Stock Market Returns and Volatility: A Comparative Analysis of South Asian Association for Regional Cooperation (SAARC) Countries Stock Markets

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Abstract

This paper attempts to investigate the impact of Volatility on Market Returns among the Stock Markets of SAARC countries. The graphical presentation showed that stock markets have stochastic trend and are correlated. GARCH(1,1) model was used which concludes a significant ARCH (1) and GARCH (1) effects and confirms all markets' returns are statistically significant since $p < 0$. The results show that the market volatility has significant influence on the stock market returns. This influence varies in degree among the Stock Markets of SAARC countries.

The association between stock returns and returns volatility has been studied by many financial researchers (Chen, Firth, & Rui, 2001). The emerging stock markets of developing countries and underdeveloped countries gained little focus (Sheikh, Shah, & Mahmood, 2017). As the globalization emerged the global markets are now more integrated. And the investors now enjoy a more diversified portfolio (Ahmed, Raheem, Weinhardt, & Streimikiene, 2016).

The size of trading activity of financial instruments (volume) or changes in the size of trading activity is the major source for the price and return volatility and it is considered as the process of information diffusion in the capital markets (Yu-Sheng, Hwei-Lin, & Yu-Cheng, 2018). In the past literature the trading volume is viewed as substitute for information transmission into the financial markets because the information movement cannot be observed (Lamoureux & Lastrapes, 1990a, 1990b). When information about an asset is disseminated into market it appears in the form of price and volume change, therefor, the information stream in the financial market is captured by the dynamics of returns, volume and volatility (Garg & Sampath, 2018).

Despite widespread research, the association between stock returns and market volatility is still subject to discussion (Chung, Fung, Shilling, & Simmons–Mosley, 2016). The research on capital markets conventionally focuses on prices of the securities and their behavior over the period. Conversely, due to non-stationarity in the prices of capital securities, the researchers prefer to study stock returns (Medeiros & Van Doornik, 2006). The capital returns of the firm reflects expectations of the investors about the forthcoming performance of the company. The influx of information to the market compel investors to adjust their prospects. The arrival of new information is primary cause for return and price changes. Yet, investors have different level of understanding due to which the price may remain unchanged. It shows that the changes in price

only reflects the ordinary reaction of the investors to the new information. However, the rise in volume of the trade is always linked with the revision in investor's expectations (Medeiros & Van Doornik, 2006). Hence, learning the mutual dynamics of capital returns, volume of the trade and volatility increases the understanding of inside structure of the capital markets. Therefore, the impact of returns volatility, on capital returns will be investigated in this study.

The results of this research provide comprehensive evidence regarding behavior of South Asian stock markets, this study contributes to the expansion of theoretical work on the association of stock index returns, and volatility. Furthermore, this study is of great benefit to the stock market players, portfolio managers, and investors as this compares the performance of different stock market indices of SAARC countries.

The literature has shown that studying the relationship between stock market returns and volatility is important because of numerous reasons. First for the construction of various financial theories and models the nature of stock return performance is vital. Secondly, stock return volatility is fundamental to finance, whether in asset pricing, portfolio selection, or risk management (Okičić, 2014). Furthermore, the previous literature also disclosed that very little studies are conducted on the impact of volatility on stock market returns in the underdeveloped stock markets, with even less research studies on the capital markets of SAARC countries. Therefore, detailed studies are required to examine the behavior of emerging stock markets of developing and underdeveloped countries. Consequently, my paper we will attempt to determine the above stated relation in stock returns from the SAARC countries.

The research papers is continued as follows; In section 2 literature review is provided, section 3 discuss the research methodology and frame work, section 4 presents the empirical analysis and section 5 summarizes conclusion.

I. Literature Review

A. Stock Returns

Stock returns are the earnings of shareholder generated from the stocks owned by the shareholder from the capital market. This profit can be in the form of dividend or the capital gain of the shareholder. The investors invest the money in the stock markets with the hope to gain returns from the stock market. As, stock returns show that how much an investment has made for the shareholder, therefore, studying the stock market returns is a major concern for the market participants and portfolio managers. The previous research has shown that returns, volume and volatility are the most important data generated by the financial markets, which helps to understand the behavior of the stock market (Sun , 2003)

The literature discloses that factors that affect Stock Returns has long been the theme of discussion among researchers and many researchers have attempted to identify these factors. (Sharpe, 1964) Has given the hypothesis that includes the following factors responsible for the Returns generated by capital securities, beta of the stock, size of the firm, and its dividend yield. Where the studies of (Black, Jensen, & Myron, 1972) and (Fama & MacBeth, 1973) expressed market beta known as risk of the market is positively associated with the average return of the market. Many researches such as (Robert & Ramaswamy, 1979), (Ahorny, Jones, & Swary, 1980) and (Rozeff, 1982) have argued that dividends yield affects the stock returns.

However, (Grammenos & Marcoulis , 2006), concluded that stock returns are effected by two types of factors exogenous and endogenous. The factors that affect the performance of firm at macroeconomic level i.e. the stock market index are known as exogenous factors. While the

factors which affect the performance of firm at a microeconomic level i.e. dividends, leverage are known as endogenous factors.

B. Stock Return Volatility

Volatility is "statistical measure of the dispersion of returns for a given security or market index". It shows the risk associated with the financial instruments or the capital market. For the measurement of the volatility of financial instruments or stock markets standard deviation or variance can be used. Stock Return Volatility is fundamental to finance, as it is the building block to Risk Management, Asset allocation, and Market Efficiency tests (Wang, Wu, & Xu, 2015). A high volatility indicates greater dispersion of returns from the mean in either direction, where, low volatility represents returns with small swings around the mean. Providing that volume of the trade, capital returns and volatility are very essential data produced by financial markets, it has attracted the scholar's attentions even today and great amount of literature has been put on paper about these stock market variables.

For the estimation of volatility, ARCH model was the first model presented by (Engle R. F., 1982). This model is further generalized as GARCH by (Bollerslev, 1986). The above two models are extensively utilized in econometrics and for the purpose of analysis of financial time series data. A study conducted by (Schwert, 1989) resulted that it is very difficult to detect the sources which contribute to volatility. (Murinde & Poshakwale, 2001) Examined the capital market volatility in developing stock markets (transition economies) of Europe. In this study the researcher provided that GARCH model is best suited for volatility forecasting, however, the symmetric and asymmetric GARCH model were not significant for forecasting future volatility.

(Xu, Chen, & Wu, (2006)) used a Vector Autoregressive (VAR) model to look into the lead-leg association between volatility of the returns and traders. The study documented that the two variables are persistent and a lead-leg relationship is present between the stated variables. This model was further utilized to dig out the affiliation between volume of the trade and skewness while using daily & monthly data from 11 stock markets (Hutson, Kearney, & Lynch, 2008). This study found that higher volume could cause greater returns skewness. The causal association was investigated between stock return and volume of the trade using quartile regression method (Chuang, Kuan, & Lin, 2009).

(Wagner, 2007) Stated that the stock markets behave in cycles, the booms are followed by the recessions. These recessions are caused by the higher stock market volatility which creates panic among the investors and the value of stock portfolio's decline. (Chen M. , 2015) Studied the association between stock returns and the volatility of securities in the chines capital markets specifically the capital markets of Shanghai and Shenzhen. The researcher used GARCH-M model to investigate the tradeoff between risk-return. For this purpose daily, weekly and monthly data was used. Chen found that empirical results for both the markets are different. The risk and return are positively associated in Shenzhen stock market, however, the relationship was negative in Shanghai Stock Exchange. However, (Chen M. , 2015) studied the same relationship with sub sample and found a significant link between risk & return for both the markets.

More recent studies (Ahmad, Ahmed, Vveinhardt, & Streimikiene, 2016, 22:6), (Wang, Qian, & Wang, 2017), (Karaa, Slim, & Hmaied, 2017), (Lau, Lucey, & Roubaud, 2018), (Sheng, Hwei-Lin, & Cheng, 2018) and (Sampath & Garg, 2018) document a robust and positive relationship between returns and volatility.

The previous literature contains two major hypothetical justifications for the association of return, volume and volatility. First the Mixture of distribution hypothesis (MDH) progressed by (Clark, 1973), (W & Epps, 1976), (Tauchen & Pitts, 1983) and (Andersen, 1996) presented that unobserved mixing variable is jointly depended on Price change and Trading Volume. This mixing variable is generally measured as source of information induction into the financial market. Furthermore, stock returns are taken as substitute for this mixing variable. Second the Sequential Information Arrival Hypothesis (SIAH) advanced by (Copeland, 1976), (Jennings, Starks, & Fellingham, 1981), (Smirlock & Starks, 1988) suggests that the information is dispersed into the market unequally. The knowledgeable traders change their portfolios according to the new information received and later on the whole market gets equilibrium position. This hypothesis suggest that volume of the trade, return and volatility contain dynamic relationship.

As MDH suggests that new information effects volume of the trade and volatility at the same time resulting in contemporaneous correlation between the capital returns and volume of the trade. Where SIAH states that information is dispersed asymmetrically, informed traders behave in different manners resulting in lead-leg, causal relationship between returns, & volatility. The following econometric model will been used to investigate the Hypothesis given below.

C. Empirical Model

$$R_{i,t} = \beta_0 + \beta_1 V_{s,t} + \varepsilon_t$$

where,

$R_{s,t}$ = Stock market return of a specified country at a specified time

$V_{s,t}$ = Volatility of a specified country at a specified time

D. Hypotheses

H1: Stock Market Returns and volatility are negatively associated;

H2: Stock Market Returns contain ARCH and GARCH affect;

II. Research Methodology

This study used the secondary data of stock returns from the capital markets of SAARC countries namely Pakistan, India, Bangladesh and Sari Lanka, Maldives, and Nepal. The daily and monthly financial data from the year 2010 to 2019 was selected from the indices namely KSE 100 index, BSE SENSEX index, DSEX index, NEPSE index, ASPI index and MASIX index. This data was selected as this the most recent data of stock markets which would show the recent behavior of the stock market of SAARC countries. The financial data was collected from the websites of respective stock markets namely https://www.psx.com.pk/, https://www.bseindia.com, https://www.dsebd.org/, https://stockexchange.mv/, and the website Investing.com. The stock market indices used in this research study are nominated on two bases: a) these indices are the major spot price indices of the countries b) The indices show the maximum behavior of the stock market.

Stock market returns are estimated using the following generalized equation:

$$R_{mt} = \ln P_t - \ln P_{t-1}$$

where,

$R_{m,t}$ = Stock market return of a country *(i)* at time *t*

$\ln P_t$ = Natural log of the most recent stock price at a time *t*

$\ln P_{t-1}$ = Natural log of the stock price at time *t – 1*

III. Results and Discussion

The estimation and fallouts of the study are presented into four stages. In the first stage, the graphical presentation of the time series data is presented which is based on historical values of major stock indices of six SAARC countries. The second stage of the results contain descriptive statistics and coefficient of variation. The correlation analysis is presented in the third stage. The econometric model, GARCH (1,1) is employed in last stage.

A. Time series graph

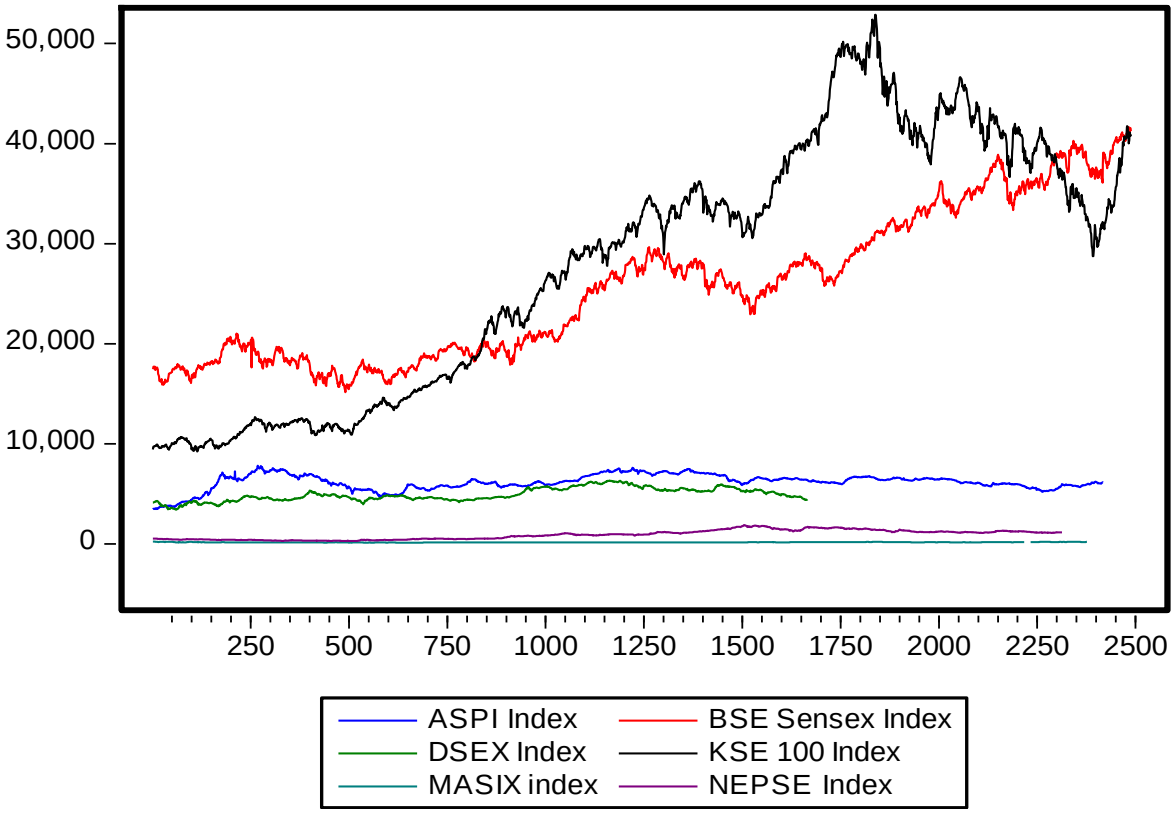

Figure 1 Historic time series of stock market indices

Source Author's estimation

The figure 1 is the time series graph of historic values of stock market indices of six major stock markets of SAARC countries. The results are plotted in line chart and the fluctuations in the line shows the spread of the data. The graphical representation shows that only two stocks BSE SENSEX and KSE 100 Index are above 5000 from the beginning till the end. Further the graph shows that MASIX has the lowest values. The KSE 100 and BSE SENSEX performed similarly during the investigated period and these stocks are separated at the start with BSE SENSEX above the KSE 100 index. The graph also shows that the indices have vibrant association.

B. Descriptive statistics

The table 1 shows the descriptive test results for all the six stock indices. The equity returns are calculated by taking log of the stock market values. Square of the returns is taken in order to avoid the negative sign with returns. Table 1 shows that highest returns are given by DS 30 index 0.109% where second highest returns are given by MASIX with 0.01269%, where lowest returns are given by ASPI index with 0.00257%.

Table 1

	ASPI	BSE SENSEX	DSEX	KSE 100	MASIX	NEPSE
Mean	0.0000257	0.0000785	0.0010929	0.0000971	0.0001258	0.0001269
Median	0.0000067	0.0000240	0.0000196	0.0000298	0.0000184	0.0000315
Maximum	0.0013707	0.0037451	0.2858220	0.0022705	0.007837	0.0030132
Minimum	0	0.0000000	0	0.0000000	0	0
Std. Dev.	0.00007	0.00017	0.016	0.00019	0.00039	0.00029
Skewness	8.79	9.44	16.32	5.04	10.39	5.23
Kurtosis	120.55	150.29	267.64	38.72	158.9	36.71
Jarque-Bera	950722.49	1484043.861	4784589.948	92735.06	1665184.886	83878.14
Probability	0	0	0	0	0	0
Sum	0.0414	0.1267	1.7651	0.1569	0.2031	0.2050
Sum Sq. Dev.	0.0000079	0.0000517	0.4521	0.0000622	0.00025	0.00014
Coefficient of Variation	2.73	2.28	15.31	2.02	3.15	2.36
Rank	3	5	1	6	2	4
Observations	1615	1615	1615	1615	1615	1615

The standard deviation values in table 1 depicts that every market has volatility which is different from other markets, it shows the dispersion of values around squared average returns of the market. The coefficient of variation is calculated for all the stock market volatilities resulting in maximum value of CV for DSEX Index of Dhaka stock exchange which gives the maximum average return among the given stock markets. Surprisingly, the KSE 100 index has minimum value for CV, even the country has gone through terrorism and other political instabilities.

C. Descriptive Analysis (monthly & annual returns)

The stock return values are transformed into monthly and annual average returns in order to have easy understanding. The highest monthly 0.527% & annual 7.649% returns are given by NEPSE and the lowest monthly 0.091% and annual 0.194% returns are given by MASIX of Maldives stock exchange. Maldives stock exchange is the smallest stock market among SAARC countries. DSEX of Dhaka stock exchange with maximum coefficient of variation 15.31 could generate monthly 0.244% & annually 2.054% returns. KSE 100 index with least coefficient of variation generated comparatively better monthly 0.279% & annually 4.860% returns.

Table 2

S.No	Stock Index	Monthly Average returns	Annual average returns
1	ASPI	0.00156	0.00918
2	BSE SENSEX	0.00171	0.01662
3	DS 30	0.00244	0.02054

4	KSE 100	0.00279	0.04860
5	MASIX	0.00091	0.00194
6	NEPSE	0.00527	0.07649

D. Correlation analysis

It is general concept that volatility of stock market is positively associated with the returns generated by the stock market (Ahmad, Ahmed, Vveinhardt, & Streimikiene, 2016, 22:6). The correlation test is conducted in order to verify this general concept.

The results of correlation analysis are shown in the table 3. The Pearson correlation coefficient has the value of 0.997 which shows a very strong positive relationship between risk and returns. The large value of T-Stat shows that values of different markets vary to great extant from one another, further, it confirms that the results are more repeatable. The P-value is less 5% which shows that strong positive association is statistically significant.

Table 3 Correlation (Risk & Return)

Pearson Coefficient of correlation	**0.997136**
N	6
T-Stat	26
Degrees of Freedom	4
Pvalue	0.0000123

E. GARCH (1,1)

Before conducting GARCH(1,1) test, Augmented Dicky Fuller Test is conducted to test the stationarity in the return data. The results of ADF test are show in the Table 4.

Table 4

	ADF Test Statistic		**Test Critical Values**		
	T-stat	**Probability**	**1% level**	**5% level**	**10% level**
ASPI	-17.865	0.00	-3.4342	-2.86313	-2.56766
BSE SENSEX	-19.8335	0.00	-3.4342	-2.86313	-2.56766
DS 30	-6.13216	0.00	-3.4342	-2.86313	-2.56766
KSE 100	-13.2553	0.00	-3.4342	-2.86313	-2.56766

MASIX	-23.2943	0.00	-3.4342	-2.86313	-2.56766
NEPSE	-17.6147	0.00	-3.4342	-2.86313	-2.56766

The results of ADF test shows that return data for all the six stock markets is stationary and the data is suitable for the GARCH(1,1) test.

Table 5

Capital markets	Gamma	Apha	Beta	sum of coefficients
ASPI	0.0000017	0.157198	0.787834	0.945
BSE SENSEX	0.0000021	0.072668	0.901818	0.974
DS 30	0.000273	0.067605	0.821216	0.889
KSE 100	0.0000056	0.144961	0.802743	0.948
MASIX	0.000025	0.439835	0.431433	0.871
NEPSE	0.000013	0.250666	0.664025	0.915
Proability	0.00	0.00	0.00	

GARCH (1, 1) test is employed using Eviews software which is developed for the purpose of financial analysis. The results of GARCH (1, 1) test are presented in table 5. The results show that all the three parameters Gamma (ε), Alpha (α) and Beta (β) for all the six stock market are significant as the p-value for all the three coefficients is less than 0.1 (P<0.1). Which means that the markets returns are defined by the 1st lag square returns, trailing variance & long run variance. The results confirm that both ARCH and GARCH effects are present.

Furthermore, the sum of coefficients for all the stock markets is approaching to zero which suggest that essential condition for the model is fulfilled. The long Run Average Variance (LRAV) is also calculated by the formula $\sqrt{\omega/1-\alpha-\beta}$ as utilized by (Engle R. , 2001). DSEX has the highest value 1.01% and ASPI has the lowest value with 0.10%. The results are robust across all six capital markets.

F. Discussion

The outcomes of this study are similar to the previous literary work. For instance, the study of (French, 1987) found positive relation between returns and volatility. (Bollerslev & Wooldridge, 1992) found correlation between volatility estimator and daily returns. The study found that these variables are correlated as high as 91% based on GARCH models. The study of (Office, 1973) concluded that monthly stock returns are associated with standard deviation (SD) of the returns. The first part of the results includes the time series graph of for the all the stock market indices. The graph shows that KSE 100 index and BSE SENSEX index have performed similarly. Moreover, these two indices are far greater than other indices of SAARC countries. The MASIX index of Maldives is the smallest stock market of South Asia. The graph 1 shows that all the indices are volatile.

(Saleem, 2007) used natural log of the ratio of stock market index for calculation of stock market returns. The descriptive statistics given in table 1 identifies DSEX of Dhaka Stock Exchange as the most volatile index and KSE 100 as the least volatile. The maximum monthly 0.527% and annual 7.64% returns are generated by NEPSE where, minimum monthly 0.091% and annual 0.194% returns are generated by MASIX of Maldives stock exchange. The

correlation analysis given in table 3 confirms a strong positive association between squared returns and standard deviation (volatility). The value of correlation coefficient was 0.997.

Before conducting GARCH test the stationarity of data is determined through ADF test. The results shows that returns data is stationary and suitable for the GARCH test. GARCH (1,1) test is employed to test the association between volatility and returns. The results of GARCH test are given in table 5. The results show that volatility of the stock market is defined by the 1st lag square returns, trailing variance & long run variance. Further, the results are robust across all six capital markets. The results of this are aligned with the previous studies conducted by the researchers.

G. Conclusion

The initial analysis of this article was graphical presentation of the behavior of the stock markets of SARRC countries. The initial analysis showed that stock markets at selected time period are volatile and correlation also exists. After the preliminary analysis descriptive analysis was conducted which includes finding mean, standard deviation, and co-efficient of variation for the purpose of classification. The results of descriptive tests show that maximum monthly 0.527% and annual 7.64% returns are generated by NEPSE where, minimum monthly 0.091% and annual 0.194% returns are generated by MASIX of Maldives stock exchange.

Correlation analysis confirmed a strong positive relationship between the stated variables. And finally, GARCH (1,1) econometric model was employed to investigate the impact of volatility on returns. The results of GARCH test shows that all the parameters are significant which confirms that volatility of the market has positive impact on returns. The impact was robust across all the capital markets. This study confirms the results of previous researcher.

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