The Impact of Interest Rate and Exchange Rate Volatility on Banks' Stock Returns and Volatility: Evidence from Pakistan

Haider Ali, Muhammad Ahmad Shahid

1. Introduction

1.   Introduction

Nature of economy affects the performance of financial sector of an economy as it plays important role for innovations. Developed countries needs less innovations in the financial sector because they are already achieved the maximum growth in the innovation, whereas under- developed economies needs more versatility in innovative activities in services of financial sector.

The extent to which innovation take place in the developing countries in the mobile banking. They reached at the conclusion that 85 percent innovation take place in only the developing countries in the mobile banking. The main reason given by them is under developed countries needs much innovation in the field of banking services as compare to developed countries (Boor, Oliveira, & Veloso, 2014)

Economic stability also accounts for the performance of banking sector. Those countries where there are strict laws and orders outperform in banking services but where there is many economic evils like corruption, do not perform well: this was seen in the study of (Park, 2012). He is of the view in his conclusion that corruption affects significantly on the bank loan quality. Corruption index and non-performing loans are positively and significantly associated that destroys the performance of banking sector and economic growth as well. In his study it was concluded that corruption disturb the allocation of bank funds from profitable operations to bad projects. So a sound economy needs a well implementation of law and order in the country so that service sectors specially banking sector can perform better.

To study the impact of exchange and interest rate on the stock prices of banks is also important for future prediction of economic growth. Economic growth can be measured with many variables like industrial production, gross domestic product and agriculture products etc. One of the important variables of measuring the future economic perspective is banking stock prices volatility studied by Arnold, Borio, Ellis, & Moshirian (2012) who concluded in the study banking industry volatility is a strong indicator of future economic growth. They are of the view that there is strong and significant negative relationship between bank tock returns volatility and future economic growth. So stability in stock prices is more important for economic growth. When there is stability in stock prices then it is associated with high economic growth in future, whereas instability causes future decreased growth (Monnin and Jokipii 2010).

It is accepted globally that a sound developed and well organized financial system is worthwhile for the circulation of economy of every country, especially for a developing economy. Financial sector takes a special place in the performance of activities of development of sound economy. Levine (1997) says that those economies which have a sound and developed financial system prosper rapidly with regard to the stock market activities as compare to those which have weak and unstructured financial system.

Different economists have different views for the importance of financial system for the economic development. According to Hicks (1969) and Bagehot (1873) the financial sector play very important role in boosting up the industrialization in England due to the facilitation of employment of capital for "immense work". (Ehnts, 1912) concludes that well performing banks outgrowth innovations in technologies by exploring the opportunities and providing investments to those entrepreneurs with the best opportunities of employing the products and procedures. But some says financial system and economic growth have no strong relationship (Levine 1997).

Vibrant financial system is back bone to fill the gap of linking of weak and strong economic units. They are of the views that due to weaker financial system developing countries face low economic growth. Moreover they also concluded that one of the reasons of low economic growth may be due to low level of investment in productive opportunities (Roy, 2014).

The significance of stock market cannot be forgotten while discussing the importance of financial sector for an economy. Stock market's performance is connected with banking sector so it contributes in the economic growth of a country. (CHO & EUN, 1986) emphasized the importance of stock market for the economic growth. He believed that due to non-availability of stock market information, banking sector cannot work efficiently. Although interest rate ceiling and financial liberalization make banking sector efficient but it cannot outperform due to lack of stock market participation. Recently, the role of stock market is assessed on the economic growth in many studies. Almost in every study there was founded a positive and significant relationship between economic growth and stock market performance.

Technical efficiency level have increased in banking sector of Pakistan and India over time, even Pakistani banking sector was experiencing slowdown in mids of 1990s but it is believed that changes in the efficiency level will lead to significant regulatory reforms in India, Pakistan and Bangladesh introduced in 1990s (Jaffry et al.2007)

They are of the opinion that total factor productivity in Pakistani banking sector increase over the period of time in the sample period. So it is concluded in this study that significant reforms can enhance technical efficiency in the banking industry. It is agreed that sound and viable functioning of financial system can bring positive changes in economic development (Andersen & Tarp, 2003) because increase in per capita income allow persons to increase their deposits and savings.

State bank of Pakistan is mainly playing very important role for the development of financial sector. It serves for the development of country and all its listed banks also. The major source of funding for development projects comes from the commercial, saving and Islamic banks (Oguntuase & Omolade, 2013). So investors in banking sector needs to know the stock return and their volatility.

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1.1 Stationery of Foreign exchange rate at level

Null Hypothesis: FX has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=22)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			1.280805	0.9986
Test critical values:	1% level		-3.43569	
	5% level		-2.86378	
	10% level		-2.56802	

Our null hypothesis in the unit root test is that foreign exchange has a unit root but according to the figures the value of probability is 0.9986 that indicates that data has a problem of unit root, which should be cleared first by using first level difference. If the problem of unit root test still persists then second difference will be taken and so on.

1.2 Foreign exchange rate stationary at first difference

Null Hypothesis: D(FX) has a unit root				
Exogenous: Constant				
Lag Length: 4 (Automatic based on SIC, MAXLAG=22)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-13.0624	0.0000
Test critical values:	1% level		-3.43571	
	5% level		-2.8638	

	10% level		-2.56802	

After clearing the problem of unit root from the variable foreign exchange, now the data is clear to infer some statistical technique. As it is shown in above table that value of probability is 0.0000 which means that now data do not have unit root and stationery problem.

1.3   Interest Rate Stationary at Level

Null Hypothesis: INT has a unit root				
Exogenous: Constant				
Lag Length: 5 (Automatic based on SIC, MAXLAG=22)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-2.37838	0.1481
Test critical values:	1% level		-3.43571	
	5% level		-2.8638	
	10% level		-2.56802	

According to null hypothesis interest rate has unit root. But after checking the variable interest rate the value of probability is greater than zero which means this variable has problem of stationery which will cause the problem in testing or in the inference of the data in a model.so this problem of unit root test must be cleared first.

1.4   Interest rate stationery at first difference

Null Hypothesis: D(INT) has a unit root				
Exogenous: Constant				
Lag Length: 4 (Automatic based on SIC, MAXLAG=22)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-22.6143	0.0000
Test critical values:	1% level		-3.43571	
	5% level		-2.8638	

As discussed above that issue of unit root should be solved first. At first level of unit root test this problem has been resolved now the data is available to infer some statistical tool.the value of probability in the first level is 0.0000 it means the data is free from unit root problem.

1.5   Stock return stationary at level

Null Hypothesis: ST has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=22)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-36.772	0.0000
Test critical values:	1% level		-3.43569	
	5% level		-2.86378	
	10% level		-2.56802	

Same is the case with variable named as stock return. The unit root test has been applied at level. The value of probability is zero, which means that data do not have stationery problem.

1.6   Stock Return stationery at first difference

Null Hypothesis: ST has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic based on SIC, MAXLAG=22)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-36.772	0.0000
Test critical values:	1% level		-3.43569	
	5% level		-2.86378	
	10% level		-2.56802	

Just to equate the variable stock return index with interest rate and foreign exchange rate for resolving the problem of stationerity the unit root test is applied at first difference. Although the unit root test was clear at level. But just for equality purpose it was applied at first difference.

1.7 ARCH test of Foreign exchange rate

Null hypothesis FX has no ARCH effect

ARCH Test:			
F-statistic	602906.2	Probability	0
Obs*R-squared	1175.707	Probability	0

As null hypothesis is that foreign exchange rate has no arch effect which means that there is no hetroskidestisity. But the value of f-statistics is 0.0000 which rejects null hypothesis and accepts alternate hypothesis when there is arch effect in the data then the best suited model for statistics is GARCH-M.
ARCH test of INT

ARCH Test:			
F-statistic	2719.472	Probability	0
Obs*R-squared	822.3748	Probability	0

As null hypothesis is that interest rate has no ARCH effect which means that there is no hetroskidestisity. But the value of f-statistics is 0.0000 which rejects null hypothesis and accepts alternate hypothesis when there is arch effect in the data then the best suited model for statistics is -M.GARCH

1.8 ARCH test of ST

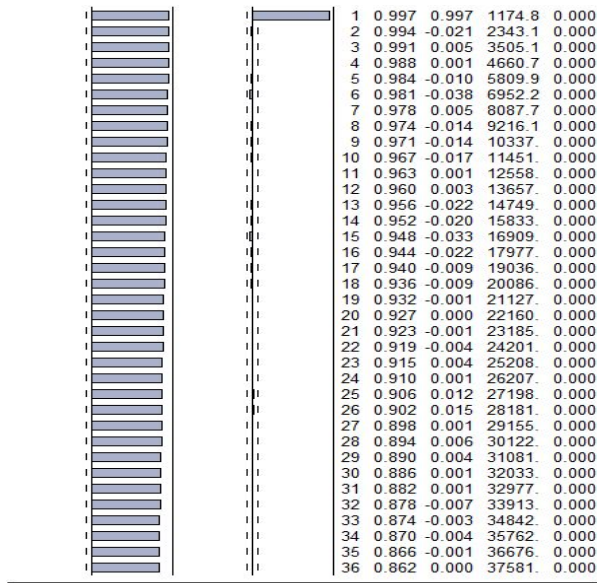| ARCH Test:			
F-statistic	193.8377	Probability	0
Obs*R-squared	166.6918	Probability	0

As null hypothesis is that banking sector stock return has no ARCH effect which means that there is no hetroskidestisity. But the value of f-statistics is 0.0000 which rejects null hypothesis and accepts alternate hypothesis when there is arch effect in the data then the best suited model for statistics is M. GARCH

1.9 Autocorrelation of ST

A test is applied to check the autocorrelation in the data. The values are clearly showing that there is autocorrelation in the variable stock return of banking sector of the model so in this situation a model named M GARCH is applied which covers problem of autocorrelation and hetroskidestisity.

1.10   Autocorrelation of FX


```
1  0.997  0.997  1174.8  0.000
2  0.994 -0.021  2343.1  0.000
3  0.991  0.005  3505.1  0.000
4  0.988  0.001  4660.7  0.000
5  0.984 -0.010  5809.9  0.000
6  0.981 -0.038  6952.2  0.000
7  0.978  0.005  8087.7  0.000
8  0.974 -0.014  9216.1  0.000
9  0.971 -0.014  10337.  0.000
10 0.967 -0.017  11451.  0.000
11 0.963  0.001  12558.  0.000
12 0.960  0.003  13657.  0.000
13 0.956 -0.022  14749.  0.000
14 0.952 -0.020  15833.  0.000
15 0.948 -0.033  16909.  0.000
16 0.944 -0.022  17977.  0.000
17 0.940 -0.009  19036.  0.000
18 0.936 -0.009  20086.  0.000
19 0.932 -0.001  21127.  0.000
20 0.927  0.000  22160.  0.000
21 0.923 -0.001  23185.  0.000
22 0.919 -0.004  24201.  0.000
23 0.915  0.004  25208.  0.000
24 0.910  0.001  26207.  0.000
25 0.906  0.012  27198.  0.000
26 0.902  0.015  28181.  0.000
27 0.898  0.001  29155.  0.000
28 0.894  0.006  30122.  0.000
29 0.890  0.004  31081.  0.000
30 0.886  0.001  32033.  0.000
31 0.882  0.001  32977.  0.000
32 0.878 -0.007  33913.  0.000
33 0.874 -0.003  34842.  0.000
34 0.870 -0.004  35762.  0.000
35 0.866 -0.001  36676.  0.000
36 0.862  0.000  37581.  0.000
```

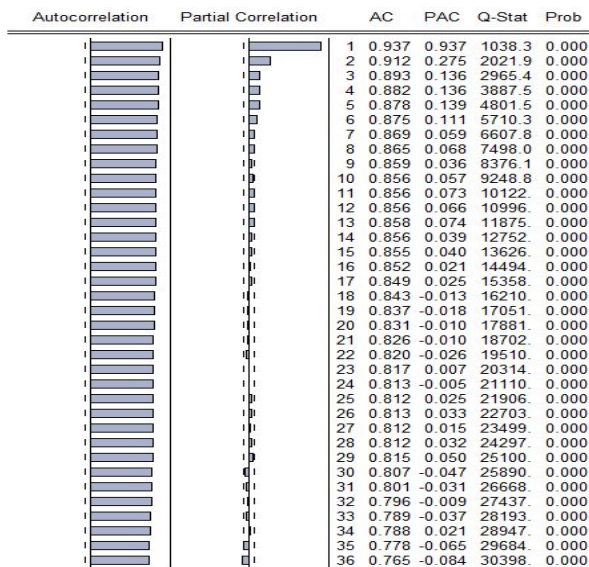A test is applied to check the autocorrelation in the data. The values are clearly showing that there is autocorrelation in the variable foreign exchange of the model so in this situation a model named M-GARCH is applied which covers problem of autocorrelation and hetroskidestisity.

1.11   Autocorrelation of INT


```
     Autocorrelation  Partial Correlation   AC    PAC   Q-Stat  Prob
 1   0.937  0.937  1038.3  0.000
 2   0.912  0.275  2021.9  0.000
 3   0.893  0.136  2965.4  0.000
 4   0.882  0.136  3887.5  0.000
 5   0.878  0.139  4801.5  0.000
 6   0.875  0.111  5710.3  0.000
 7   0.869  0.059  6607.8  0.000
 8   0.865  0.068  7498.0  0.000
 9   0.859  0.036  8376.1  0.000
10   0.856  0.057  9248.8  0.000
11   0.856  0.073  10122.  0.000
12   0.856  0.066  10996.  0.000
13   0.858  0.074  11875.  0.000
14   0.856  0.039  12752.  0.000
15   0.855  0.040  13626.  0.000
16   0.852  0.021  14494.  0.000
17   0.849  0.025  15358.  0.000
18   0.843 -0.013  16210.  0.000
19   0.837 -0.018  17051.  0.000
20   0.831 -0.010  17881.  0.000
21   0.826 -0.010  18702.  0.000
22   0.820 -0.026  19510.  0.000
23   0.817  0.007  20314.  0.000
24   0.813 -0.005  21110.  0.000
25   0.812  0.025  21906.  0.000
26   0.813  0.033  22703.  0.000
27   0.812  0.015  23499.  0.000
28   0.812  0.032  24297.  0.000
29   0.815  0.050  25100.  0.000
30   0.807 -0.047  25890.  0.000
31   0.801 -0.031  26668.  0.000
32   0.796 -0.009  27437.  0.000
33   0.789 -0.037  28193.  0.000
34   0.788  0.021  28947.  0.000
35   0.778 -0.065  29684.  0.000
36   0.765 -0.084  30398.  0.000
```

A test is applied to check the autocorrelation in the data. The values are clearly showing that there is autocorrelation in the variable interest rate of the model so in this situation a model named M-GARCH is applied

which covers problem of autocorrelation and hetroskidestisity.

1.12   Result of GARCH

	Variance Equation			
C	79.154	4.657402	16.99531	0
RESID (-1)^2	0.621215	0.041916	14.82061	0
GARCH(-1)	0.437628	0.021804	20.07142	0
D(INT)	36.96201	19.64147	1.881835	0.0399
D(FX)	-153.4114	33.20045	-4.620763	0

The above results indicate that volatility of bank stock returns are significantly affected by its own past volatility as the value of ARCH term is 0.6215(0.0000). GARCH term of the model is also significant which show that volatility if bank stock returns is persistence. Volatility of both interest rate and foreign exchange rate have significant effect on the volatility of bank stock returns.
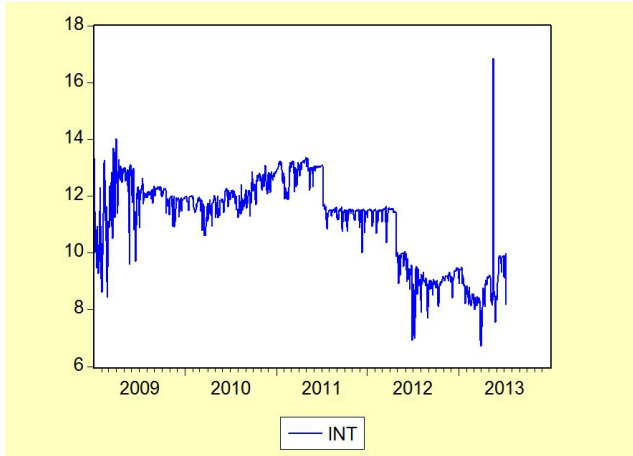
1.13   GRAPH of FX
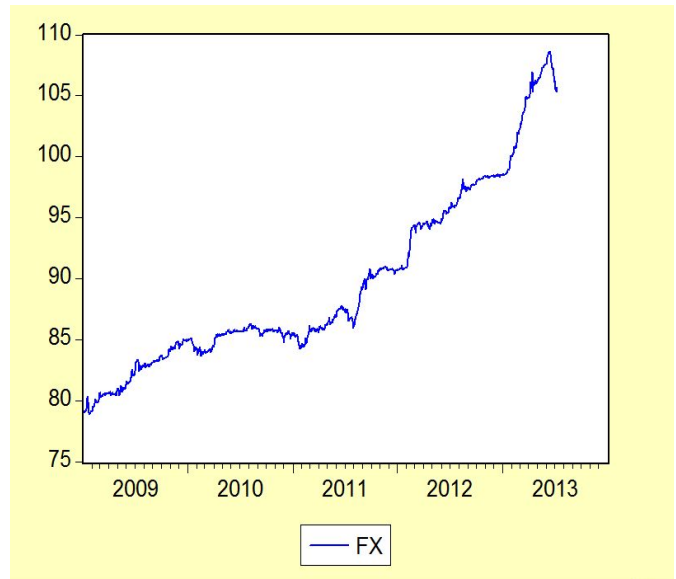
The graph showing the volatility of foreign exchange rate form the period 2009 to 2013.These rates of

foreign exchange rate is on daily basis. The picture is clear that foreign exchange rates has increasing trend. There are so many fluctuations but trend of increasing has been observed in the sample period.

1.14   GRAPH of INT

The volatility in the interest rate is high. As seen in the graph these fluctuations are high and this impact on the stock return of financial sector.

1.15   GRAPH of ST
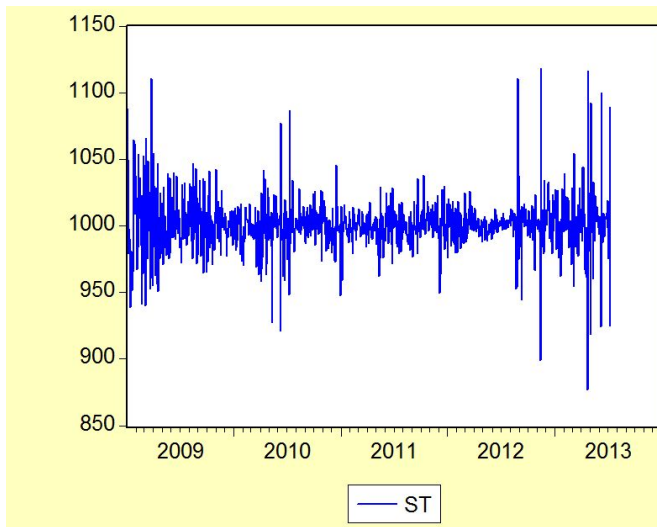
There is high volatility in the initial time of sample period and at the ending time of sample period. But fluctuations persisted in the whole sample period.

2.   Conclusions and Recommendations

The profitability of financial sector is of utmost important for policy makers and investors of home country as well as foreign country. The purpose of the study was to examine the impact of interest and exchange rate volatility of stock return of banking sector. For the purpose of accomplishment three variables were used. Interest rate, exchange rate is independent variables and third variable is the stock return of all listed banks of Karachi stock exchange. As the banking sector profitability is concerned with number of stakeholders mentioned in the introduction. The volatility of banking sector return affects the decisions of investors, hedgers, policy makers etc. So this study will help all those stakeholders who concerned with the fluctuations of profitability of financial sectors and volatility of exchange rates and interest rates. M-GARCH models was used to examine the impact of independent variables on stock returns of banks. The data analysis exposes that interest and foreign exchange rates are significantly affecting the stock returns of all the banks. So the concerned policy makers, hedgers, investors of home country and foreign investors should take into considerations the results of the study. Hedgers can consider this study while hedging their portfolio of investment with the exchange rate fluctuations which is found to be significantly affecting the stock returns of bank. The findings are supporting the portfolio theory as referred in the theoretical framework. The decision making authority of exchange rate and KIBOR can improve their decisions as both these variables are sensitive towards return of banking sector. one of the economic indicator which contributes to GDP is financial sector. So policy makers in monetary policy have to be conscious about the volatility of both the KIBOR and exchange rates.

The authorities of stock market should also be vigilant towards volatility of both the independent variables. As for as the limitations of the study is concerned, at individual level of each bank, the impact of both these variables could be observed. So that an individual bank can make better control within the organization. For better control feed forward control concept can help banking sector to upgrade their performances at individual level as well as at aggregate level.

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