EFFECT OF MACROECONOMIC VARIABLES ON STOCK MARKET PERFORMANCE OF SAARC COUNTRIES

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Golam Mohammad Wali Ullah[1]
Ashraful Islam[2+]
Md. Sohan Alam[3]
Md. Kanon Khan[4]

[1,2,3,4]*School of Business, Independent University, Bangladesh (IUB), Dhaka, Bangladesh*

(+ Corresponding author)

ABSTRACT

Stock market is one of the most widely followed markets in the world with a horde of transactions facilitated every day. Thus, not surprisingly a plethora of research has been dedicated to understanding the nature of these markets and what factors affect their movements and performance in general. Several studies have postulated that macroeconomic variables do tend to significantly affect stock market performance, while other studies found inconclusive relation at best. It is also worth noting that most of these studies were conducted on developed markets and rarely touched on the developing markets. On this background, the objective of this study is to examine the significance of macroeconomic variables in effecting stock market performance of SAARC countries using the OLS multiple regression Model. We have used annual data for the period 2005-2015. The findings of the study showed that macroeconomic variables i.e. exchange rate, foreign currency reserve and interest rate are all statistically significant in affecting stock market performance of SAARC countries. Whereas, inflation and money do not have a significant relationship in affecting stock market performance.

Contribution/ Originality: This study is one of very few studies which have investigated the effect of macroeconomic variables on stock market performance of SAARC countries. A regression analysis on the variables establishes links the significance of the market performance with key macroeconomic indicators in the region.

1. INTRODUCTION

Stock Market, sometimes simply referred to as "the market", is the most followed financial market in the world where financial securities or claims on the earnings of corporations are traded (Mishkin and Eakins, 2011). The market provides long-term funds to listed companies in stock exchanges by pooling in funds from various investors which allow companies to expand their business and it provides investors an alternative investment opportunity. Levine and Zervos (1990) has shown the importance of financial system in mobilizing savings, allocating capital, exerting corporate control, and easing risk management.

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Although, stock markets in developed countries have enjoyed sustainable growth and stability over the years, albeit the market crashes that has rocked the global financial markets (Hull, 2012) stock markets in emerging economies are considered the most volatile markets in the world (Engle and Rangel, 2005) and they have been growing significantly in the last two and half decades. They are also more sensitive to macroeconomic factors, such as changes in the level of income, inflation, interest rates, etc.

The effect of macroeconomic variables on stock markets have been widely researched with first comprehensive studies conducted by Fama (1970) and Roll and Ross (1980). They observed various macroeconomic variables and their effect on stock price fluctuations and proved conclusively that certain macroeconomic variables tend to have very strong influence and effect on stock prices while others remain inconclusive at best. Theoretically the macroeconomic variables interest rates, money supply, inflation, exchange rates and foreign currency reserves have an impact on the stock index and leads to fluctuation of stock market price. For instance, higher interest rates and inflation both share the same characteristics of raising the stock market price (Smart *et al.*, 2014).

Notable research on this field had shown evidence of variables like real interest rate, industrial production index, oil prices, inflation having a significant impact on market performance (Lintner, 1973; Grossman and Shiller, 1981; Chen *et al.*, 1986). While other papers (Hussain, 2009; Barbic and Jurkic, 2010) failed to conclusively prove strong relationship between selected macroeconomic variable on stock market performance. In many research negative relationship was found between stock market performance and some macroeconomic variables. Interest rates were stated as insignificant in forecasting stock market price in a research conducted by Owens and Hardy (1925). Stock speculation was proven to be more accurate based on Money Supply growth, Fama and Schwert (1977). While in other cases like the test conducted by Rozeff (1975) stock price increases prior to the change in money supply or they change simultaneously, which provides less forecasting opportunities. Inflation keeps the nominal prices up while the real return is constant but inflation is not the sole reason, rather, other factors relating to inflation impacts the stock prices more. On the contrary, many studies revealed that macroeconomic variables were not having the desired effect on stock prices. Interest rate, in certain cases, was showing a negative relationship between the stock prices which is the opposite of what the theory states. It was also observed that the information varied from country to country, based on market efficiency (Zweig, 2010).

This paper will help shed some light into whether movement in stock price is affected by changes in macroeconomic variables and whether they do so significantly. The paper will be using major stock market indexes of SAARC countries as a proxy for stock market performance and five macroeconomic variables: inflation rate, interest rate, foreign exchange rate, foreign currency reserve, and money supply. This paper will serve as a helpful tool to investors in identifying key macroeconomic variables while investing in stock market and help in making suitable investment decisions.

2. LITERATURE REVIEW

2.1. Stock Market Index (Dependent Variable)

The performance of stock market can be measured by observing composite market indexes, preferably the broad market indexes, i.e. S&P 500, NYSE Composite Index, FTSE 100, etc. An index is a mathematical construct, which provides idea on the movement and condition of the market. In order to formulate a market index the market capitalization of selected companies are first calculated, which is done by multiplying the number of shares outstanding of each company with the company's current share price. Then market weight is calculated, which is referred to as the index weight, by dividing the market capitalization of company on the index by the total market capitalization of the index. Then a weighted average market capitalization is computed, by adding the multiples of market capitalization of each company in the index with its weight. This weighted average is then compared timely with the base value to assess how much and in what direction the index has moved.

Various theoretical models and framework have been employed by researchers in the past to study the effect of macroeconomic variables on stock market and the two most important and noteworthy theories are Efficient Market Hypothesis used by Fama (1970) and the Arbitrage Pricing Theory (ATP) developed by Roll and Ross (1980). Efficient Market Hypothesis (EMH) stipulates that in an efficient market that prices incorporate all available information at any point of time, be it historical data, public of private information, or predictions of future price expectations. Hence, investors stand no chance in making abnormal profit as prices automatically adjust to reflect any new information. The EMH has three forms, namely, the weak-form, semi-strong form and the strong-form depending on the definition and type of information that is being reflected on prices. The Arbitrage Pricing Theory (APT) is another way to link macroeconomic factors to stock price. It is an extension of the Capital Asset Pricing Model (CAPM) by using a multifactor approach to explaining stock prices instead of using one independent factor, the market premium. The theory assumes that an asset's return is dependent on various macroeconomic, market and security-specific factors. The factors that influences stock price movements, according to Roll and Ross (1980) are unanticipated shifts in risk premiums; changes in the expected industrial production; unanticipated inflation; and, unanticipated movement in the shape of the term structure of interest rate.

Previous studies explored on this topic found contrasting outcomes. Grossman and Shiller (1981) examined the how historical price movements can be justified by new information. Using evidence from 1890-1979, they show that stock price movement can be attributed to real interest rate movement. Chen *et al.* (1986) investigated the impact of macroeconomic variables on stock prices by using seven macroeconomic variables to test a multifactor model in the USA. They found that market index and oil prices are not related to financial market while industrial production, change in risk premium and twist in the yield curve are significantly related to stock returns. Similarly, the study conducted by Doong *et al.* (2005) on six Asian countries to investigate the relationship between stock and exchange rate using the Granger causality test found that there is strong negative relation between stock returns and change in the exchange rates for all countries excluding one.

Contrary to previous studies mentioned above, research by Gjerde and Sættem (1999) on relationship between stock returns and macroeconomic variables in Norway show a positive relationship between oil price and stock returns as real economic activity and stock returns. Their study also shows an insignificant relation between stock returns and inflation.

Most of these studies test the Fisher hypothesis which predicts a positive relationship between expected nominal returns and expected inflation. Their findings were inconsistent with the Fisher hypothesis as they all reported a negative relationship between stock returns and inflation (Jaffe and Mandelker, 1977).

2.2. Macroeconomic Variables (Independent Variable)

An increase in stock prices over time is said to increase the wealth leading to an increase in the demand for money, hence interest rates. High interest rates in turn can attract foreign capital, causing currency appreciation. When domestic currency appreciates or foreign currency depreciates, the balance sheet of domestic multinational firms deteriorates in terms of domestic currency which could be bad news for their shareholders and their share prices. On the other hand, appreciation of domestic currency or depreciation of foreign currency could be good news for domestic producers due to cheap imported inputs. This will have a favorable impact on the firms' share prices. High interest rates in turn can attract foreign capital, causing currency appreciation. When domestic currency appreciates or foreign currency depreciates, the balance sheet of domestic multinational firms deteriorates in terms of domestic currency which could be bad news for their shareholders and their share prices (Rogoff, 2001). In contrast, appreciation of domestic currency or depreciation of foreign currency could be good news for domestic produces due to cheap imported inputs. This will have a favorable impact on the firms' share price. Overall, exchange rate changes can move stock prices in either direction (Saha, 2015). The existence of a relationship between stock prices and exchange rate has received considerable attention and previous studies on the effect of

exchange rate on stock market index produced several conclusions. Early studies (Soenen and Hennigar, 1988; Aggarwal, 2003) in this area considered only the correlation between the two variables, exchange rates and stock index returns. Abdalla and Murinde (1997) examined interactions between stock market price movement and exchange rates for four emerging markets namely, India, Korea, Pakistan and Philippines, using Granger-Causality and Co-integration techniques, their study reveals a unidirectional causality running from exchange rate to stock market price. Agus and Carl (2004) investigated the statistical relationship between stock prices and exchange rates using Granger-causality and Johansen co-integration test in four ASEAN countries, namely Indonesia, Philippines, Singapore and Thailand. The co-integration test found that all the stock market prices and exchange rates in the four countries are co-integrated and the causality runs from exchange rate to stock prices. However, there are some studies that could not establish any relationship between exchange rate and stock market prices. Some of these studies are as follows Nieha and Lee (2001) found no significant long-run relationship between stock market prices and exchange rates in G-7 countries, using both Engel-Granger and Johansen's co-integration tests. Rahman and Uddin (2009) in their study on dynamic relationship between stock market prices and exchange rate in South Asian countries found no relationship between stock market prices and exchange rates. Whereas Keray (2009) found long-run relationship between the variables while studying long-run stock prices and monetary variables in Jamaica.

Ray (2012) conducted studies, to find the relationship between foreign exchange reserves of Indian and the Bombay Stock Exchange (BSE) index, using annual data from 1990-91 to 2010-11. The study used simple linear regression model, unit root test and Granger causality test to establish a relationship between the Bombay stock market movement and foreign currency reserve. The results demonstrated that foreign exchange reserve of India has a positive impact on the BSE market index. The study also showed that the causality between the two variables were unidirectional, it runs from foreign currency reserve to stock market capitalization but not vice versa. Research by Barbic and Jurkic (2010) analyzed the relationship between stock market indexes and macroeconomic variables including, inflation rate, broad money supply, money market interest rate and foreign currency reserve of selected Central and Eastern European (CEE) 1countries namely, Coratia, Czech Republic, Hungary, Poland and Slovenia. Using Johansen co-integration and Ganger causality test they showed that foreign currency reserve has very little impact in influencing market index in CEE countries. Other research in this field includes study by Hussain (2002). The study analyzed the impact of macroeconomic variables: foreign exchange rate; foreign exchange reserve; industrial production index; whole sale price index; gross fixed capital formation; and, broad money M2 on the stock prices in the Karachi Stock Exchange (KSE) using data from 1986 to 2008. The results show that the foreign exchange rate and foreign currency reserve have a significant effect on stock market index KSE 100, while other variables like industrial product index and gross fixed capital formation did not have a significant effect on stock prices.

Interest rates play a role in determining the level of stock prices, since the monetary policy committee uses interest rate as a tool to control money supply. However, there were reports where it is also found that interest rate is affecting stock prices in a negative way (Owens and Hardy, 1925). Interest rate is one of the important macroeconomic variables, which is directly related to economic growth. Generally, interest rate is considered as the cost of capital, meaning the price paid for the use of money for a period. However, from a borrower's point of view interest rate is the cost of borrowing money and from a lender's point of view, interest rate is the fee charged for lending money. Davidson (1996) hit upon the relationship between both variables. He used regression analysis to find this relationship where he found the important impact of interest rate on stock market. His results were focusing on the long-term interest rates which play a fundament role in the deviation of price dividend ratios. Kunt and Maksimovic (1996) have found that countries with lesser interest rate have strong stock market as compared to countries which have higher interest rate. They also mentioned that developed countries are usually having low interest rates due which their stock market's performance is extra-ordinary.

3. DATA & METHODOLOGY

3.1. Data

This paper aims to fulfill the research objective by looking at the stock market performance of selected SAARC countries, namely: Bangladesh, India, Pakistan, Sri Lanka, Maldives, and Nepal. The data used in this paper is a panel series data, which contains observations of multiple fields obtained over multiple time periods for the same countries. The fields in this case study are the stock market indices and the macroeconomic variables and the time period is from 2005 to 2015 (eleven years of data).

The data collected for this research paper was from secondary sources. The defined stock market index figures were gathered from their respective country's stock exchange websites and the macroeconomic variables were taken from reliable sources, such as, World Bank and Trading Economics websites. Several other websites have been used to cross check the validity of the figures, namely: CIA website (for exchange rate reserve); IMF website (for economic variables); Bangladesh Bureau of Statistics website; and, Yahoo Finance website.

The market indices used as a proxy for this paper are as follows: S&P BSE SENSEX index is used, which is simply the market index containing 30 well established and financially sound companies listed on the Bombay Stock Exchange. For Bangladesh market, the DSE General index is used, which is made up of the market capitalization of all the companies listed in the Dhaka Stock Exchange. The KSE 100 index is used as proxy for the Pakistan stock market. It is made up of 100 companies with the highest market capitalization. The NEPSE index, used as a proxy for the Nepal Stock market performance, is made up of the total market capitalization of all companies listed in the Nepal Stock Exchange. The Colombo Stock Exchange All Stock Price Index (ASPI) is used as a proxy for the Sri Lankan stock market performance, and is made up of market capitalization of stocks listed in the Colombo Stock Exchange. For Maldives, the MASIX index is used as proxy for the stock market performance of Maldives, which is computed using the market capitalization of all companies listed in the Maldives Stock exchange.

3.2. Model

The significance of the association between the selected macroeconomic variables and stock market indices was tested using the OLS (Ordinary Least Squared) Multi-regression model. A multifactor or multivariate regression model is a statistical model that is used to assess the relationship between multiple independent variables (predictors) and their effect on the dependent variable (outcome variable) (Cooper and Schindler, 2014).

We have used the following model to establish a relationship between stock market index and the selected macroeconomic variables.

$$Stock\ Market\ Index = \beta_0 + \beta_1(ER) + \beta_2(CR) + \beta_3(CPI) + \beta_4(IR) + \beta_5(M2) + \varepsilon \qquad (1)$$

Here,

ER	=	Exchange Rate
CR	=	Foreign Currency Reserve
CPI	=	Inflation
IR	=	Interest Rate
M2	=	Money Supply
$\beta_1...\beta_5$	=	Coefficient of the independent variables
β_0	=	represents the y-axis intercept of the regression line
ε	=	error item, which represents the error in predicting the value of the dependent variable (stock market index), given the value of the dependent variables.

3.3. Hypothesis

The individual hypothesis testing the research question is summarized in Table 1.

Table-1. Hypothesis

Independent Variable	Null Hypothesis	Alternate Hypothesis
1. Exchange Rate *(ER)*	**H₁** : There is no significant relationship between exchange rate and stock market index	**Hₐ₁** : There is a significant relationship between exchange rate and stock market index
2. Foreign Currency Reserve *(CR)*	**H₂** : There is no significant relationship between foreign currency reserve and stock market index	**Hₐ₂** : There is a significant relationship between foreign currency reserve and stock market index
3. Inflation rate *(CPI)*	**H₃** : There is no significant relationship between inflation rate and stock market index	**Hₐ₃** : There is a significant relationship between inflation rate and stock market index
4. Interest rate *(IR)*	**H₄** : There is no significant relationship between interest rate and stock market index	**Hₐ₄** : There is a significant relationship between interest rate and stock market index
5. Money supply *(M2)*	**H₅** : There is no significant relationship between money supply and stock market index	**Hₐ₅** : There is a significant relationship between money supply and stock market index

Source: Official Stock Market website of respective countries, World Bank Stats, Trading Economics, IMF website & CIA country stats, EViews 8 ™

4. FINDINGS

4.1. Descriptive Statistics

Descriptive statistics for the six variables are summarized in Table 2. Form the table it can be seen that, the mean of the stock index for the SAARC countries stood at 3.40 points and the average exchange rate is 67.96 against the US dollar. The foreign currency reserve is observed to have a mean of 9.853 while, inflation in SAARC countries stood at a mean of 8.608% and interest rate on loans was on average 11.35%. The M2 money supply in the region was on average 16.69 with considerable spread in distribution in the data set, having a range of 33.91, however the most significant spread in the data is exhibited in exchange rate having a range of. The standard deviation figures from Table 1, reveals that the most volatile data is of exchange rate with a standard deviation of 32.71 and the least fluctuating data is interest rate with S.D. of 0.0278.

Table-2. Descriptive Statistics

Variables	Mean	Maximum	Minimum	Standard Dev.
Stock Index	3.404792	4.50693	2.0592	0.7359
Exchange Rate	67.96133	130.5600	12.7500	32.7164
Foreign Currency Reserve	9.853107	11.5120	8.2765	0.8923
Inflation	8.608333	22.6000	2.1000	3.7792
Interest Rate	0.113542	0.1890	0.0700	0.0278
Money Supply (M2)	16.69017	38.8400	4.9300	5.1907

Source: Official Stock Market website of respective countries, World Bank Stats, Trading Economics, IMF website & CIA country stats, EViews 8 ™

From Table 3, it can be seen that there are no multi-collinearity effects between the predictor variables. The table also shows that money supply has weak negative correlation with stock index, exchange rate, foreign currency reserve, inflation and interest rate. Correlation between other variables other than money supply is positive except for interest rate which exhibited a weak negative correlation with foreign currency reserve, -0.0549. Foreign currency reserve shows a strong positive correlation with stock index with a correlation coefficient of 0.8630. Exchange rate also shows a moderately positive correlation with stock index with a correlation coefficient of 0.4404. Interest and inflation rates do have a positive correlation with stock market index, but the correlation coefficient is fairly low with 0.0661 and 0.1440, respectively. Therefore, we can expect moderate to high positive correlation between exchange rate and foreign currency reserve with stock market index and fairly low positive correlation between inflation and interest rate with market index. We can also expect money supply to have weak negative correlation with stock market index.

Table-3. Correlation

	Stock Index	Exchange Rate	Foreign Currency Reserve	Inflation	Interest Rate	Money Supply (M2)
Stock Index	1.0000	0.4404	0.8630	0.1440	0.0661	-0.0873
Exchange Rate	0.4404	1.0000	0.2367	0.1891	0.0200	-0.0498
Foreign Currency Reserve	0.8630	0.2367	1.0000	0.0906	-0.0549	-0.2473
Inflation	0.1440	0.1891	0.0906	1.0000	0.1606	-0.1749
Interest Rate	0.0661	0.0200	-0.0549	0.1606	1.0000	-0.0778
Money Supply (M2)	-0.0873	-0.0498	-0.0247	-0.1749	-0.0778	1.0000

Source: Official Stock Market website of respective countries, World Bank Stats, Trading Economics, IMF website & CIA country stats, EViews 8 ™

4.2. OLS Multi-Regression Model Findings and Analysis

The Regression model equation formulated by the software is as follows,

Stock Market Index = -3.742747 + 0.005497*(**ER**) + 0.667672*(**CR**) + (-0.000451)*(**CPI**) + 2.706989*(**IR**) + (-0.006691)*(**M2**) + ε 　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**(2)**

It can be interpreted from this equation that the regression line has a negative y-axis intercept at -3.743. The exchange rate, foreign currency reserve and interest rate moves in the same direction as stock market index, while inflation and money supply move in the opposite direction.

The OLS Regression analysis collated is summarized in Table 4. From Table 4, the value of R-squared from the analysis shows that 81.72% of the movement is stock market index is explained by the regression model used in this paper. The rest, 18.73% of the variations in the stock index movement is due to other variables not included in the model. The adjusted R-square value of about 80% shows that the model is significant in representing the population. Therefore, we can conclude that the model is significant in explaining the stock market performance, that is, the model is a good fit.

Table-4. Estimation output

Variable	Coefficient	Std. Error	Probability
β_0	-3.742749	0.544844	0.0000
Exchange Rate, β_1	0.005497	0.001368	0.0002
Foreign Currency Reserve, β_2	0.667672	0.049561	0.0000
Inflation Rate, β_3	-0.0000451	0.011856	0.9970
Interest Rate, β_4	2.706989	1.569710	0.0903
Money Supply, β_5	-0.006691	0.008389	0.4286
R-squared		0.817223	
Adjusted R-squared		0.800299	
F-statistic		48.28836	
Prob(F-statistic)		0.000000	

Source: Official Stock Market website of respective countries, World Bank Stats, Trading Economics, IMF website & CIA country stats, EViews 8 ™

Since, the *Prob (F-statistic)* is less than the level of significance, α = 10%, therefore, the independent variables in the model are jointly significant in explaining the movement is stock market index.

4.3. Hypothesis Test Results and Inference

In order to test that macroeconomic variables, namely: exchange rate, foreign currency reserve, interest rate, inflation rate and money supply have a statistically significant relation with stock market performance, Z-test has been conducted.

The results of the Z-tests are summarized in Table 5, which reveals that: exchange rate, foreign currency reserves and interest rates, all have a significant relationship with stock market performance, with p-values 0.0002, 0.0000, and 0.0903, respectively which is consistent with the findings of Keray (2009); Ray (2012); Hussain (2002) which have all concluded a significant relationship with the named variables with stock prices and stock market performance.

Whereas, inflation rate and money supply has proved to have no significant relationship with stock market performance, having p-values 0.9970 and 0.4286 respectively. These findings were consistent with Hussain (2002) who have found negative and no significant relation was between inflation rate and money supply with stock market performance. Table 6, summarizes the findings of this paper with some of the previous literature on the topic.

Table-5. Hypothesis Test Results & Inference

Null Hypothesis	Alternate Hypothesis	P-Value	Decision Rule	Result
H_1; Exchange rate has no significant relationship	H_{A1} : Exchange rate has significant relationship	0.0002	P < 0.10000 **Reject Null**	**Exchange rate has a significant** relationship to stock index
H_2; Foreign currency reserve has no significant relationship	H_{A2} : Foreign currency reserve has significant relationship	0.0000	P < 0.10000 **Reject Null**	**Foreign currency reserves has a significant** relationship to stock index
H_3; Inflation rate has no significant relationship	H_{A3} : Inflation rate has significant relationship	0.9970	P > 0.10000 **Accept Null**	**Inflation rate has no significant** relationship between stock index
H_4; Interest rate has no significant relationship	H_{A4} : Interest rate has significant relationship	0.0903	P < 0.10000 **Reject Null**	**Interest rate has a significant** relationship between stock index
H_5; Money supply has no significant relationship	H_{A5} : Money supply has significant relationship	0.4286	P > 0.10000 **Accept Null**	**Money supply has no significant** relationship to stock index

Source: Official Stock Market website of respective countries, World Bank Stats, Trading Economics, IMF website & CIA country stats, EViews 8 ™

Table-6. Findings' Consistency with Other Papers

Variable	Findings	Consistent with
Exchange Rate	*Positive* and *Significant*	Keray (2009)
Foreign Currency Reserve	*Positive* and *Significant*	Ray (2012)
Inflation Rate	*Negative* and *has no Significance*	Hussain (2002)
Interest Rate	*Positive* and *Significant*	Davidson (1996)
Money Supply	*Negative* and *has no Significance*	Hussain (2002)

5. CONCLUSION

This study was conducted to investigate the significance of the effect of macroeconomic variables on stock market performance of SAARC countries. The findings of the study can be discussed and summarized as follows:

The hypothesis test using the multivariate regression model reveals that the exchange rate, foreign currency reserve and interest rate all have significant and positive relation to stock market performance, given that all these variables had a p-value of less than the level of significance, i.e. 0.1000. These variables also had positive coefficients, in the regression equation, thus signaling a positive relation with stock market performance.

However, the results of the Z-test failed to find a statistically significant relation between inflation and money supply with stock market performance. The Regression model also show a negative relation of the two variables with stock market performance.

These indicate that macroeconomic variables do in fact significantly affect stock market performance, except for inflation and money supply which have a negative relation to market performance but do not significantly effect it.

SAARC countries are one of the fastest growing emerging economies of the world, therefore its capital market performance is a vital statistic for investors and other developed economies alike. To gauge or forecast market performance using the macroeconomic spectrum, it is imperative to monitor changes in variables, like exchange rate, foreign currency reserve and interest rate as they would significantly impact market performance.

Finally, the limitations of this paper should not be overlooked. Analysis made in this paper used annual data of eleven years with five predictor variables and data for both Bhutan and Afghanistan has been excluded due to lack of information. A more detailed study with the inclusion of other widely used variables, like the industrial production index and oil prices and a wider time span may have increased capabilities of this study.

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