The Impact of Interest Rate Volatility on Stock Returns Volatility

Qadir Bukhsh Baloch[a], Arif Hussain[a], Hamid Ullah[a], Abdel Mohsen Nassani[b], Jameel A Khader[c], Ala Abdel Hamid[c], Sadaf Shamsuddin[d]

[a]National University of Modern Languages, Islamabad, Pakistan.
[b]College of Business Administration, King Saud University, Riyadh Saudi Arabia.
[c]Arriyadh Community College, King Saud University, Riyadh Saudi Arabia.
[d]Department of Management Olaishah, King Saud University, Riyadh, Saudi Arabia
E-mail: qbuzdar@yahoo.com

ABSTRACT: The concept of volatility in the stock returns has been given considerable importance in different recent researches and it was worthwhile for some of the researchers to predict the volatility of the stock market. This study is focusing on the predication of the stock returns volatility based on the interest rate volatility while considering the data of well establish stock market of Pakistan, Karachi Stock Exchange 100 index, and monthly rates of six monthly T- bills for the period of 1994 to 2010. For the stock volatility we used different models in which the first one is the simple standard deviation which shows a significant variation in the stock returns due to variations in the interest rates so their exist a volatility due to the changes in the interest rates in Pakistani markets. ARCH model is one of the well known methods to forecast the error term in the data and which will certain our forecast regarding stock prices. In the Karachi Stock Exchange the ARCH (1, 1) has been statistically significantly proved. The GARCH (1, 1) model is also used to estimate the stock volatility. This model shows the short run volatility affect the lagged stock returns and is contributing to the overall volatility. The sum of α and β is less than 1 so the short run volatility is positively related to the overall stock volatility. The GARCH (1, 1) model has outperformed the other volatility models in the case of the Karachi Stock exchange, Pakistan.
[Qadir Bukhsh, Baloch, Arif Hussain, Hamid Ullah Abdel Mohsen Nassani, Jameel A Khader, Ala Abdel Hamid, Sadaf Shamsuddin. **The impact of Interest Rate Volatility on Stock Returns Volatility**. *Life Sci J* 2013;10(7s):901-904] (ISSN:1097-8135). http://www.lifesciencesite.com. 143

Key words: Interest rate volatility, Stock returns volatility, ARCH, GARCH

Introduction

The existence of a well regulated and well organized stock exchange is very much essential for the smooth functioning of the financial markets in any country. As the stock market provides a convenient platform for the trading of securities and also attract savings from the public. The expected and unexpected changes of the stock market activities stimulate the investors to redesign or take decisions regarding their investment portfolios in the short run and in the long run. The understanding of such a phenomenon is very much crucial for the emerging stock market like the Karachi Stock Exchange. The Karachi Stock Exchange has observed a considerable amount of changes in the last two decades since its incorporation in 1948. An important question is as to what moves the Karachi Stock Exchange and what are the stimulating factors for such visible changes. The answer is not much simple as the Karachi Stock Exchange show a very complex behaviour over the period of time. In the early nineties the liberalization and deregulation of the economy and institutions allowd the foreign investors and private sector in the country to direct their funds towards the stock markets in Pakistan. Such a participation ensured the higher trading volumes and also results in the increase of market capitalization to a greater extent. The period of mid nineties has proved a nightmare for the KSE because of the political unrest and detonating law and order situation in the country. The nuclear test has further aggravated the situation in the economic sanctions from the entire world. The period of 2000 to 2007 is considered to be the honey moon period for the Karachi Stock Exchange as the market has observed a considerable amount of growth in capitalizations and also in the volume turnover. Such a performance of KSE can be attributed to the positive growth favoring strategies, a highly stable and continuous macroeconomic policies, stability at the political fronts, the higher liquidity in the market, inflow of the foreign investments, a burgeoning amounts of corporate earnings and also the privatization of most of the public sector corporations has put the KSE towards prosperity. A common observation about KSE assumes that it is much driven by the speculative measures, insider trading and also the price manipulation by the major investors in the market rather than by the investment oriented fundamental factors in the market.

Various endeavors have been made to explore the dynamics and secrets of the stock market movements and variations. The financial market

integration, adjustment of stock market to the origination of new information, the market fundamentals and various macroeconomic policy changes are a few factors which directly or indirectly may affect the stock market activities and their trends. The question as to what moves the stock markets and what can be the underlying factors for the stock markets volatility and its movements are much important than how to quantify them. The present is regarding the impacts of interest rates on the stock prices and their volatilities in the Karachi Stock Exchange.

Literature Review

Zafar et al (2008) investigated the impacts of short term interest rates on the stock return volatility in the Karachi Stock Exchange during a period of 2002 to 2008. The GARCH models were applied to asses this relationship. The results revealed that the short term interest rates have aggregate predictive power to asses the stock returns as a strong negative relationship has been confirmed in the particular study. Likewise Poon and Tong ( ) has confirmed a weak predictive power of the movements in various variables like interest rate, growth output and the inflation rate with that of stock returns.

Mala and Reddy (2007) has studied the Fiji stock market and its movements because of changes in the interest rate. By using the ARCH and GARCH models the dynamics of such a relationship it was confirmed that interest rate changes have a significant effect on the stock returns and their volatilities in the small island economy of Fiji. Leon (2008) has explained the dynamics of interest rate, stock returns and the stock returns volatility. The Garch models were applied on the time series data of interest rate and stock returns. The results confirmed a strong positive relationship between the stock returns and interest rate. On the other hand, the interest rate has a weaker predictive ability to determine the volatility in the Korean stock market.

Joseph and Vezos (2006) has studied collectively the combined effects of interest rate and foreign exchange rates changes on the stock returns of banking firms in the United States. The EGARCH model and simple ordinary least square (OLS) regression models were applied in this context. It has been confirmed that the foreign exchange rate and interest rate sensitivity does not reflect the stock return sensitivity for the United States banking firms as is shown by the empirical results. While the stock market index returns to a grater extent lead to stock return sensitivity of banking firms in the United States markets.

Beirne et al (2009) studied the impacts of exchange rate interest rate on the stock returns of financial sector in sixteen countries of Europe, Japan and the United States. A strong negative effect of the said variables on the stock returns has been confirmed. Elyasiani (2004) in a study of Interest rate movements and the stock returns has asserted that interest rate do affect the banking firm's stock returns in the United States financial market. The sensitivity of insurance company's stock returns to that of interest rate variations in the United States markets has been studied by Brewer et al (2006). By using the GARCH-M model a strong form of sensitivity was determined between interest rate and insurance company's stock returns in the United States markets. According to Rizwan and Khan (2007) the short term interest rates confirms the stock returns movements in the Karachi Stock exchange.

Methodology:

This research is an empirical study on the relationship of interest rate with that of KSE100 index and predicting the stock index (KSE100 index) volatility based on Interest rates volatility. Data for this research will be collected from different sources. KSE 100index will be collected from the KSE website, while the monthly T-bills rate will be collected from IFS software and state Bank of Pakistan for the period of 1994 to 2010.

The main theme of this paper is to predict the implied stock volatility of Karachi Stock Exchange (KSE) while using different volatility models. So the universe of the study is the Karachi Stock Exchange. Sample of the study is KSE100 index which is the representative index of the Karachi Stock Exchange. Stock prices and 90 days' T-bills rate will be taken into consideration for the statistical computation and analysis. Stock index will be collected from KSE web site and IFS software while T-bills rate will be taken from the website of State Bank of Pakistan (SBP).

Empirical Analysis:

Autoregressive Conditional Heteroskedasticity (ARCH):

ARCH model is used for the time series data where we assume that variance of the current error term to be a function of the actual sizes of the previous time periods' error terms. It is one of the well known methods to forecast the error term in the data and which will certain our forecast.

Three stepwise models is estimated in order to find out the ARCH in the data each step of the model is given below.

- First simple OLS regression is run in which stock returns are consider as dependant variable while the interest rates is consider as an explanatory variable.
- Then residuals of the above equation is saved and then again regression is run while considering the difference stock returns as an dependent variable while the residual terms in

different lags form is check and select that lag at which the results of uhat is significant.

- Square of the Error term or square of the residual term is collected and then again regress that on its different lags and find out that that which lag is significant.

The entire above step is done and shown as below in stepwise regression.

ARCH (1)

Stockreturns = 69.2227 + 1.13651 T-bills rates.

t-Value	1.6382	20.8406
R-squared	0.984539	
F	1979.980	

d_Stock_returns = 45.4975 + uhat

t-value	5.7699	66.3800
R-squared	0.957621	
F	4406.304	

usq = 10049 + 0.174652 usq_1

t-value	3.2376	2.4705
R-squared	0.030502	
F	6.103600	

equation11, equation12, equation

Equation 11 shows a first step of the ARCH model having a simple regression in which stock returns are consider as dependent variable while the interest is an explanatory variable. And the coefficients are estimated and t-value of the t-bills is significant which shows that it has its relationship with the stock returns while the F- value shows that overall model is significant and R^2 shows that 98% variation in the stock returns is explained by the variation in the interest rates.

In the second steps the stock returns are regress against the error term or the residual terms of the above regression as shown by equation 12. All of the estimated values are significant due to the fact that t-value calculated is more than critical value of the t test.

In equation 13 square of the residual is regress on the different lags values and find out the lag which is significant so at first lag the square of the residual term is significant so in case of stock returns and the interest rate there is ARCH(1). The square of the residual term shows the stock returns volatility which depends on the lag value of square of error term.

Generalized autoregressive conditional Heteroskedasticity GA**RCH** (p,q)

GARCH (1, 1)

$$\sigma_n^2 = \gamma V_L + \alpha u_{n-1}^2 + \beta\sigma$$

0.07 % + 11.6% + 86.9%

…….equation14

The GARCH model is used to estimate the stock volatility. Variance equation for model 1 shows that past square residuals significantly and positively impact the stock returns volatility. In addition to this, past variances are also observed as significantly positively effecting stock return volatility. The above model shows that short run volatility is about 0.07% while the lag stock returns are affecting the overall volatility by 11.6% and the variance is by 86.9%. While the sum of α and β is 97.5% which is less than 1 so the short run volatility is positively related to the overall stock volatility.

σ = Squr root (∑ui ^{2}/ n-k)
σ = 0.0259

The standard deviation of the model shows the variation in the stock returns due to variation in the interest rates is about 2.5%. Which means that the stock varies as the interest rate varies by 2.5% and thus there is a chance of about 2.5% error in the predicting the stock prices on the basis of interest rate.

Conclusion:

The exposure of stock returns to that of interest rate volatility is an important factor in the overall risk assessment of a particular stock. Intensive research has been done on the stock return volatility to that of interest rate volatility. This relationship is also much important in the monetary policy implementation, risk management practices of the financial institution. Different theories established an inherent relationship exists between the interest rate and stock markets price. In theory the interest changes potentially alters all the stock returns but the degree of change is different for various stocks. This study focus on the predication of the stock returns volatility based on the interest rate volatility, taken the data of well establish stock market of Pakistan, Karachi Stock Exchange 100 index, and monthly

rates of six monthly T- bills for the period of 1994 to 2010. For stock volatility different models in which the first one is the simple standard deviation which shows a significant variation in the stock returns due to variations in the interest rates so their exist a volatility due to the changes in the interest rates in Pakistani markets. ARCH model is one of the well known methods to forecast the error term in the data and which will certain our forecast regarding stock prices. In the Karachi Stock Exchange the ARCH (1, 1) has been statistically significantly proved. The GARCH (1, 1) model is also used to estimate the stock volatility. The empirical result suggested that the short run volatility affect the lagged stock returns and is contributing to the overall volatility. The sum of α and β is less than 1 so the short run volatility is positively related to the overall stock volatility. The GARCH (1, 1) model has outperformed the other volatility models in the case of the Karachi Stock exchange, Pakistan.

Acknowledgement:

The authors are thankful to the Deanship of Scientific Research, King Saud University Riyadh for funding the work through the research Group project No RGP-VPP-076.

References:

1. Nousheen Zafar, Syeda Faiza Urooj and tahir Khan Durrani (2008). Interest arte volatility and stock return and volatility. European Journal of Economics, Finance and Administrative Sciences, Issue 14.
2. Rajni Mala and Mahendra Reddy (2007). Measuring stock market volatility in an emerging economy. International Research Journal of Finance and Economics, Issue 8.
3. Nathan Lael Joseph and Panayyiotis Vezos (2006). The sensitivity of US bank's stock returns to interest rate and exchange rate changes. Managerial Finance, Vol 32, No.2, pp 182-199.
4. John Beirne, Guglielmo Maria Caporale and Nicola Spagnolo (2009). Market, Interest rate and exchange rate risk effects on financial stock returns: A GARCH-M approach. Quantitative and Qualitative Analysis in Social Sciences, Vol 3, Issue 2, pp 44-68.
5. Elyas Elyasiani (2004). Bank stock returns sensitivities to the long-term and short-term interest rates: A multivariate GARCH approach. Managerial Finance, Vol. 30, No. 9.
6. Elijah Brewer III, james M. Carson, Elyas Elyasiani, Iqbal Mansur and William L.Scott (2006). Interest rate risk and equity values of life insurance companies: A GARCH-M model. Journal of Risk and Insurance.
7. Mohammad Faisal Rizwan and Safiullah Khan (2007). Stock return volatility in emerging equity market (KSE): The relative effects of country and global factors. International review of Business Research Papers, Vol.3, No.2, pp 362-375.

5/22/2013