IMPACT OF FINANCIAL AND REAL ASSETS ON VOLATILITY IN KSE100 INDEX

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ABSTRACT: *Volatility, a prominent issue, hinders investors for taking rational investment decisionsin any secondary market. The article used Arch-Garch (1, 1) model to measure volatility in KSE100 index on the daily data of variables from 2012-2013. Karachi Stock Exchange 100 returns and volatility primarily depend upon its own shocks, internal factors and policies. Stock market volatility occurs because of KSE 30 index and gold returns while foreign currencies returns do not contribute in volatility of KSE100 Index. Volatility brings substitute investment flow from secondary market to real assets and investors rush towards real assets during higher volatility in KSE100. Analysis provides solid foundation to claim that companies of KSE30shape decision of investors KSE100 Index. KSE faced moderate level of variation owing to better economic, social and political environment in 2013. It gives us sound clue that these social phenomena also contribute in volatility of stock markets.*

Keywords: KSE100, KSE 30, Volatility, Garch Arch, investment flow

1. INTRODUCTION

Stock market of a country plays vital role in managing and directing the investments to different sectors of the economy as changes in these markets reflect the economic conditions of a country [1] Volatility of stock markets has been excessively increased and become a source of turmoil for the investors from last few decades. Abnormal changes in stock market volatility create mementoes risk for the investors because they are deprived to enjoy the true benefits of diversification [2, 3]. This situation has given rise to the need of investment in alternative financial assets and in real assets as fortification against stock market volatility [4].

To hedge against risk faced by investor in secondary stock markets, they have great concern about the factors which significantly affect the stock market index. These factors are broadly classified into social, economic, international and political which are primary agents of volatility and return trade-off. Motive of this paper is to find the nexus of alternative investments, including investment in financial and real assets, on stock market volatility. The paper also analyzes the impact of foreign currencies returns which is taken as financial asset proxy and gold returns as real assets on stock market volatility. In previous literature, Comparison of advanced stock markets with less developed stock markets gives us some sort of opinion that developing stock markets are needed to explore more for more improved investment decision as developed stock markets. Developed stock markets are already more robust as compared to developing markets in context of infrastructure, policies , governing mechanism and broader outreach [5] In developing counties like Pakistan, stock exchange volatility and return is major concern for research. That is why the focus of this paper is particularly upon the markets of Pakistan for which Karachi Stock Exchange 100 index (KSE 100)has been chosen as benchmark.

Karachi Stock Exchange (KSE) is the largest stock exchange of Pakistan, which has been gone through many changes in its functioning during the decade of 1990s[1]. In early 1990s, KSE opened for international trade and Pakistani investors were permitted to open foreign currencies accounts. For atomization of stock markets functioning, computerized system named KATS[2] (Karachi Automated Trading System) had been introduced. The purpose of this atomization was the provision of fair and efficient market place for the investors.

KSE has three types of indexes including KSE-100 index, KSE-30 index and KMI-30 index. KSE-100 index is the largest index of the country and represents all prominent sectors of businesses. KSE-100 index is further divided or split into 323 sectors and it includes the major companies from each sector based upon their capitalization [6]. KSE-30 index was introduced in 2006 and included only top 30 companies listed on KSE. This index has been formulated by using free floating methodology. KMI-30 index constitutes the top 30 sharia compliance companies listed on KSE and this index was introduced in September 2008.

In Pakistan, State Bank of Pakistan (SBP) supervises the foreign exchange markets and is responsible for the formulation of exchange rate policies under Foreign Exchange Regulation Act of 1947. Moreover, all commercial banks are considered as authorized dealer of foreign market.

Exchange rate is expressed as the rate of a country's currency against another country's currency means it is the rate at which one currency can be exchanged with the other one. Foreign exchange system in Pakistan has gone through many reforms during last few decades [7]. Pakistan's

[1] After 1990 KSE 100 index had been introduced which is major achievement for public as well as government

[2] KATS concept introduce harmony, trust and efficiency in secondary market which also boosted index level shortly

[3] KSE 100 index capture all major sector of Pakistani economy www.kse.com

currency was linked with British Pound but later on in 1971, it had been made attached with US$ at the rate of Rs. 4.76 / US$. In 1981, the market was shifted to float system from fixed exchange rate system while the multiple exchange rate system was launched in year of 1998. This system includes government exchange rate linked to US$, Floating Inter Bank Rate and the rate that combines both the government and interbank rates. Multiple exchange rate system was changed to uniform system in 1999 by relinking Pak Rupee with US$ in which local currency was permitted to fluctuate within a specified range. Later on, the concept of such ranges was also changed and local currency had been made free to float means market forces determine the exchange rate.

Abnormal changes or sever volatility in stock markets shifts the investors inclination to make their investments in real assets among which gold has been the most demanding hedging [8]. For this particular reason, this study has also been extended by analyzing the effect of investments in gold with volatility in returns of KSE-100 index. For this purpose, daily prices of real asset i.e. gold have been used for measuring their effect on volatilities in KSE-100 index.

Study Objectives

To ascertain relationship between stock market and currencies

To determine magnitude of relationship

2. LITERATURE BACKGROUND

Stock market is affected by the changes in reserve ratio of commercial banks imposed by central bank [8]. This impact is negative on equity indexes but magnitude varies from economy to economy and entity to entity [1]. Ehrmann, and Fratzscher [14] concluded in his research that low equity-based companies, having weak liquidity and profitability potential were likely to be more affected by the change in monetary policy as compare to established companies. Bomfim [8] inspected pre-announcement and news impacts of monitory policy on the secondary market especially on stock markets in perspective of disclosure of monetary policy decisions in USA. FED reserve was the major variable in the study. Bomfim [8] showed that volatility of equity markets tend to be relatively lower on days before and higher on days after monetary policy decisions. Thorbecke [1] employed this methodology from 1953-90 and found out the response of US stock returns to monetary policy shocks based on federal fund rates. Rigobon and Sack [7] explored that movements in the stock market could have a significant impact on the macro economy and are, therefore, likely to be an important factor in the determination of monetary policy. However, little is known about the magnitude of the Federal Reserve's reaction to the stock markets.

Perez-Quiros and Timmermann [15] used changes in market interest rates or official rates as their measures of monetary policy. Agha et al. [3] observed the monetary transmission mechanism in Pakistan with the help of vector autoregressive technique. The researchers concluded that contraction policy decreased the demand, which automatically decreased the price in economy. Interest rate was a major channel whereas exchange rate was a minor one and statistically insignificant in the study. Bekaert, Cho and Moreno [16] studied the impact of monetary policy on bond prices in USA. They found that prices of stock and commodities were affected by nature of monetary policy especially with interest rate mechanism. These findings supported the results inferred by Chen [9].

Gertler and Gilchrist [10] documented the quantum of stock return with monetary policy and found that portfolios were affected by monetary policy responses. Cochrane and Piazzesi [17] used Eurodollar rates to check the impact of monetary policy whereas Rigobon and Sack [7] utilized the Eurodollar Futures rate to explore the impact of monetary policy on stock markets.

Interest rate and banking reserve ratio are primary tools of monetary policy around the globe to control the monetary base in economies. Circulation of money creates many problems despite of certain advantages, which may be high inflation, currency depreciation, unemployment, and disturbance of balance of payment. Contractionary monetary policy shrinks economic activities and controls the inflation rate by increasing interest rate by central bank whereas expansionary monetary policy enhances the money supply and increases the employment activities.

Stock market is affected by volatility in monetary policy. It is empirically proven that there exists a significant policy response in context of stock market; with a 5 percent rise in S&P 500 may boost a 25 basis point tightening policy and vice versa [7].

Bernanke and Kuttner [21] empirically tested the notion that monetary policy had an impact on the stock market returns. They concluded that expansionary monetary policy boosted the stock market index and return. 25 points reduction in federal fund might increase 1.25 % return. They also determined that the impact of fund rate variation was based upon the nature of industry. Every type of industry was not equally affected by the 25 points reduction in reserves. They used three type of equity excess return proxies i.e. cash flows, discount rate in real interest rate to nullify or accept the hypothesis. The researchers have found that there exists a relationship in portfolio return (stock return) and magnitude of monetary policy. They further dig deep the topic by preference in tools of monetary policy.

Bernanke and Gertler [2] claimed that an inflation-targeting monetary policy or contractionary monetary policy automatically stabilizes the stock market or stock market returns. Main reason behind it is the adjustment of interest rate; in booms, inflation rises that automatically raises interest rate in economy which moderate or equilibrate the price increase of equity. Expansionary monetary policy provides a signal for economy and participants take it positive, which increases future production causing higher economic growth.

Barro [18] asserted that simple monetary policy affected the employment with wage function and created vulnerability in market. Gertler & Gilchrist [10] criticized this particular model. Christiano et al.[19] advocated full monetary model and gave suggestions to incorporate proper banking sector assisted by financial institutions thoroughly. Bernancke and Gertler [20] gave suggestion that appropriate monetary

policy was compulsory for economy otherwise a burst in economic bubble would create financial instability and further decline in assets' values.

Stock market investors can use available resources and organize them in a best way to get handsome return on their investment but the availability of financial resources somewhat depends upon the monetary policy of specific economy (Risqué et al., 2011). Expansionary monetary policy equips the secondary market investors and enlarges the financial resources by reducing interest rates. The instability in stock price or in the stock market is considered as a threat and may be controlled by MP. Many researchers Chen *et al.,* [9] ,Bekaert *et el*., Gertler, & Gilchrist, [10] have conducted research on the relationship of interest rates and stock prices. The variation in firm's value and in its stock is influenced by the interest rate. The fluctuation in interest rate depends on the economic conditions and it is controlled by monetary policy.

3. THEORETICAL FRAMEWORK

Model of the study

Arch, Garch (1-1) research technique[4] serves as primary tool in the study which is a well-known measure of volatility and future forecasting. The model accumulated on two equations i.e. main equation[5] and variance equation.

In this paper, KSE-100 index has been used as dependent variable while KSE-30 index has been chosen as one of the explanatory variables in order to analyze its impact on volatility of KSE-100 index. Among other explanatory variables, foreign exchange market has been chosen for the analysis. Exchange rate of Pak Rupee against US$ and Euro has been selected to gauge the role of foreign exchange market in stock market volatility.

Main model

$KSE100R = \beta0 + \beta1 KSE30 + \mu$

Variance equation

$Ht = \beta3 + \beta4 * h\ t\text{-}1 + \beta5 * e2\ t\text{-}1 + C6*GR + C7*DR + C8*ER$

GR = Gold Return, DR = Dollar Return ,ER= Euro Return

Ht is current day volatility of KSE100 Return and it is combination Arch and Garch terms

β4 *h t-1 is Garch term and may be used synonymously as previous day residuals volatility or KSE100 return volatility

β5* e2 t-1 is Arch term and based upon square error it may be uses synonymously as previous day residuals volatility or KSE100 return volatility

Real assets also contribute in volatility in KSE returns owing to substitute investment and investor trend in Pakistan so GR, DR and ER are exogenous variables and included of the study

These terms also considered as first order terms along with no unit root in data and Residual from main model are used to calculate variance equation

Study hypotheses

KSE30 index returns does not contribute in volatility of KSE100 index return

Gold return has no relationship with KSE100 index

Dollar return has no relationship with KSE100 index

Euro return has no relationship with KSE100 index.

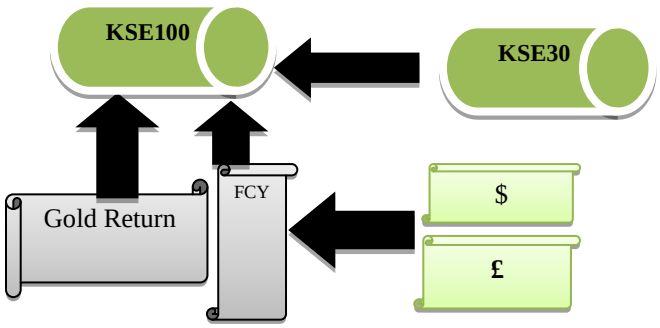

Figure: 1 Theoretical framework of the study

4. METHODOLOGY AND ANALYSIS

To conduct this empirical study, we have collected data on daily bases from 2012 to 2013of KSE 100 index and KSE 30 index. Other variables i.e. gold prices, dollar and euro foreign exchange rates in variance equation also have similar frequency and time period. Return on daily basis is calculated of all variables and used in the study. The data is collected from official website of the KSE and other reliable sources. Sample consists of 496 observations which are enough to present valuable findings with solid justification.

Table 1: Descriptive analysis

	KSE	GOLD	DOLL	EURO
Mean	0.13	-0.014	0.04	0.05
Maximum	3.62	5.11	2.18	2.83
Minimum	-3.32	-8.73	-1.88	-1.87
Std. Dev.	0.89	1.21	0.60	0.647
Skewness[6]	-0.21	-0.70	-0.21	0.01
Kurtosis[7]	5.00	10.41	3.35	3.51
Observations	496	496	496	496

Highest level of variation has been found in gold during the analysis period whereas lowest has been found in dollar prices. Currency data reveals normal distribution whereas data of KSE 100 index and real asset (gold) is not normally distributed. The return fluctuation in currency has been found more than real assets. This descriptive analysis provide clue that people preferred in real assets in comparison of currency in spite of high level of volatility because of more capital gain.Amount of gold investment increased with the passage of time irrespective to its higher variation in prices. This finding tells us that investor in Pakistan are risk lover in contrast to risk averse. This claim may also be well satisfied by the fact that irrespective to bad social and political condition KSE 100 index moves on.

[4] This technique is considered most efficient technique to capture volatility and forecasting time series data

[6]Skweness results shows that gold return are not normally distributed while other variable are limited skewed

[7]Kutosis results also tells that gold return data is not normally distributed other variables are approximately have normal distribution

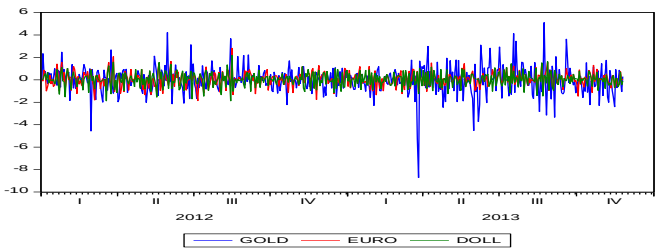

Figure 2: Graphical presentation of currencies' return

The above graph shows that higher level of variation in currency was in 2013 in comparison of 2012. This severe fluctuation is mirror reflection of government policies and political change in the economy.

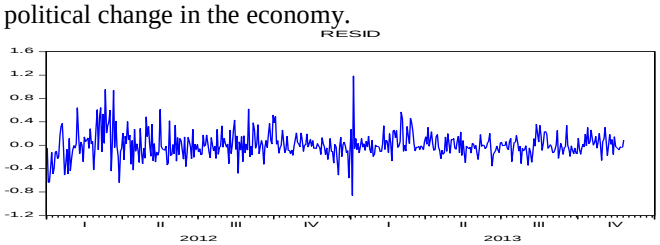

Figure 3: graphical presentation of KSE 100 residuals

Residual graph shows that the data has conditional heteroskadasticity, higher fluctuation followed by higher fluctuation while lower fluctuation followed by lower fluctuation. Highest level of fluctuation has been witnessed in the mid of 2013 while higher fluctuation has been found in 2012 in contrast to 2013. So, above graph give us impulse to run Arach Garch (1,1) model.

Table 2 :Results of Ardch-Garch (1,1) Model

	GED[8]		Stu t		ND	
Variable	Coefficient	Prob.	Coefficient	Prob.	Coefficient	Prob.
KSE30	0.89	0.00**[9]	0.89	0.00**	0.88	0.00**
C	0.02	0.00**	0.01	0.00**	0.01	0.00**
RESID(-1)^2	0.13	0.00**	0.18	0.00**	0.19	0.00**
GARCH(-1)	0.42	0.00**	0.61	0.00**	0.47	0.00**
GOLD	0.01	0.00**	0.001	0.00**	0.01	0.00**
DOLL	-0.01	0.25	-0.01	0.07	-0.01	0.03
EURO	-0.01	0.47	-0.01	0.36	0.00	0.97
R-SQUARED	91.69		0.93		0.93	
DURBIN-WATSON STAT	1.8470		1.85		1.85	

ARCH GARCH (1,1) model has been applied on the data. To get in-depth and enriched results, different methods of this technique have been applied like GED method, Student t method and normally distribution method. Arch term is significant in the model which means previous day information affects current volatility in KSE 100 index. Significance of Garch term means previous day's volatility affects the currency volatility in KSE100.In other words, KSE100 primarily is influence by its own shock and by external factor (gold returns). KSE 30 volatility is reason of volatility of KSE 100 index. We may infer another interesting fact that the top 30 companies in KSE100 impact volatility of KSE100 substantially .In plain words volatility in top companies affects the volatility in other smaller companies that are out of this top bracket. P Values of these variables point out that stock market volatility is also due to volatility of gold returns while euro returns do not contribute in volatility of KSE100 Index. Correlation analysis shows gold returns and KSE100 returns have inhernt negative relatinship that is varified by other reserchers' work [8,10] but gold returns contributes positivly in KSE100 volatility.Results give a picture that shows selected foreign currencies provides mixed results Dollar returns negatively impact to KSE 100 whereas Euro has no relationship [7].

In nutshell, KSE30, Gold returns positively impact volatility of KSE while dollar and Euro do not statistically impact KSE100. Shock in gold (returns fluctuation) affects investment decision in capital markets and their return transmit in volatility of KSE100.

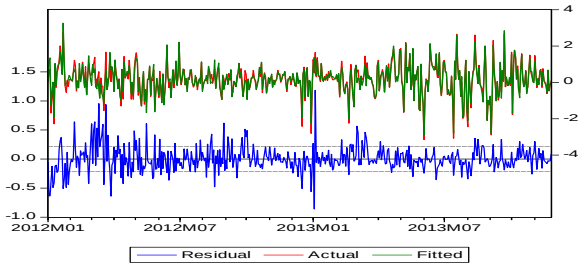

Figure 4: Graphical presentation of actual and fitted residuals of the model

Graphical representation of residuals elaborates that first four months of 2012 KSE100 witnessed higher level of volatility while rest of the months of 2012 faced lower level of volatility. In January 2013, KSE100 index faced highest level of volatility in few days but remaining months of 2013 witnessed moderate level of variation even lower than 2012. In 2012, Pakistani new political party has gained the crown and unstable political condition and terrorism were major reason of higher level volatility in KSE100 index. KSE faced moderate level of variation due to better economic, social and political environment in 2013. It gives sound clue these social phenomena also contributes in volatility of stock markets.

Assumption testing

No model can be efficient or consistent without incorporating the assumption of statistical techniques. To test the assumption of GARCH ARCH (1,1) model Arch test, Auto correlation test, Heteroskadasticity test, Unit Root test and Normality test have been performed. P value of Arch test provides solid proves that there is no Arch effect or hetro chance in the model. So Value of Durban Watson (DW) provides the justification that no serial correlation exist in the data and to get better understanding square Corrlogram test has been conducted for better understand of

[8] Three method of estimation has been applied to get better picture of estimation , GEG, ND and Student t methods all reveals approximately same results

[9]** Variable is highly significant @ less than 1 %.

autocorrelation. So we can say hetro and auto correlation problem do not exist in data. However, normality in data is not exist and some prominent researchers (Baltagi, 2006, Green, 2oo1) give opinion that without normality in residuals result will be consist and normality may be compromised. Detail of these tests has been provided in appendix.

5. CONCLUSION

Volatility, a prominent issue, hinders investors for taking rational investment decisions in any secondary market. Arch-Garch (1-1)has been applied onthe model to forecast volatility in KSE100 index on daily data of variables from 2012 -2013. KSE 100 Index returns and its volatility primarily depend upon its own shock or from its internal factors, policies and initiatives. Volatility in KSE100 stems from its own shocks and KSE30 while dollar returns and euro returns do not contribute in the volatility.Another interesting fact depicts thatKSE30 shape the decision of investors in KSE100. Owing to unstable socio-economic position in Pakistan, investors also prefer other highly liquid substitutes like gold for investment. This finding also gives some clue that our investors give importance to real assets (gold) in comparison to foreign currencies (Dollar, Pound). Investors' behavior in big companies impact other investor, socio-economic position and fluctuation of currencies has opposite relationship with stock markets. KSE faced moderate level of variation owing to better economic, social and political environment in 2013. It gives us sound clue these social phenomena also contributes in volatility of stock markets. It is recommended that policy maker should keep in mind the nature of relationship and control fluctuation and instability of economy to boost secondary market activities.

Future research direction

Figure 2 reveals interesting anomalies and further research ground that why fluctuation of currency and market is opposite. Currencies faced more fluctuation in 2013 whereas market fluctuated more in 2012. The opposite or negative relation gives us further ground for research to this aspect of secondary markets.

REFERENCES

1. Kale, P., Dyer, J. H., & Singh, H. Alliance capability, stock market response, and long-term alliance success: the role of the alliance function. *Strategic Management Journal*, **23**(8), 747-767 (2002).
2. Lee, W. Y., Jiang, C. X., & Indro, D. C. Stock market volatility, excess returns, and the role of investor sentiment. *Journal of Banking & Finance*, **26**(12), 2277-2299(2002).
3. Goetzmann, W. N., & Kumar, A. Equity portfolio diversification*. *Review of Finance*, **12**(3), 433-463(2008).
4. Gencer, G., & Kilic, E. Conditional Correlations and Volatility Links Among Gold, Oil and Istanbul Stock Exchange Sector Returns. *International Journal of Economics and Financial Issues*, **4**(1), 170-182(2013).
5. Attari, J., Irfan, M., & Safdar, L. The Relationship between Macroeconomic Volatility and the Stock Market Volatility: Empirical Evidence from Pakistan. *Pakistan Journal of Commerce & Social Sciences*, **7**(2), 309-320(2013).
6. Farid, A., Ashraf, J., & Khan, A. H. Volatility at Karachi Stock Exchange [with Comments]. *The Pakistan Development Review*, 651-657(1995).
7. Qayyum, A., & Kemal, A. R. Volatility Spillover between the Stock Market and the Foreign Market in Pakistan: *Pakistan Institute of Development Economics*(2006).
8. Shahzadi, H., & Chohan, M. N. Impact of Gold Prices on Stock Exchange: A Case Study of Pakistan: Working paper series, *Karachi Stock Exchange*, **10**(2): 1-12(2012).
9. Anlas, T. The Effects of Changes in Foreign Exchange Rates On ISE-100 Index. *Journal of Applied Economics and Business Research*, **2**(1), 34-45(2012).
10. Sadri, H., & TayebiSani, E. The Impact of crude oil, gold price & their volatilities on Stock Markets: Evidence from selected member of OPEC. *European Journal of Banking and Finance*, **10**(1), 94-101(2013).
11. Muhammad, N., Rasheed, A., & Husain, F. Stock Prices and Exchange Rates: Are they Related? Evidence from South Asian Countries [with Comments]. *The Pakistan Development Review*, 535-550(2002).
12. Jianfeng, Z., Li, Z., & Qing, C. The Effect of Stock Index Futures to Stock Market Volatility A Study of the Chinese Stock Markets. *International Conference on System Science, Engineering Design and Manufacturing Informatization*, 45-48(2011).

APPENDIX

Table 3: ARCH test of Heteroskedasticity

Heteroskedasticity Test: ARCH

F-statistic	0.001405	Prob. F(1,493)	0.9701
Obs*R-squared	0.001411	Prob. Chi-Square(1)	0.9700

Figure 5 : normality test of residuals (JB Test)