Macroeconomic Factors and Stock Returns: Evidence from the Emerging Market of Asia

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Abstract

This study examines the impact of macroeconomic variables on stock returns of Pakistan, India and Sri Lanka for the period of 1997-2014. GMM approach is used to analyze the impact of macroeconomic variables on stock returns. Variables of the study were T-Bills, Exchange Rate, Consumer Price Index (CPI) and the Industrial Production Index (IPI). The results of study show that T-Bills rate has significant negative impact while Exchange rate has a significant positive impact on the Stock Returns of the study period.

Keywords: T-Bills Rate, Exchange Rate, Consumer Price Index, Industrial Production Index, Stock Returns

INTRODUCTION

Macroeconomic indicators/variables are the key reflection of economic prosperity or economic downturn. These variables and their strategic intersection always create the effervesce through which one economic phenomena such as consumer price index, exchange rate or any other variable will significantly impact the other phenomena of related interest or study. Over the past recent periods, the interaction between various macroeconomic factors and stock return gain a significant aspiration from research community to test whether various macroeconomic variables have any influence on stock market return or not. Several research studies from developed and emerging economies, that investigates the relationship between macroeconomic variables and stock returns, empirically conclude that the stock return are predominantly determined by various macroeconomic variables such as T-bills rate, exchange rate, consumer price index (CPI) and industrial production index (IPI). The subjective evidence from various sources including financial press and industry reports confirm that various economic indicators; such as monetary policy, have large and significant impact on the volatility of stock returns. Other sources including empirical and industrial also indicates that various macroeconomic variables largely influence the investor investment decision, including both individual and institutional investors. These hypothesis and evidences not only motivate researchers to test and investigate the relationship between stock returns and macroeconomic variables, but also lay down the platform for further, in depth investigation for determining extend and type of impact that such macroeconomic variables and their volatility have on the stock returns. This research study extend the conjectural evidence of relationship between T-Bills rate, exchange rate, consumer price index, industrial production index and stock returns of Pakistan, India & Sri Lanka.

The pragmatic evidence of relationship between macroeconomic variables and stock return with the development of ARDL approach provides another approach to examine the relationships between the macroeconomic variables and stock returns. (Johansen, 1991) provide with gainful work of ARDL approach for co-integration. This methodology provides the many paybacks on co integration process. First it can be applied on the series that are not considering the stationary. Second ARDL approach measures the long run relationship between the variables that is not possible in co-integration process if series are not stationary at same level. The further and greater advantage of ARDL model is; it provides accommodation that, greater number of variables many studies have been published about the relationships between stock returns and macro variables in well-developed countries such as the US, Japan and Europe (see, (Miller, K. D., Jeffrey, F. J., & Mandelker, 1976); (Johansen, 1988); (Johansen, S., & Juselius, 1990). However, regional stock markets of South Asian countries such as Pakistan, India & Sri Lanka are less explored because of their small sizes and geographic locations. This study investigates the relationships between the Pakistan, India and Sri Lanka stocks returns and a set of four macroeconomic variables from August 1997 to December 2014 using co-integration tests.

This study deals with the issues concerning the relationship between Macroeconomic variables and stock returns of different countries. Therefore this study try to see which of the macro economic variables impact more and in greater extend the stock returns and in comparison with the other countries. The idea is to find out in which direction these variables direct the stocks returns. This study is focused on the stocks returns which is more useful for the future planning of the investment in the countries. There are multiple factors to consider in explaining the decline in stock returns. Macroeconomic variables have researched in decline stocks returns. Stock prices are generally believed to be determined by some fundamental
macroeconomic variables such as T-bills, exchange rate and Consumer price index and Industrial production rate. Several studies have attempted to capture the effect of economic forces on stock returns in different countries. For example, the Arbitrage Pricing Theory (APT) developed by (Ross, 1976) used some macroeconomic variables to explain stock returns in the US stock markets.

When the domestic currency depreciates against foreign currencies, export product prices will decrease and, consequently, the volume of the country’s exports will increase, assuming that the demand for this product is elastic. (Mukherjee, T. K., & Naka, 1995), (Engle, R. F., & Granger, 1987) confirmed this positive relationship existed in Japan and Indonesia both of which are considered as large exporting countries. (Miller, K. D., Jeffrey, F. J., & Mandelker, 1976) also showed that an increase in stock price has a negative short-term effect on domestic currency values but in the long term this effect is positive, while currency depreciation has a negative short and long-term effect on the stock market.

CPI can measure the average change in price of goods and service for the specific time period. (Engle, R. F., & Granger, 1987) pointed out the inverse relationship between inflation and the stock prices. Increase in CPI leads to increase in nominal T-bills and there is positive relationship between nominal T-bills and discount rate. So increase in CPI also leads to increase in discount rate; that having negative effect on stock returns. Because increase in discount rate will leads to reduction in the present value of cash flows. T-Bill rates have been used as proxy of T-bills. It is postulated that increases in T-bills will increase the production cost so it will decrease the prices of stocks. Rise in T-bills lead to rise in discount rate and the results in decrease in present value of future cash flows. Therefore, it is expected that an increase in T-bills will adversely affect the stock market returns. (Hasan, A., & Nasir, 2008) explored the same relationship in their study. Industrial production index have been used to measure the manufacturing production rate in the economy. It describes the overall economic activity in the economics of the country. It influences the expected cash flows of the stocks. Production rate having positive effect on the stock prices. Industrial production index rise when economy expands and fall during the economy recession (Johansen, 1988).

LITERATURE REVIEW

The relationship between equity market returns and economic fundamentals has been extensively tested in developed markets. Only few studies were available with reference to Pakistan, India and Sri Lanka which are the major countries of South Asia and located on cross roads of central Asia, Middle East. Now an overview of some significant recent empirical work in this area.

The world has become a global village. One of the important and major advantage of the globalization is that the size of international trade has grown very rapidly. This growth has the need for foreign currencies to make international transactions of goods and services and the need to have a stable exchange rate. The main reason to establish the relationship between exchange rate and stocks prices is to influence the decisions about monetary and fiscal policy. (Gavin, 1989) stated that booming market has a positive effect on cumulative demand.

(Bhattacharya, 2012) explored the mechanism of exchange rate and the stocks prices. The data was collected on weekly basis from 6-7 countries. They used Autoregressive (VAR) model for lag length and also GARCH model for the studies. Empirical evidence showed that stock prices cause future exchange rate. On the other side exchange rate have less effect on the stock prices. (Johansen, S., & Juselius, 1990) investigated the relation between stock prices and the exchange rate and used weekly data from Korea, Philippines, Indonesia, Taiwan and Thailand from period between 2000 to 2008. They used EGRACH model for examining the correlation between stock returns and exchange rate. The results showed that higher correlation between emerging countries except Philippines. (Engle, R. F., & Granger, 1987) investigated the relationship between stock prices and exchange rates in Bangladesh. They considered monthly nominal exchange rates of US dollar, euro, Japanese yen, pound sterling and monthly values of Dhaka Stock Exchange General Index for period between June, 2003 to March, 2008. The results showed that there is no co integrating relationship between stock prices and exchange rates.

(Nishat, M., Shaheen, R., & Hijazi, 2004) explored the relationship between T-bills and the equity prices from Nigeria stock market for the period of 1997 to 2006. The regression analysis showed that decrease in the prices of T-bills leads to increase in the prices of equity. (Odhiambio, 2009) investigated the impact of T-bills on financial growth. The results showed that there was positive relationship between T-bills and financial developments. (Bhattacharya, 2012) revealed the relationship between market liberalization and macro-economic variables in Pakistan stock market. The results showed that T-bills having negative relationship in Pakistani stocks markets. The relationship between macroeconomic factors and stock returns is extensively investigated. The findings of the literature suggest that there is a significant linkage between macroeconomic factors and stock return. Results showed that there is positive relationship between Industrial production index and stock returns. (Mehra, 2006) explored relationships between industrial production, exchange rate and equity return and found unidirectional relationship.

(Johansen, S., & Juselius, 1990) explored relationship between industrial production index, exchange rate and stock returns. The results of their study indicated that there is positive relationship between stock prices and the industrial production. (Mukherjee, T. K., & Naka, 1995) and (Johansen, 1988) investigated the relationship between stock prices and exchange rate and the equity market. The results of both studies showed positive relationships between industrial production and equity market.

(Nishat, M., Shaheen, R., & Hijazi, 2004) discloses the impact of macroeconomic variables on equity returns and used consumer price index as the proxy of inflation. The results of this study showed that CPI negatively relates to equity returns. (Humpe, A., & Macmillan, 2009) investigated the impact of macroeconomic variables and the equity returns and showed that negative relationship of equity prices with consumer price index, (Odhiambio, 2010) investigated that market reacts differently in change of macro-economic forces. (Shiblee, 2009) explored the relationship between Consumer price index and share prices and found stronger positive effect on equity prices. (Abdul Aziz, M., Habibullah, M. S., Ngah, W., Saini, W. A., & Mohamed, 2000) and (Johansen, S., & Juselius, 1990) explored the association between equity prices and macro-economic variables. The results showed that there is no correlation between equity prices and the Consumer price index (Johansen, 1991).

DATA DESCRIPTION AND METHODOLOGY

This study explores the short run and long term causal relationship between macroeconomic variables on stock returns in Pakistan, India and Sri Lanka for the period 7/1997 to 12/2013 by using monthly data. The set of macroeconomic variables included in the study are Exchange Rate, T-bills, Consumer Price Index and Industrial Production Index.

DEPENDENT VARIABLE

The stock market returns are calculated by using the following equation:

\[ R_t = \ln \left( \frac{I_t}{I_{t-1}} \right) \]

Where: \( R_t \) is Return for month ‘t’; and \( I_t \) and \( I_{t-1} \) are closing values of KSE- 100 Index for month ‘t’ and ‘t–1’ respectively.

INDEPENDENT VARIABLES

Industrial production index (IPI)
IPI is the independent variables that has been used to measure the manufacturing production rate in the economy. It describes the overall economic activity in the economics of the country. It is hypothesized that an increase in industrial production is positively related to equity prices (see (Nishat, M., Shaheen, R., & Hijazi, 2004)).

**Consumer price index (CPI)**

Inflation rate is also used as a proxy for Consumer Price Index. It measures the average change in price of goods and service for the specific time period. (Bhattacharya, 2012) pointed the inverse relationship between inflation and the stock prices. Increase in CPI leads to increase in nominal T-bills and there is positive relationship between nominal T-bills and discount rate. So increase in CPI also leads to increase in discount rate (see (Miller, K. D., Jeffrey, F. J., & Mandelker, 1976)).

**Foreign Exchange Rate**

Exchange rate of individual countries has been taken because the basket of exchange rate could not be developed for the countries under study. The depreciation of currency is positive relative for the exporting economy and depreciation in currency for importing economy is negative relative (see (Johansen, S., & Juselius, 1990)).

**T-Bills Rate**

T-Bill rates also used as proxy of Interest rate. (Johansen, S., & Juselius, 1990) explored the same relationship in their study. Increase in T-bills rate will increase the cost of capital, the increases in T-bills will increase the production cost so it will decrease the prices of stocks. Rise in T-bills lead to rise in discount rate and the results in decrease in present value of future cash flows. Therefore, it is hypothesized that an increase in interest rate is negatively related to equity market returns (see (Johansen, 1988)).

**METHODODOLOGY**

The estimation approach in this paper involves two steps and combination of models. In the first step, we estimate the coefficients beta on the risk factors for each industry in each year using Generalized Method of Moments (GMM) approach to Time- Series regression (Engle, R. F., & Granger, 1987). Study focus on the GMM because, in our opinion, it is the most important innovation in empirical methods in finance within the past fifteen years. The approach is simple, flexible, valid under general statistical assumptions and often powerful in financial applications such as the estimation of the linear asset pricing models.

In order to obtain more efficient and consistent estimates of the parameters, (Johansen, 1988) developed the Generalized Method of Moments (GMM) and (Johansen, S., & Juselius, 1990) developed the System Generalized Method of Moments (SGMM) estimation models where there are no initial condition restrictions (Bhattacharya, 2012). These methods utilize more instrumental variables that hold some important properties (Bahmani-Oskooee, M., & Nasir, 2004). One of these is that independent variables uncorrelated with the subsequent disturbances for error terms. The second one is that the instrumental variables are uncorrelated with the disturbances. The third one is that the instrumental variables are highly correlated with those variables that are used as instruments. Finally, that the disturbances are serially uncorrelated. These assumptions should be tested beforehand in order to obtain consistent and unbiased estimates. In this paper, all of these methods will be applied and compared. Furthermore it should be noted that when the number of time periods is small, the A&H estimator may be subject to a large downward finite-sample bias. This problem may be eliminated with the inclusion of explanatory variables. These methods are applied to the stock exchange and macroeconomic data in panel type studies.

Moreover, study chose to use the GMM model because of their main advantage. Firstly, unlike the maximum likelihood (ML) estimator, the GMM estimator does not require the specification of the joint distribution of the observed variables. Secondly, in the GMM model, the instrument vector does not need to be economically exogenous. The only requirement is that this vector be predetermined in the period when the agent forms his expectations. Both past and present values of the variables in the model can be used as instruments. Model estimator is consistent even when the instruments are not exogenous or when the disturbances are serially correlated

\[ R_{it} = c + \beta_{1}Bills_{it} + \beta_{2}Bills_{it-1} + \beta_{3}Bills_{it-2} + \varepsilon_{it} \]

\[ (1) \]

The daily return \( R_{it} \) is computed with this ( Theriou et al., 2010):

\[ R_{it} = \log \left( \frac{T_{it}}{R_{it-1}} \right) \]

\[ (2) \]

Where i is the company, t is the time, \( R_{it} \) is the return of industry i stock on stock t, c is a constant. \( \beta_{i} \) are estimated coefficients denoting the T-bills, exchange rate, CPI & IPI. This coefficient is estimated by GMM Model.

In the second step, a pooled data set consisting of the stock returns and the risk factor betas for each industry from equation (1) using GMM data estimation. Equation 3 is an unconditional relationship between return and risk factors.

\[ R_{it} = \beta_{i}Y_{it}^{t-bills}Y_{it}^{t-bills-1} + \gamma_{i}Bills_{it} + \gamma_{i}Bills_{it-1} + \varepsilon_{it} \]

\[ (3) \]

Where \( \beta_{i} \) is the coefficient estimated from the first step for each stock/Company in time t.

**DATA ANALYSIS**

**Descriptive statistics (Pakistan)**

Table 1 shows the descriptive statistics of macroeconomic variables and the stock returns of Pakistan. It includes the mean, standard deviation, skewness, kurtosis and range etc. Result shows that the index return is 8.2% with 7% standard deviation, the other variables exchange rate, Consumer price index, industrial production rate, and the T-bills rate are respectively 4.06%, 4.55%, 4.37%, -0.4112% have returns and 1.4%, 2.1%, 2.6%, 5.1%, have standard deviation.

**Descriptive statistics (India)**

Table 2 shows the descriptive statistics of macro-economic variables and the stock returns of India. It includes the mean, standard deviation, skewness, kurtosis and range etc. Result shows that the Index return is 8.80% with 5.1% standard deviation, the other variables Consumer price index, industrial production rate, T bills rate and the exchange rate respectively 4.58%, 4.54%, 2.48%, 3.79%, have returns and 1.6%, 2.1%, 0.8%, 5% have standard deviation.

**Descriptive statistics (Sri Lanka)**

Table 3 shows the descriptive statistics of macro-economic variables and the stock returns of Sir Lanka. It includes the mean, standard deviation, skewness, kurtosis and range etc. Result shows that the Index return is 7.12% with 05.9% standard deviation, the other variables Exchange rate, T Bills rate, Consumer price index and Industrial production respectively 4.5%, 0.11%, 4.53%, 4.66%, have returns and 1.7%, 7.5%, 3.0%, 4.9% have standard deviation.

The results reflect that the Exchange rate & T-Bills have statistically significant values and can greatly influence the stock return in both short & long run. The Exchange rate has positive relationship with stock return, while T-bills & Consumer Price Index has negative relationship with the stock return. The Industrial Production Index also has the positive relationship with the stock return. The two variable of significance in the study are the Exchange
Rate & T-Bills which reflects that the stock return can vary greatly with the increase in both T-Bill rate & Exchange Rate. The Increase in the exchange rate results in the increase in the stock return & the increase in the interest rate on T-Bills can decrease the stock return as well as the value of underlying stock. The results are consistent with the related studies (Hasan, A., & Nasir, 2008) & (Menike, 2006).

<table>
<thead>
<tr>
<th>Stock Index</th>
<th>T-Bills</th>
<th>Ex Rate</th>
<th>CPI</th>
<th>T-Bills</th>
<th>Ex Rate</th>
<th>CPI</th>
<th>T-Bills</th>
<th>Ex Rate</th>
<th>CPI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>8.29731</td>
<td>-</td>
<td>4.06872</td>
<td>4.55836</td>
<td>4.37374</td>
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</tr>
<tr>
<td>Standard</td>
<td>0.07271</td>
<td>0.05111</td>
<td>0.01465</td>
<td>0.02163</td>
<td>0.02638</td>
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</tr>
<tr>
<td>Median</td>
<td>8.54095</td>
<td>-</td>
<td>4.08514</td>
<td>4.45851</td>
<td>4.39270</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1: Descriptive statistics -Pakistan

Table 2: Descriptive statistics -India

Table 3: Descriptive statistics -Sri Lanka

Table 4: GMM estimates

CONCLUSION

The study has used the GMM approach for the impact of macroeconomic variables on stock returns. Results of GMM coefficients reveal that consumer price index and the industrial production index are statistically insignificant while T-bills and the exchange rate have significant long run effect on Stock returns of Pakistan.

Based on the above findings we can derive some important policy implications. T-Bills have negative effect on stock return so regulatory institutions should properly regulate the T-Bills rates so investors move in the stocks market resulting in higher level of productive cash flow for the economies. In a country’s economic environments, significant macro-economic variables should be properly regulated for optimum benefit to the economy.

The study was limited to the fact that the data for the limited time period was available. The policy makers do not portray all the rationale behind a particular shock to macro-economic factors. The goal to why and how much shock is to be given always remains under a cloud and ambiguous. Thus the policy making, beneath observation of the statistical guideline, might not have been followed strictly by the policy makers. Conceding the argument, the shock other than the macro economic shock may also influence the stock prices.

REFERENCES


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