Impact of Macroeconomic Variables on Stock Returns of Chemical Industry in Pakistan

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Abstract

This study investigates the impact of macroeconomic variables on stock returns at the industry level. The macroeconomic variables used in this research are interest rate, GDP growth rate, exchange rate, and inflation rate. This study uses the yearly data of chemical industry listed in Karachi Stock Exchange. Yearly data has been collected from 2002 -2009. The effect of macroeconomic variables on stock returns is studied with the help of multiple linear regression analysis. This research reveals a significant positive relationship between stock returns and exchange rate. It has also been observed that inflation negatively affects stock returns and the relationship is significant. On the other hand, GDP positively affects stock returns of chemical industry but relationship is insignificant. Similarly, it has been found that interest rate negatively affects stock returns but the relationship does not appear to be significant.

***Keywords*:** Stock returns, Macroeconomic variables, multiple linear regression model, Karachi Stock Exchange.

Introduction

Finance theory demonstrates that investors put their money in banks or buy stocks to get something extra for the money invested. Investor always desires for high returns and less risk (Downs, 2005). Studies prove that high returns are attached with high risk. The choice of investors regarding which security to invest in depends on their risk preference. According to Keown, Martin, Petty and Scott (2005) there are two types of risk i.e. systematic and unsystematic risk. According to CAPM theory, returns which investors receive are only for the non-diversifiable risk involved. Chiou and Robert (2007) claims that administration of risk is important for success of the business.

Stock market is a secondary market where investors buy and sell out securities. On the basis of studies mentioned in the literature section, long list of factors that can affect stock prices i.e. EPS, DPS, firm size, future plans, profitability, GDP, interest rate, CPI, exchange rate, and Government regulations, etc are determined.

Previous studies mentioned in the literature show that fluctuations in macroeconomic variables affect economy either directly or inversely. GDP, inflation, unemployment rate, interest rate represents current and future performance of the economy. GDP increases with the growth of the economy and vice versa. Inflation rises when economy is growing due to increase in demand for goods and it is normally lower down in recession of the country. But sometimes inflation continues to rise during recession due to growth of money supply. High real interest rate negatively affects economic growth because it increases borrowing cost and shrinks profits on investments. Rise in interest rate lower borrowings and promote savings which leads to little investments and expenditure. Other consequence of high interest rate is appreciation of the value of domestic currency which leads to decrease in exports. GDP decreases, currency depreciates, and inflation goes up in country facing recession. These and other macroeconomic variables affect companies in negative manner because companies incur losses, incapable to cover their costs of business due to decrease in sales, high inflation and money supply.

Literature Review

It has always been disputed that macroeconomic factors influence stock prices and in turn stock return. Government policies (fiscal and monetary) have vast influencing power on financial activities as well as on stock market. This encourages researchers to explore the consequence of macroeconomic variables on stock returns.

Cheng (1995) find out that supply of money directly affects stock returns while interest rate and returns on stocks have inverse relation in UK stock market. While, Hussain and Tariq (1999) recommend that stock prices is affected by money supply (M2) in short and long period of time. However, Mukherjee and Naka (1995) examined the relationship through application of VECM on monthly data of Tokyo Stock Exchange and determined that share prices react positively to change in exchange rate, industrial production (GDP) and money supply whereas association between share prices and inflation and interest rate is negative.

Another study conducted by Nydahl (1999) opines that exchange rate significantly affects stock returns of 26% of the firms. He further found out that more sensitive to exchange rate are those companies which are more dependent on outside country‟s transactions while companies which are employing derivatives are nearly covered from risks of exchange rate. However, Mansor (2000) explored associations between share prices and exchange rate in Malaysia stock market. He discovers exchange rate is causal correlated with share prices in the short run but no relationship in the long run. In another research, conducted by Griffin and Stulz (2001) determined that there is insignificant economic importance of variations in exchange rate on stock value of industries because firms use different techniques to turn away this risk. However, Joseph (2002) studied the outcome on chemical, Pharmaceuticals, engineering, and electrical industries‟ returns on stocks of interest and exchange rate in UK. He concluded that interest rate deviations highly affect firms as compared to exchange rate.

Maysami and Koh (2000) stated that inflation, rise in money supply, change in interest rate have co-integrating relationship with fluctuations in Singapore stock exchange both in short and long period of time. While, Ralph and Eriki (2001**)** determined that Inflation affect stock prices negatively examined in Nigeria stock market utilized information of 18 years (1980-1997). They also stated that financial deregulations, GDP, interest rate, and money stock strongly moves share prices. Kimyaz (2003) determined that firms listed in Istanbul stock exchange are greatly sensitive to exchange rate fluctuations especially financial, textile, chemical and machinery industries. He further found out that companies which are highly dependent on exports and imports are extremely sensitive to exchange rate. Similarly, Tsoukalas (2003) found out that in Cypriot stock market, stock prices and chosen macroeconomic variables (CPI, GDP, supply of money, and Exchange rate) are strongly related. But share prices are more volatile with respect to exchange rate because its economy depends on tourism and foreign banking by analyze stock prices from 1975 to 1998 through vector Autoregressive model (VAR). However, Maysami, Howe and Hamzah (2004) used VECM and discover that returns on stock market of Singapore and property index are affected by all selected macroeconomic variables. Specifically, he finds that exchange rate, inflation and returns on stock market in Singapore move in same direction and different sectors behave differently.

Nishat and Shaheen (2004) found that stock values are strongly affected by GDP in positive direction but inflation significantly depresses prices of stock in Pakistan. Results

of Granger causality show that macroeconomic variables cause variations in stock prices. Another research conducted by Merikas and Merika (2006) concluded through VAR model, stock price reacts negatively to variations in real economic variables but stock prices reacts negatively to inflation. However, Gan, Lee, Yung and Zhang (2006) determined that movement in stock market and inflation, interest rate, money supply, exchange rate and GDP in real terms and domestic retail oil prices are linked in New Zealand. Sohail and Hussain (2009) uncover that in the long run price of stocks react negatively to consumer price index, while it reacts positively to the rest of the macroeconomic factors except three month T-bill rate to which it have insignificant positive reaction.

Gunsel and Çukur (2007) explore the validity of arbitrage Pricing Theory (APT) in London Stock Market and determine that impact of each factor is different in different industry. Some industry stock prices are positively affected while others are negatively affected by the same factor. For example: they discover that exchange rate and returns of building materials and merchants moves in inverse direction while returns of chemical industry reacts positively to exchange rate, others have diversified their risk. Hyde (2007) utilizes data of four European countries and found that stock returns are changed with variation in stock market in all the four countries. Exchange rate is related to stock returns and at industry level, it is significant in all the selected European countries while relation between instability in interest rate and stock returns is significant only in Germany and France. Kandir (2008) disclose that interest rate, exchange rate (due to rise in tourism services and overseas trade) and returns on stocks are correlated, whereas significant inverse affiliation between inflation and portfolio return is only for three portfolios. On the contrary, shares return and supply of money, oil prices and industrial production is not significantly linked to each other.

Leon (2008) concluded that interest rate negatively move market return and insignificant positive impact on conditional variance of returns. He further said that interest rate has good predictive influence for return on stocks and it has a feeble projecting influence on volatility. Similarly, Zafar, Urooj and Durrani (2008) took the stock returns data and 3-month T-bill rate data beginning at January 2002-June 2006. His findings are similar to N. dri. Konan Leon (2008) in case of impact of interest rate on market returns because when there is rise in interest rate, people choose to invest in banks instead of stocks due to which prices of stock decreases.

Vardar, Aksoy and Can (2008) used Generalized Autoregressive Conditional Heteroscedasticity models (GARCH) and daily data for stock prices from 2001 to 2008. Each sector behaves differently in response to change in interest and exchange rate depending on the composition of each sector listed in Istanbul Stock Exchange. Exchange rate and inflation rate is also negatively related to stock returns. While, Alam and Salahuddin (2009) found effect of interest rate on share prices for both developed and developing countries is mixed. They determined that interest rate and movement in interest rate and stock prices is inversely related in all countries excluding Philippine. Whereas, Aydemir and Demirhan (2009), Exchange rate affect stock prices. But the extent and type of their relationship is different in each country. Exchange rate negatively affects stock market indices in Turkey. On the other hand, Frimpong (2009) used co-integration analysis for long term and vector error correction model for short term relationship analysis. He discovered that in the long run stock cost (price) has a

significant negative response to the macroeconomic variables excluding exchange rate which is positively related to stock returns. In the short run, he found out that all macroeconomic variables affect GSE All-Share Index negatively except exchange rate but impact of inflation and money supply is not significant.

Mohammad, Hussain and Ali (2009) unearthed that foreign exchange and stock prices moves in same direction. Rise in industrial production leads to rise in stock prices. Rahman and Jashim Uddin, (2009) apply Johansen technique and Granger causality technique to study the correlation between exchange rate and prices of stocks of firms of three countries stock exchange in South Asia and found no causal link. On the other hand, Rahman, Sidek and Tafri (2009) found out that Malaysia stock market is negatively related with exchange and interest rate and supply of money in the long run.

Significance of the Study

This research is conducted to increase awareness of investors and brokers and it also endeavor to add to body of literature because little amount of research is focused specifically on chemical industry. Chemical industry is very important for economic development of the country because all manufacturers make use of chemicals in different forms. It is used in almost every industry. Pakistan is agricultural country and agriculture now a day is greatly reliant on fertilizers, pesticides, soil treatment chemicals, insecticides, etc. to get better and large amount of products to fulfill demands of people of the country. Israr khan, (2009) analyzed chemical industry globally and found out that more than 70,000 products are manufactured in this industry internationally. Chemical industry is key contributor to economic development of countries worldwide but its role in Pakistan is insignificant due to shortage of investment.

Stock returns are affected by number of factors. Effects of macroeconomic variables lead to market risk which has positive or negative effects on all industries but due to firm and industrial factors the extent may be different. An awareness of the effect of fluctuations in macroeconomic variables on returns of different industries stocks would be beneficial for investors, finance practitioners, economists, and for academic purposes. By discovering the sensitivity of returns of different industries to fluctuations in macroeconomic variables, investment managers may be able to protect themselves from losses due to fluctuations in macroeconomic variables. Investors will be unable to get profit by investing in stocks if they do not know the effects of macroeconomic variables on industry returns. For example if a company stock returns decreases due to rise in interest rate, managers can hedge against the loss by shifting his investment to stock that are less affected or not affected by interest rate fluctuations.

Theoretical Framework

On the basis of previous research, stock returns is selected as dependent variable and four macroeconomic variables are selected as independent variables i.e. inflation rate, exchange rate, interest rate and gross domestic product.

Methodology

This research is based on positivistic paradigm in which secondary data was analyzed. The scope of this study is to deliver practical suggestion to investors and brokers of Pakistan. Therefore the population of this research includes companies listed in Karachi Stock Exchange. Due to importance and negligence of chemical industry by previous researchers, it is selected. 25 companies are selected through simple random sampling from chemical industry listed in Karachi Stock Exchange (KSE).

Secondary data of five variables employed in this research out of which independent are four and dependent is one (stock returns) studying the behavior of companies from 2002- 2009. Data was gathered from website of Business recorder, a financial daily KSE website, and economic survey of Pakistan (various issues), companies‟ website, and online articles published in different journals.

Purpose of the Research

The purpose of this study is to examine the return on stocks of chemical industry of Pakistan and their reaction to variations in exchange rate, inflation, interest rate, and GDP (sources of risk) using companies listed in Karachi Stock Exchange (KSE) in a given period i.e. 2002 to 2009. It is to help investors and brokers to get high profits and minimize their risk.

Research Hypothesis

A large and growing body of literature has investigated the relationship of macroeconomic variables and stock return by investigating different economies with different statistical models. This research tested the following assumption about stock return and macroeconomic variables.

H1: Stock returns of chemical industry are significantly positively affected by GDP, interest rates, exchange rate, and inflation rate.

Model

A multiple regression will be used to analyze the impact of macroeconomic variables on stock returns on chemical industry. After putting macroeconomic variables as independent variables on the right side and stock returns on the left side as dependent variables, the following model is developed;

$SR = \alpha + \beta 1\ (IFR) + \beta 2\ (ITR) + \beta 3\ (GDP) + \beta 4\ (ER).$

Each acronym represents different variable as;

SR= Stock Return

IFR = Inflation Rate

ITR = Interest Rate

GDP = Gross Domestic product

ER = Exchange Rate

b = slope of the variable

a = intercept

Dependent Variable

Return on stocks

Return can be obtained in different forms e.g. interest, profits or loss, net income, capital gain or loss. Expected return is always positive but realized return can be positive, negative or zero. Return can be calculated through different methods. But this study‟s main emphasis is on holding period return of common stocks. Stock returns are most of the time calculated for holding periods such as a month, a quarter or a year.
Return is usually expressed in the form of percentage. It can be calculated for a single period (also called annual return) or for multiple periods (also called annualized return).

Return= (Capital Gain +D1)/P1

P2-P1= capital gain

P1= Purchase price of share

P2= current market value

D1 = Dividend (not reinvested)

Independent Variables

1. Gross Domestic Product

GDP is used to determine prices of goods and services manufactured in a year within a country in market and it is exercised to evaluate economic development of a country. GDP incorporate all Government and private expenditures, goods and services manufactured exports less imports, and inflation to correctly represent the goods and services of a nation (S.E. Smith, 2010). It is easy to evaluate economic health of a country in a current year against previous year due to obvious calculation of GDP. But there are some discrepancies in GDP calculation i.e. it doesn‟t consider value of underground markets transactions (black and gray), quality and purpose of goods and services for which it is produced (they may be manufactured to recover the country from

disaster not for economic growth), does not allow for variation in prices and unpaid work at home GDP incorporate earnings of the foreigner which they have earned domestically, however it does not incorporate earning of the citizens that they have earned in foreign countries (S.E. Smith, 2010).

Stock Returns and Output Growth

Industrial production and stock returns are positively related because both share prices and dividends increase with rise in industrial production due to enhancement of revenue of firms and industries (Nishat and Shaheen, 2004) and (Mohammad, et al., 2009).

2. Interest Rate

Interest rate is amount of extra money paid by borrower for the use of money (credit) of someone else or return on deposited money received from someone else (bank) and it is usually charged on yearly basis (Mike Moffat, 2010). It is expressed as percentage of the principal on annual basis.

Stock Prices and Interest Rates

Stock prices react negatively to variation in interest rate. Stock prices fall due to two reasons i.e. Production costs increases with rise in interest rate which leads to decrease profits and dividends decreases and second reason is opportunity cost increases due to rising interest rate and people will prefer to invest in banks. Stock prices are negatively related to (RRR) required rate of return (Nishat and Shaheen, 2004) and (Mohammad, et al., 2009).

3. Exchange Rate

Mike Moffat "Exchange rate is value of currency at which it can be converted to other currency e.g. on 4th March, 2010, 85 Rupees is equivalent to one US $.

Exchange rate and stock returns

Due to increase in international trade, any change in exchange rate (depreciation of currency) affects the profits of firms and in turns stock prices decreases (Günsel and Çukur). Stock prices decrease due to decrease in the worth of currency due to expected inflation (Ajayi and Mougoue, 1996). So it means that returns on stocks are positively related to exchange rate of a country but some researcher think that stock prices is negatively related to value of currency in terms of another currency because decrease in worth of currency leads to increased exports which leads to increased profits (Murinde & Poshakwale,2004).

4. Inflation

Kimberly Amadeo (2009) "Inflation is when the prices of most goods and services continue to creep upward called consumer price index (CPI)."

Stock Returns and Inflation Rate

Stock prices and unexpected inflation is negatively related because profits and borrowings of firms are badly affected (due to variation in cash flows and discount rate) by unanticipated inflation (Nishat and Shaheen**,** 2004) and (Günsel and Çukur, 2007).

Results

After analyzing the selected data through regression, we will come up with the conclusion of the research, if other variable that may influence stock returns are kept constant.

Stock Return of Chemical Industry and Macroeconomic Factors Data

The table given below provides data of average stock returns of chemical industry, GDP, inflation, exchange and interest rates from the year 2002 to 2009.

Tabel 1

Annual Data of Stock returns, GDP, Inflation, Exchange and Interest Rate

Years	Stock Returns(% age)	Interest Rate (% age)	GDP (% age)	Exchange Rate (Rs/$)	CPI (% age)
2002	77.09	11.81	3.1	61.4258	3.54
2003	61.97	6.81	4.7	58.4995	3.1
2004	68.68	5.33	7.5	57.5745	4.6
2005	8.89	8.22	9	59.3576	9.3
2006	-4.06	10.47	5.8	59.8566	7.92
2007	51.29	10.6	6.8	60.6342	7.8
2008	-17.97	12.73	4.1	62.5465	12
2009	3.35	13.76	2	78.0495	22.3

Source: Business recorder website and annual reports of selected companies
Economic Survey of Pakistan, (2008-09)

Table 1

Model Summary

Model Summary R square	Adjusted R Square	F	Sig	Durbin-Watson
.896	.758	6.478	0.078	2.26

a. Predictors: (Constant), Exchange rate, Gross Domestic Product, Interest Rate, Inflation Rate
b. Dependent Variable: Stock Returns

Table 3

Coefficients

Model	Un standardized Coefficients		Standardized Coefficients	t	Sig	Colinearity Statistics	
	B	Std. Error	Beta			Toler -ance	VIF
Constant	-6.114	2.720		-2.248	0.11		
Inflation Rate	-15.018	4.194	-2.320	-3.581	.037	.082	12.137
Gross Domestic Product	8.225	6.815	0.516	1.207	.314	.189	5.280
Interest Rate	-0.717	4.420	-0.056	-0.162	.882	.286	3.494
Exchange Rate	0.118	0.041	2.077	2.886	.063	.067	14.984

The results of regression model give values of coefficients of inflation rate, interest rate, GDP, and exchange rate.

$SR = \alpha + \beta 1\ (IFR) + \beta 2\ (ITR) + \beta 3\ (GDP) + \beta 4\ (ER)$

Stock Returns = −6.114 −15.018 (IFR) – 0.717 (ITR) + 8.225 (GDP) +0.118(ER)

The regression results revealed that stock returns have linear relationship with the independent variables. 1% change in GDP will move stock returns by 8.225% in upward direction and 1% increase in Inflation will bring shift in stock returns by 15.018% in downward direction and vice versa. 1% decrease in Exchange Rate will bring downward adjustment in stock returns by 0.118% and 1% increase in interest rate will depress stock returns by 0.717%. Exchange rate has significant positive relationship with stock returns and inflation has significant negative relationship at 10% level of significance. On the other hand, exchange rate and GDP has insignificant relationship with stock returns.

P-value of F-test indicates significance of overall model here the p-value is less than 10% level of significance. R2 is 0.896 (89.6%); this means that 89.6% of the variation in dependent variable (stock returns) is explained due to independent variables (interest rate, inflation rate, GDP, and exchange rate) and the model is good in explaining all variables. The calculated (Durbin Watson) DW value is 2.2, which shows that there exists no autocorrelation in the model, making it more reliable.

Conclusion

The basic aim of every investor and broker is to maximize returns and minimize level of risk. It is possible only with full knowledge of sources of risk. Current research only took into account macroeconomic sources of risk. This research inspects the positive or negative influence of macroeconomic variables on returns of companies‟ stocks listed in Karachi Stock Exchange and chemical industry is selected for analysis. Analysis of previous researches identified many variables which affect stock returns such as demand and supply factors, firm size, market trend, profitability, asset turnover, leverage, dividends, company management, growth perspective, future plans, macroeconomic factors i.e. interest rate, CPI, GDP, stock market trends, Government regulation. But current study selected only four variables due to limitation of time and other resources.

The macroeconomic variables selected for this research are Inflation (CPI), Interest Rate, Exchange Rate, and GDP. 25 companies from chemical sector are selected. Literature show that interest rate and inflation rate negatively influence stock returns and GDP positively influence stock returns but impact of exchange rate differs from country to country. In some countries, the relationship is positive whereas in some countries the relationship is negative.

At 10% level of significance, exchange rate significantly affects stock returns of chemical industry in positive direction and Inflation significantly negatively influence stock returns. Other variables relationship of interest rate and GDP with stock returns of chemical industry is insignificant. After analyzing the findings of the regression, we reached to the conclusion that "GDP and exchange rate positively affects stock returns and Interest rate and inflation negatively affects stock returns" and the findings of this research are analogous to previous researches. This research covers eight years annual data of share prices and dividends for investigation and chemical industry and provides base for future researchers to conduct comparative study covering different companies and different sectors.

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