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The Dynamic Relationship among Domestic Stock Returns Volatility, Oil Prices, Exchange Rate and Macroeconomic Factors of Investment

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ABSTRACT

This study investigates the impact of oil price variations, exchange rates, macroeconomic factors and domestic stock volatility in selected south Asian countries. This study employs a general autoregressive heteroskedastic (GARCH) model using quarterly data from 2001 to 2021. The results reveal that there is a significant relationship between the domestic stock of credit and macroeconomic factors. We find surprising results for the set of the countries; there is a negative impact of asset portfolio investment in the domestic stock for Bangladesh, and Pakistan. There is a positive impact on the economic growth in the majority of countries with the exception of Pakistan and Bangladesh. Inflation seems to increase while there is an increase in the credit in the economy.

Keywords: Oil Prices, Energy Sources, Exchange Rate, Macroeconomic Factors, Domestic Stock Returns
JEL Classification: C22

1. INTRODUCTION

Exchange rates can also affect oil prices directly through financial markets or indirectly via other financial assets, and through portfolio rebalancing and hedging practices in particular. Although the previous studies were also conducted in the south Asian market but not focus on the domestic stock still yet likewise Khan et al. (2015) investigate the association between the south Asian stock and macroeconomic variables from 1998 to 2012. They use the vector autoregression (VAR) model to analyze results. They concluded that the South Asian stock market not efficient. Furthermore, the stock return of Pakistan, Sri Lanka, and the Bangladeshi stock markets is directly and indirectly influenced due to local and regional factors. While the Indian stock return is influenced by lagged values (Yang et al., 2022; Zhang et al., 2022).

While earlier Wang (2011) explores the Asian market volatility through three main factors local, regional, and international. He covered a period of 6 years from 2005 to 2010. He uses the "heterogeneous autoregressive (HAR) model" to estimate the contribution of various aspects like factors local, regional and international. The common belief in driving the volatility, the main factor is the local factor driving volatility in the Asian market. Similarly, Gunasinghe, (2015) examined the behavior of the stock market of Pakistan, Sri Lanka and India after the policies of liberalization from 1992 to 2002. He used correlation,

cointegration, and generalized impulse response to analyze the results. The multivariate test shows that no long-time association exists among the stock market of Pakistan, Sri Lanka, and India. The results also explore that at a low level, the minimum relationship exists among the stock market as if the high change occurring in the Indian market also influences the Pakistan and Sri Lankan market.

We didn't find any comprehensive study on this topic except some research notes and published reports, which highlighted the importance and significance of this area of research. However, some of previous studies focused only on the domestic stock return in selected south Asian countries. So, it is important to view how oil prices, exchange rate, and macroeconomic factor influences the domestic stock of South Asian countries. The rest of paper is organized as literature review as section 2; data and methodology as section 3; results analysis as section and discussion of results as section 4; conclusion and references are at last.

2. LITERATURE REVIEW

The previous literature suggests the importance of foreign investment in different countries such as Hauser (1994) examined the relationship between equity portfolio in emerging market and currency hedging. The results indicate that the overall impact of currency depreciation on stock prices can be either positive or negative. Oseni and Nwosa (2011) investigated the association between the stock volatility and macroeconomic variables in Nigeria for the period of 1986-2011. They showed a positive association between the GDP and market stock volatility while the inflation rate and interest rate negatively influence the stock return of Nigerian firms. Several studies such as (Jain et al., 2022) investigate the stock market volatility in the Ghanaian stock market for the period of 2000 to 2013. The result of his study explores how the stock market return is affected due to macroeconomic variables. Furthermore, the results show that the interest rate and money supply negatively influence the stock return of Nigerian firms. While the exchange rate positively influences the stock return of Nigerian firms.

Hussain et al, (2015) study the growth factor of the stock market and higher portfolio investment in Pakistan from 1993 to 2009. The results suggested without strong ownership individual and institutional low relationships exist between the economic policies on the developing market. They explore that a higher rate of interest and currency stability, direct flow of investment, lower level of inflation, and a higher rate of GDP are associated with lower volatility of foreign portfolio investment. They suggest that foreign investors want to know about the currency position, inflation rate, and interest rate of the host country before direct portfolio investment in the host country.

Income Inequality erodes social cohesion and trust, limiting collaborative action and encouraging individualism (Khan et al., 2021). Consumption patterns that do not support clean energy use tend to place an additional burden on the environment. Secondly, in terms of the political stream, by altering the quality of institutions and power interactions between different social groups, income inequality can have an impact on REC.

Several studies for instance; Ali et al., 2022; Aslam et al., 2022; Arslan et al., 2021; Chen et al., 2022; Ge et al., 2022; and Dai et al., 2022 explore countries are unable to cut environmental emissions while also increasing their incomes. To put it another way, continued economic growth necessitates increased energy consumption, which results in increased carbon emissions. Mohammed et al. (2021) uses a monthly data-set to examine the relationship between the price of oil and the exchange rate in the Kingdom of Saudi Arabia from 1986 to 2019 by using ARDL and the error correction model. Accordingly, there is a significant long-run cointegration between variables. Gao et al. (2022) employing the wavelet approach, examine the asymmetric and complex effects of oil prices on the currency rates of Southern Asia. Data-set from 1983 to 2018 is reviewed from monthly statistics for empirical analysis. The indicators are in phase, as seen by the positive correlation between the rates of currency exchange and oil prices, according to wavelet coherence results.

3. METHODOLOGY

3.1. Sampling and Data Collection

This study is trying to identify the relationship between oil prices (OP), an exchange rate (EXCH), macroeconomic variables, and domestic stock returns in selected south Asian countries (Bangladesh and Pakistan). This study used quarterly data set starts from 2001 to 2021. All data related to domestic credit to the private sector, foreign portfolio investment, GDP growth rate, oil prices, exchange rate, and interest rate spread [1] are taken from World Bank indicator (WDI) and International Monetary funds (IMF). This study uses twenty one (21) years of data set in quarterly form (21*4 = 84) observations for two countries (84*2 = 168). So, the total observation of our study consists of one hundred and sixty eight (168). These observations are sufficient for data analysis through Generalized AutoRegressive Conditional Heteroskedasticity (GARCH) model.

3.2. Econometric Model

Based on the work of (Bollerslev, 1986) we define a GARCH (1, 1) model which has two equations, the first equation represents the mean equation and the second represents the variance equation which will describe the volatility of the dependent variable. There is vast existing literature which defines the advantages of using the GARCH models instead of other autoregressive models. Akgiray (1989) states that the GARCH model is superior to ARCH, moving average, and historical

1 Lending rate minus deposit rate

Table 1: Descriptive statistics

Variables	Mean	Median	Max	Min	Standard deviation	Skewness	Kurtosis
Bangladesh							
DSP	34.43	34.04	47.57	16.06	9.05	(0.26)	1.89
ASP	1.39E+09	5.74E+08	3.43E+09	562963	1.32E+09	0.40	1.46
OP	6.38	6.21	11.39	2	2.25	(0.07)	3.15
EXCH	0.01	0.01	0.01	0.01	0.002	0.55	2.05
GDP	6.05	6.06	7.86	3.83	0.98	(0.30)	2.59
I	6.04	5.76	9.25	3.06	1.71	0.47	2.57
Pakistan							
DSP	21.47	19.76	28.73	15.38	5.42	0.28	1.33
ASP	3.29E+08	3.45E+08	4.91E+08	1.11E+08	1.22E+08	(0.38)	1.92
OP	8.81	7.80	20.28	2.52	4.59	0.89	3.52
EXCH	0.01	0.01	0.01	0.007	0.002	0.69	2.32
GDP	4.41	4.70	7.66	1.60	1.70	(0.08)	2.28
I	2.45	3.45	8.32	(5.07)	3.80	(0.55)	2.57

Source: Author's calculation

Table 2: Unit root tests

Levels	T_u	T_t	T	Difference	T_u	T_t	T
Bangladesh							
DSP	3.98***	5.36***	2.73****	ΔDSP	6.41***	5.76***	4.95***
ASP	4.73***	2.16	1.58	ΔASP	4.34***	6.10***	3.63***
OP	2.62	1.99	0.12	ΔOP	4.10***	5.31***	4.08***
EXCH	1.45	2.26	2.46**	ΔEXCH	4.05***	3.73*	3.30***
GDP	1.28	3.08	0.58	ΔGDP	3.62***	3.52*	3.60***
I	0.89	1.87	1.46	ΔI	4.03***	3.92**	3.74***
TRAD	0.03	2.33	4.14***	ΔTRAD	4.10***	3.96**	2.27**
Pakistan							
DSP	0.63	2.13	0.43	ΔDSP	2.75**	2.73	2.81***
ASP	2.12	2.43	0.51	ΔASP	4.22***	4.04**	4.27***
OP	1.68	1.58	0.40	ΔOP	4.62***	4.78***	4.77***
EXCH	0.61	2.08	2.62***	ΔEXCH	3.08	3.27	2.22***
GDP	2.04	2.05	0.43	ΔGDP	5.22***	5***	5.29***
I	2.88*	3.62**	0.67	ΔI	6.50***	6.18***	6.71***
TRAD	1.12	1.40	2.85***	ΔTRAD	3.77**	3.82**	2.73***

***, **, * indicates significance at 1%, 5% and * 10%, respectively, Source: Author's calculations

Table 3: GARCH (1, 1) model

Variables	Bangladesh	Pakistan
Mean Equation		
C	0.008**	0.0004
DSP(-1)	0.60***	0.63***
ASP	2.06E-09**	−2.04E-11**
GDP	0.02***	0.03***
OP	−0.004	0.0003
EXCH	−0.01	0.13***
I	−0.08**	0.002***
Variance Equation		
RESID(-1)^2	0.22**	0.11***
GARCH(-1)	0.74***	0.84***
R-squared	0.68	0.66
Adjusted R-squared	0.64	0.63
Log likelihood	150.89	260.02

***, **, * indicates significance at 1%, 5% and * 10%, respectively, Source: Author's calculations

mean models which are used to forecast the US monthly stock index volatility. West and Cho (1995); Malik et al., 2023 report the superiority of the GARCH model when used to forecast dollar exchange rate volatility. Pagan and Schwert (1990) used GARCH, EGARCH, Markov switching, and three non-parametric models in forecasting US stock returns. The GARCH (p, q) model consists of three components:

1. α_0 is the weighted long run variance,
2. $\sum_{i=1}^{q} \alpha_i \in^2_{t-1}$ is a moving average term (MA), which is the sum of 'm' previous lags squared-innovations multiplied by the assigned weight α_i for each lagged square innovation,
3. $\sum_{j=1}^{p} \beta_j h_{t-j}$ is an autoregressive term (AR), defined as the sum s of the previous lagged variances multiplied by the assigned β_j for each lagged variance.]

$$h_t=\alpha_0+\alpha(B)\in^2_t+\beta(B)h_t \quad (1)$$

Where $\alpha(B)=\alpha_1B+\alpha_2B^2+\ldots\ldots+\alpha_qB^q$ and
$\beta(B)=\beta_1B+\beta_2B^2+\ldots\ldots+\beta_pB^p$ (2)

The above are the polynomials in the back-shift operator (Bera and Higgins (1993)).The equation of the GARCH model is found below:

4. EMPIRICAL RESULTS

4.1. Descriptive Statistics

The Table 1 contains the summary statistics for the set of variables used for the respective countries. Pakistan's asset portfolio, growth rate and spread exhibit skewness to the left and is only inflation which shows excess kurtosis. For Bangladesh, asset portfolio and interest spread show excess kurtosis to the left whilst inflation, exchange rate, and interest rate give evidence of non-normality.

4.2. Unit Root Tests

Testing the stationarity of the data is the start for our empirical estimation as shown in below Table 2. Therefore, we follow the work of Phillips and Perron (1988); and Perron (1989).

4.3. Discussion

We estimate the benchmark model GARCH (1, 1) model for Bangladesh and Pakistan and the results are reported in Table 3. The first equation is the mean equation and the second is the variance equation of GARCH (1, 1) model. The findings show that our results are accurate and robust for every country based on the significance of the coefficients and the magnitude of the coefficient of determination. We get surprising results for the impact of asset portfolio investment (ASP) in the domestic stock of the country. An increase in the asset portfolio investment decreases the domestic

stock (DSP) of Bangladesh and Pakistan. On one hand, we find a negative impact of portfolio investment in the domestic stock and on the other hand a positive impact in the remaining countries. However, the GARCH term for Afghanistan and Nepal is not significant meaning that our GARCH model reduces to an ARCH model in Table 3.

5. CONCLUSION

Even though the set of countries belongs to the same region there is high heterogeneity between them. However, the selected south Asian countries should implement policies which focus on the structure of the domestic stock market. The domestic stock market is a fragile market and the smallest impact in the core determinant (interest rate spread) could have a significant impact on the credit distribution. Countries should strengthen the role of the institutions and reduce the instability of their macroeconomic factors in order to attract more stock in the country. Thus, this work could give insight for the policymakers and researchers for future research.

Further, the variables included in the study are macroeconomic variables which are not available monthly or at higher frequency. Another limitation is related to the models' properties related to the number of lags as the autoregressive models are sensitive to the number of lags. Instead, GARCH model are the benchmark among the autoregressive models; the coefficients are restricted to be positive, and imposing artificial restrictions, it makes the model less reliable and far from reality. Hence, the researcher should be careful while using autoregressive models as fitting GARCH models is more an "art than of science."

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