Relationship between Macroeconomic Variables and KSE-100 Index: Evidence from Pakistan

Nadeem IQBAL¹, Sajid Rahman KHATTAK², Muhammad Arif KHATTAK³

¹Faculty of Business Administration, BZU Sub Campus, Dera Ghazi Khan, Pakistan, Email: dmadeemiqbal1@gmail.com
²Muhammad Ali Jinnah University Islamabad, Email: Sajidtk99@yahoo.com
³Faculty of Management Sciences, Muhammad Ali Jinnah University Islamabad, E-mail: Arif@jinnah.edu.pk

Abstract
The present study aims to investigate the relationship of macroeconomic variables on stock returns in Pakistan. The study used monthly data from January 2001 to December 2010. For data analysis, different econometrics models were used such as auto regressive distributed lag (ARDL), augmented dickey fuller (ADF), vector error correction model (VECM) are used. The study found that there is short as well as long run relationship exists between macroeconomic variables and stock returns. Money supply, exchange rate, and consumer price index have significant long run relationship with stock prices, while oil prices have no significance relations with stock returns. In short run money supply and exchange has positive significant relation with stock returns, while consumer price index and oil prices have no significant relation with stock returns.

Key words: Macroeconomic Variables, KSE-100 Index, ARDL, VECM, ADF, Pakistan

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1. Introduction
Capital markets play an imperative role in the financial sector of the economy. Efficient capital market stabilizes financial sectors and promotes economic growth and prosperity which help to provide important investments channels that contribute to attract domestic and foreign capital. According to Fama (1970) efficient market is one where stock prices quickly adjust with the information, so there is no use of historical information and they cannot forecast future stock prices, and the market should react to readily available new information. The relationship between macroeconomic variables and stock returns is being continuously studied by different academic, economists, and practitioners (e.g. Chen et al, 1986; Mukherjee and Naka, 1995; Cheng and Ng, 1998; Kown and Shin, 1999; Mayasmi and Koh, 2000; Quadir, 2012; Kuwornu et al, 2011; and Buyaksalvarci, 2010) over the last few decades. It is often believed that macroeconomic variables such as inflation rate, interest rate, exchange rate, oil prices industrial production, gold prices determined the stock prices. A numbers of studies shows their effect on stock returns in different countries and found different results. To examine the relationship between macroeconomic variables and stock returns two main theory support it which is Arbitrage Pricing Theory (Ross, 1976), and Discounted Cash flow or Present Value Theory. APT (Ross, 1976) is considered the most applicable or valuable theory of linking macroeconomic variables with stock returns. In today competing market investor's shifts their investments from one source namely banks to competing stock markets. In emerging economies financial sectors development aimed to shifts their financial system from one bank-based to security market-based. To facilitate economic growth deregulations and liberalization occurs in most emerging economies. Interest in the financial markets and the labors to conjecture their performance is associated to the growing recognition among financial analysts, policy makers, and academicians of the increasing impact of macroeconomic variables on stock markets. Investment in stock markets is more profitable than other sources of investment, but one may considered the risk associated with these stocks. Most investors invest in stock market by purchasing shares of respective companies for the purpose to maximize their wealth, but most of them do not consider the risk associated with these stocks in the form of macroeconomic variables such as inflation rate, interest rate, exchange rate, oil prices, industrial production etc may cause adverse effect on their investment and bear loss instead of profit.
The rest of the paper is organized as follows: section two focuses on reviewing existing literature; section three present theoretical framework and methodology; section four discuss the results of the study and section five conclude the paper.

2. Literature Review

According to market efficiency theory it is difficult for investors to get access returns because stock prices adjust very rapidly to the available information, therefore stock prices replicate all available information about the stock prices. So it is difficult for investors to forecast future stock movement because efficient capital market incorporates new information quickly and completely. But we know that stock prices reflect expectations of future performance of the firm’s earnings or profits. So, stock prices should be used as indicator of economic activities. To guide a nation’s macroeconomic policy, relationship between stock prices and macroeconomic variables can be used (Mayasmi et al, 2004).

Net earnings of the company’s determine stock prices. It depends on how much the profits the company is earning in the near future or in the long-run. It is know that the company will earn more in the coming year or years creates expectations about stock prices to move upward or increase are also high. Stock prices will rise due to positive expectations. On the other hand, if the above case is reversed, means that the company did not perform well in the coming years will generate negative expectations about stock prices, which lead to decrease the stock prices. We simply say that, there is a direct relationship between stock prices and company performance. Increase in inflation will decrease the company earnings (worth) will also affect stock prices and eventually the market returns. A lot of research studies investigated the relationship between macroeconomic variables and stock returns and found that they were associated with the risk-return of stock (Gangemi et al, 2000).

Chen et al, (1986) studied the impact of economic forces on stock returns by using APT. they found that variables such as inflation rate, interest rate, exchange rate, industrial production, and bond yield have impact on stock market. Chatrath et al, (1997) investigated the relationship between inflation and stock prices of Indian Stock Market. The study found a negative relationship between stock returns and inflation. Zhao (1999) found a strong relationship exist between stock returns and inflation in China Stock Market. Omran and Pointon (2001) explored the relationship between stock returns and inflation in Egypt and found negative relation exist between them.

Besides there negative relationship some study also found positive relationship between stock prices and inflation as well such as, Choudhry (2000) found a positive relationship between inflation and stock prices in four highly inflated countries. Mayasmi et al, (2004) also found positive relation exist between stock prices and inflation. Mohamed et al, (2007) studied the effect of macroeconomic variables on stock returns in Malaysia. They found a positive relationship between stock prices and inflation. Engsted and Tanggaard (2002) found a weak positive relation between inflation and stock returns in US and found a strong positive relation in Denmark.

According to “Fisher effect” expected nominal rates of interest on financial assets should move one to one with expected inflation (Fisher, 1930). Further changes in both rates were expected to affect the discount rate in the same direction (Mukherjee and Naka, 1995). Therefore interest rates are expected to be negatively related to stock returns (Abujee, 2008). Increase in interest rate would also increase the required rate of returns and thus decrease the stock returns, so stock returns will decrease when interest rate is increase. Hayworth (1983) found that there is a positive relationship among stock returns and money growth and inflation, while negative relation exists between stock returns and interest rate.

The relationship between stock returns and exchange rates are based on simple financial theory. Exchange rate as a monetary variable as an indicator of a currency that effect stock prices in a same way to inflation variables. When depreciation occurs in the domestic currency against foreign currencies, prices of exported goods decrease and, consequently, the export of country will increase, assuming that the demand for these goods is elastic. Appreciation in the country currency decreases the cost of imported goods. According to Pebbles and Wilson (1996) an appreciating currency is generally accompanied by increases in money supply, reserve, and a decrease in interest rates. Bilson et al, (2001) found that exchange rate has negative relationship with stock returns. Besides there negative relationship, some studies also found positive relationship between stock returns and exchange rates such as, Mukherjee and Naka, (1995) found a positive relationship between stock prices and exchange rates in Japan and Indonesia, both two are considered a large export countries. Gazi and Hisham (2010) explored the relationship between macroeconomic variables and stock returns in Jordan Stock Market. They found that oil prices, trade surplus, money supply and foreign exchange reserves have long run effects on Jordanian Stock Market. They also found a negative relation between crude oil prices and stock market returns. The above literature led us to the following hypothesis:
Hypothesis 1: There is a negative effect of CPI on KSE-100 Index.
Hypothesis 2: There is a negative effect of oil prices on KSE-100 Index.
Hypothesis 3: There is a negative effect of foreign exchange rate on KSE-100 Index.
Hypothesis 4: There is a positive relationship of money supply and KSE-100 Index.

3. Theoretical Framework and Methodology

Arbitrage Pricing Theory is generally the theory of assets pricing that has become influential in the pricing of assets. APT was developed by Stephen Ross in 1977. The arbitrage pricing theory (APT) offers a testable alternative to the capital asset pricing model. The CAPM predicts that security rates of return will be linearly related to a single common factor - the rate of return on the market portfolio. The APT is based on similar intuition but is much more general. APT assumes that the rate of return on any security is a linear function of k factors.

\[ E(r_i) = r_f + \beta_{i1} f_1 + \beta_{i2} f_2 + \ldots + \beta_{ik} f_k + \epsilon_i \]  

Where:
- \( E(r_i) \) is the random return of asset i;
- \( r_f \) is the risk-free return on asset i;
- \( \beta_{ik} \) is the sensitivity of the assets' return to the k factor;
- \( \epsilon_i \) is random error.

3.1. Methodology

This study explores the relationship between macroeconomic variables and stock returns in Pakistan. The study takes KSE-100 Index (stock returns) as a dependent variable and exchange rates, oil prices, narrow money, and CPI as independent variables. We take the monthly data from January 2001 – December 2010 from the database of KSE, on the basis of which we can analyze different measures in order to realize how the variations in the macroeconomic variables may affect stock returns.

The dependent variable used is Karachi Stock Exchange-100 Index (KSE-100 returns). It is calculated by using the following equation:

\[ R_t \cdot \ln (P_t) - \ln (P_{t-1}) \]  

Where:
- \( R_t \) is the returns for the month t;
- \( P_t \) and \( P_{t-1} \) are the closing values of KSE-100 Index for the month t and t-1 respectively.

The explanatory or independent variables are explained in the following paragraph.

3.2. Research Model

Different methods are used to check the relationship between macroeconomic variables and stock prices. This study examined the effect of macroeconomic variables on KSE-100 Index by using ARDL model. We used this approach because there is a stationary problem in data, some data are stationary at level while some are at 1st difference. This model of co-integration has several advantages over other co-integration procedures. When some data are at level and some are stationary at 1st difference then ARDL approach is widely used. To check the long-run effect of macroeconomic variables we used the following equation:

\[ \ln R_t = \beta_0 + \sum \psi_i \ln R_{t-1} + \sum \eta_i \ln CPI_{t-1} + \sum \lambda_i \ln Oil_{t-1} + \sum \delta_i \ln FEX_{t-1} + \sum \lambda_i \ln M1_{t-1} + \mu_t \]  

Where:
- \( \ln R_t \) = Log of KSE-100 Index;
- \( \ln CPI_t \) = Log of Consumer Price Index;
- \( \ln FEX_t \) = Log of Foreign Exchange Rates $/ Rs;
- \( \ln Oil Prices \) = Log of oil prices in $;
- \( \ln M1_t \) = Log of Money Supply.

To confine the short-term phenomenon of the variables an error correction model is applied. Error correction model is represented as follow:

\[ \Delta \ln R_t = \beta_0 + \sum \Delta \ln CPI_{t-1} + \sum \lambda_i \Delta \ln Oil_{t-1} + \sum \delta_i \Delta \ln FEX_{t-1} + \sum \lambda_i \Delta \ln M1 + EMC + \mu_t \]  

By employing cumulative sum (CUSUM) and cumulative sum square (CUSUMSQ) tests is to estimate long term and short term coefficients stability. If the plots of CUSUM and CUSUMSQ statistics stay within the critical bands of 5 percent level of significance then model is structurally stable.

4. Empirical Results

ADF test is used to check the stationary of data. The table shows that some data are stationary at level such as CPI, X Rate and KSE, while some data are stationary at first difference such as M1 and oil prices at 5% confidence level. If some data are stationary at level and some at first then ARDL is the mostly used technique. We did not use PP test because there is no issue of data normality, if there is an issue of normality then PP is more favorable than ADF.
Table 2 shows ADF test results. Table 1 shows diagnostic statistic of the study. The results show that there is no issue of serial correlation, function form, normality, and heteroskedasticity in the data. Table 3 displays the results of long run ARDL approach. The results show that money supply, consumer price index, and exchange rate have significant long run relationship with stock prices in Pakistan, while oil prices have insignificant relation with stock returns. Logically money supply increases the liquidity of money flow in the country which ultimately increases stock prices Maysami and Koh (2000). The study results are supported by many studied such (Hassan and Nasir, 2010).

ECM results shows that M1 and X rate has a significant and positive relationship in short run with stock returns, while CPI and Oil prices has insignificant relations with stock returns in short run in Pakistan. R² show the explanatory power of the model which is 31.57% and the Adjusted R² is 29.16%. F. prob is significant and the value of Durban Watson is 2.013 which proof that there is no issue of autocorrelation in the data. Figure 1 and 2 shows CUSUM and CUSUMSQ are between the two critical lines which proof that the model is structurally stable.

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5. Conclusions
Research shows that macroeconomic variables have both positive and negative effect on stock returns. Research also showed that some macroeconomic variables affect stock returns for only short run while
some for long run depends upon the country circumstances. The aim of this paper is to investigate the effect of macroeconomics variables on stock returns in Pakistan. The study use monthly data from January 2001 to December 2010. For data analysis Auto Regressive Distributed Lag model (ARDL). ARDL is use instead of Co-integration because some data are stationary at level while some are at 1st difference, in such case ARDL is more recommended by researcher. Macroeconomic variables include money supply (M1), consumer price index (CPI) as a measure of inflation, exchange rate (X Rate), and oil prices. The study found that money supply, consumer price index, and exchange rate have positive and significant relationship with KSE-100 Index or stock returns, while money supply and exchange rate also have a positive and significant relationship in short run as will, but consumer price index and oil prices have a positive but insignificant relationship in short run in Pakistan. The result is supported also by previous studies also such as (Hassan and Nasir, 2010). The results reject our three hypotheses that CPI, X rate, Oil prices have negative relationship with stock returns, but the study found positive relations. Although the study have good insight but also have some limitation as well, if the study used more macroeconomic variables the research will be more clear, also if the selected time was more (20 years) will also be good for study. So, it is for future implication to use more macroeconomic variables and select long time horizon will gives a good results.

References