakistan is also affected by the volatility of foreign portfolio investment.

5.2 Policy Recommendation

This study provide result which help economic policy makers for the purpose of financial constancy perspective and also help investors regarding choice making in currency risk and international portfolio strategies. Result shows that Pakistan Stock market is affect from foreign portfolio investment. There must be a proper analysis of markets behaviour before investor invest in financial market.

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Appendix

---- Database information ----

Sample: 2005(1) - 2016(6) (138 observations)

Frequency: 12

Variables: 4

Variable	#obs	#miss	type	min	mean	max	std.dev
DLKSE_100	137	1	double	-0.4488	0.01252	0.19786	0.075968
DLFII	137	1	double	-9.1771	0.036956	7.1718	3.2786
Constant	138	0	double	1	1	1	0
Trend	138	0	double	1	69.5	138	39.836

Series #1/2: DLKSE_100

Normality Test

	Statistic	t-Test	P-Value
Skewness	-1.7910	8.6508	5.1160e-018
Excess Kurtosis	8.8211	21.451	4.4848e-102
Jarque-Bera	517.41	.NaN	4.4170e-113

ARCH 1-2 test: F(2,132) = 0.88875 [0.00690]**

ARCH 1-5 test: F(5,126) = 0.45210 [0.00811]**

ARCH 1-10 test: F(10,116) = 0.73338 [0.00691]**

Q-Statistics on Raw data

Q(5) = 7.37153 [0.0194442]*

Q(10) = 15.2279 [0.0123969]*

Q(20) = 22.9449 [0.0291506]*

Q(50) = 51.7014 [0.0407186]*

H0 : No serial correlation ==> Accept H0 when prob. is High [Q < Chisq(lag)]

Q-Statistics on Squared data

Q(5) = 2.45959 [0.0782568]*

Q(10) = 7.22776 [0.0703782]*

Q(20) = 8.39714 [0.0988897]*

Q(50) = 15.8356 [0.0999999]*

H0 : No serial correlation ==> Accept H0 when prob. is High [Q < Chisq(lag)]

RUNS TEST =-0.292507 [0.7698994]

Series #2/2: DLFII

Normality Test

	Statistic	t-Test	P-Value
Skewness	-0.12992	0.62752	0.00530
Excess Kurtosis	0.0086457	0.021024	0.00983
Jarque-Bera	0.38581	.NaN	0.00824

ARCH 1-2 test: F(2,132) = 4.4023 [0.0141]*

ARCH 1-5 test: F(5,126) = 2.0334 [0.0783]*

ARCH 1-10 test: F(10,116) = 1.3515 [0.2118]*

Q-Statistics on Raw data

Q(5) = 32.9163 [0.0000039]**

Q(10) = 35.9940 [0.0000844]**

Q(20) = 49.3273 [0.0002763]**

Q(50) = 91.4010 [0.0003183]**

H0 : No serial correlation ==> Accept H0 when prob. is High [Q < Chisq(lag)]

Q-Statistics on Squared data

Q(5) = 10.2686 [0.0679720]*

Q(10) = 16.6776 [0.0818098]*

Q(20) = 20.9472 [0.4002435]*

Q(50) = 56.8499 [0.2351488]*

H0 : No serial correlation ==> Accept H0 when prob. is High [Q < Chisq(lag)]

RUNS TEST = 2.49662 [0.0125384]*

ADF Test with 2 lags

No intercept and no time trend

H0: DLKSE_100 is I(1)

ADF Statistics: -6.78077

Asymptotic critical values, Davidson, R. and MacKinnon, J. (1993)

	1%	5%	10%
	-2.56572	-1.94093	-1.61663

OLS Results

	Coefficient	t-value
y_1	-0.926942	-6.7808
dy_1	0.084685	0.75504
dy_2	0.046443	0.54889
RSS	0.736831	
OBS	134.000000	

Information Criteria (to be minimized)

Akaike	-2.320329	Shibata	-2.321302
Schwarz	-2.255452	Hannan-Quinn	-2.293965

H0: DLFII is I(1)

ADF Statistics: -10.1148

Asymptotic critical values, Davidson, R. and MacKinnon, J. (1993)

	1%	5%	10%
	-2.56572	-1.94093	-1.61663

OLS Results

	Coefficient	t-value
y_1	-2.199159	-10.115
dy_1	0.534297	3.3256
dy_2	0.145027	1.7072
RSS	954.102031	
OBS	134.000000	

Information Criteria (to be minimized)

Akaike	4.845838	Shibata	4.844865
Schwarz	4.910715	Hannan-Quinn	4.872202
