

Javed Mahmood Jasra¹, Rauf-I-Azam², Muhammad Asif Khan³

IMPACT OF MACROECONOMIC VARIABLES ON STOCK PRICES: INDUSTRY LEVEL ANALYSIS

This study examines the relationship between stock prices and interest rate, exchange rate and consumer price index (CPI). 4 different industries were selected for this study on the basis of data availability, these industries included oil and gas, chemical, cement and insurance industry. The data for the selected industries and economic variables were obtained for the period of 6 years (24 quarters). Regression analysis was used to analyze the impact of exchange rate, interest rate and consumer price index on stock returns. Stock index is used as a dependent variable and the macro-economic variables are used as independent variables. Results of the study show that the impact of interest rate on oil and gas, chemical and cement industry are insignificant, while it has significant effect on insurance industry. When the impact of consumer price index is determined it shows significant effect on oil and gas, chemical, cement industry and insurance industry respectively. The exchange rate showed significant negative effect on all 4 industries.

Keywords: macroeconomic variables; interest rate; consumer index; exchange rate; stock prices.

Джавед Махмуд Джасра, Рауф-І-Азам, Мухаммад Асиф Хан ВПЛИВ МАКРОЕКОНОМІЧНИХ ЗМІННИХ НА ЦІНИ АКЦІЙ: ВИБІРКОВИЙ АНАЛІЗ ЗА ГАЛУЗЯМИ

У статті розглянуто відношення між цінами на акції і процентними ставками, обмінним курсом і індексом споживчих цін (ІПЦ). 4 галузі промисловості були вибрані для цього дослідження на основі наявних даних — це нафтогазова, хімічна, цементна і страхова. Дані для галузей і економічні змінні отримано за період 6 років (24 квартали). Для оцінювання впливу обмінного курсу, процентної ставки і індексу споживчих цін на прибутковість акцій використано регресійний аналіз. Результати дослідження показують, що вплив процентної ставки на нафтогазову, хімічну і цементну промисловість незначні, тоді як вона має значний вплив на страхову галузь. Індекс споживчих цін має істотний вплив на нафтогазову, хімічну, цементну промисловість і страхову галузь. Курс обміну валют показав значний негативний вплив на всі 4 галузі.

Ключові слова: макроекономічні змінні; процентні ставки; індекс споживчих цін; обмінний курс; ціни на акції.

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Джавед Махмуд Джасра, Рауф-И-Азам, Мухаммад Асиф Хан ВЛИЯНИЕ МАКРОЭКОНОМИЧЕСКИХ ПЕРЕМЕННЫХ НА ЦЕНЫ АКЦИЙ: ВЫБОРОЧНЫЙ АНАЛИЗ ПО ОТРАСЛЯМ

В статье рассмотрены отношения между ценами на акции и процентными ставками, обменным курсом и индексом потребительских цен (ИПЦ). 4 отрасли промышленности были выбраны для этого исследования на основе имеющихся данных — нефтегазовая, химическая, цементная и страховая. Данные по отраслям и экономические переменные получены за период 6 лет (24 квартала). Для оценки влияния обменного курса, процентной ставки и индекса потребительских цен на доходность акций

¹ Correspondent Author, PhD Scholar, Department of Management Sciences, Iqra University, Islamabad, Pakistan.

² Professor, Director Institute of Management Sciences, Arid Agirculture University, Rawalpindi, Pakistan.

³ Visiting faculty member, Iqra University, Islamabad, Pakistan.

использован регрессионный анализ. Результаты исследования показывают, что влияние процентной ставки на нефтегазовую, химическую и цементную промышленность незначительны, в то время как она имеет значительное влияние на страховую отрасль. Индекс потребительских цен имеет существенное влияние на нефтегазовую, химическую, цементную промышленность и страховую отрасль. Курс обмена валют показал значительное отрицательное воздействие на все 4 отрасли.

Ключевые слова: макроэкономические переменные; процентные ставки; индекс потребительских цен; обменный курс; цены на акции.

1. Introduction. Financial sector reforms in Pakistan have changed the financial environment of the economy. In the current scenario, activities in the financial sector and their relationships with the real sector become more important. Since the financial sector reforms during the last years, the implementation of various measures including a number of structural and institutional changes in different sectors of the financial environment has brought change in the functioning of the financial sector in Pakistan. Due to introduction of new techniques it becomes possible to re-examine the financial sector environment. Most studies conducted during the last years recognized that macroeconomic variables, namely exchange rate and money supply, have impact on stock returns. Early studies [1, 2] in the area of exchange rates and stock returns considered only the correlation between the two variables. According to the theory, firm's foreign operations and returns are effected due to changes in exchange rate. This would, in turn, affect its stock prices. Multinational characteristics of a firm can also be a reason for changes in stock prices. An investor will seek better opportunity elsewhere in case of decreasing trend of stock market.

In a small open economy like Pakistan the impact of exchange rate on companies' returns is of main substance for policy makers. Exchange rate is the rate at which one currency may be converted into another. Free market system and international trade are also affected by changes in exchange rate that helps to maintain balance of capital and balance of trade. When home currency is depreciated against a foreign currency, export of a country becomes cheaper as compared to foreign. When demand for currency increases to pay for exported goods, then the value of a currency will increase. Sudden ups and downs in exchange rate will affect a company's return. Exchange rate determines the level of exports and imports and if home currency's value increases as compared to foreign currency, as a result the price of imported goods decreases at home market which affects local firms' profits. Side effect of high-valued currency is that its exports become costly at international market which is not a good sign.

Exchange rate plays a major role in influencing both supply and demand for export volumes. Exchange rate affects companies' returns determining the relationship between international and domestic prices. Movement of exchange rates not only makes exports/imports costlier or cheaper, but also effects companies' returns. Consumer price index (CPI) is also considered a restricted measure of inflation, measure confined to the inflation faced by the household sector of economy. CPI is generally a measure of services purchased by a household and average prices of consumer goods. The primary effect on total companies' returns is stronger in high inflation countries than in low inflation countries [3]. Karachi

Stock Exchange (KSE) was founded in 1947. It consists of Pakistani as well as overseas companies. Karachi Stock Exchange is the most liquid and largest exchange of Pakistan. It was declared the world's best performing stock market in 2002 [4]. KSE started with a 50 shares index, later on November 1, 1991 the KSE-100 was started, after that KSE-100 is used as standard. KSE-100 crossed the psychological level of 15,000 first times in the history of Pakistan on April 20, 2008. In 1991 KSE launched based on 1,000 points. Growth in 2001, 2005 and 2008 was 1, 770, 9, 898, and 15,000 simultaneously [4]. The study contributes to the existing literature by analyzing the relationship between economic variables and stock returns in an emerging Asian market which has a different structure and institutional characteristics from developed stock markets. Therefore, it is critical to find whether stock returns in Pakistan respond differently to economic variables or not. This is a sectoral study examining the variability of stock returns to economic variables at the firm and industry level.

The purpose of this study is to investigate the relationship between stock market returns and macroeconomic variables, i.e. interest rate, consumer price index (inflation) and exchange rate, for the case of Pakistan, and the nature of the impact is also checked, if there exists a relationship between these, and towards which side the relation is positive or negative.

2. Literature Review. Research on the relationship between macroeconomic variables and stock market on industrialized economies has extended the analysis to the cases of developing economies. An illustrative list of studies for developed economies is included in [5]. It identified such factors as industrial production, risk premiums, inflation, and interest rate, slope of the yield curve, money supply and so forth as being important in explaining stock returns. Notable studies for developing economies include [6, 7] for Singapore, [8, 9] for South Korea, and Malaysia [10, 11]. Using bivariate cointegration and causality tests [12] noted significant interactions between consumer price index and exchange rate and stock prices for the case of Singapore. [13] studied the effect of macroeconomic variables on Turkish stocks. The study consisted of the data from July 1997 to June 2005 on macroeconomic variables, namely exchange rate and money supply, interest rate, growth of international trade oil prices and return on MSCI world equity index. The data is taken from all non-financial firms listed on ISE. The data is used by formation of portfolios, not by taking a single stock. Multiple regression model is used to analyze the data by using 7 macroeconomic variables and stock returns. The result of this study shows that interest rate, exchange rate and world market return affect all the portfolios. Only 12 portfolios showed the effect of inflation and other factors showed no significant effect.

[14] documented significant contribution of interest rate and exchange rate in the long-run relationship between Singapore's stock prices and various macroeconomic variables. Evaluating Korean equity market [15] provided support for oil prices, exchange rate, dividend yield and money supply as being significant macroeconomic factors. Similarly, [16] established a long-run relationship between stock prices and 4 macroeconomic variables: industrial production index, exchange rate, trade balance and money supply for Korea. [17] conducted research on long-term relationships between macroeconomic variables and Karachi Stock Exchange index.

The macroeconomic variables included are industrial production index (IIP), exchange rate, consumer price index (CPI), narrow money (M1) and the value of investment return market rate. The data used for the analysis is collected quarterly from 1973 to 2004. The model used is vector error correction model. The study found that these 5 variables are cointegrated and two long-term equilibrium relationships exist between these variables. A causal relationship is found between the stock market and the economy. According to the finding, the largest positive determinant of Pakistani stock prices is industrial production index, while the largest negative determinant of stock prices is Pakistani inflation.

[18] studied the relationship between macroeconomic variables and stock prices in KSE. The variables used in this study are exchange rate, exchange reserve, industrial production index, wholesale price index, gross fixed capital index and broad money. Quarterly data were used from 1986 to 2008. The methodology used in this study was regression analysis. Exchange rate and exchange reserve showed significant effect on stock prices while industrial production index and gross fixed capital formation had no significant effect on stock prices. A large increase in stock prices in Pakistan was after liberalization in 1991. [19] conducted a study on the impact of exchange rate on stock prices and found only the correlation between two variables. The findings explained that foreign operations and profits if a firm are effected by changes in exchange rate, which is the reason to effect stock prices. The multinational characteristics of a firm can also effect stock prices. Due to decline of stock market, an investor will try to seek better opportunity elsewhere. When an investor is not interested to invest into a stock market, demand for money will decrease and in result interest will fall, as a result foreign investors withdraw their money which causes further decreasing of currency value.

[1] found that the US dollar and US stock prices have significant positive correlation and another study conducted by [20] showed significant negative relationship. [21] found difference in results because the nature of countries is different. [22] conducted the study on G7 countries, recognized the cause for the lack of strong correlation among stock prices and exchange rate. [23] explained the relationship between exchange rate and stock prices by using cointegration and Granger causality for the first time. After that [24, 25] used this technique to analyze these aspects in various research papers covering both industrial and developing countries. [26] found bidirectional relationship between exchange rate and stock prices for Hong Kong.

[27] found a is bidirectional relationship between the US exchange rate and the stock market for USA. [28] conversely identified the results for India, Korea and Pakistan and suggested that stock prices are caused by exchange rate, which is similar to the earlier study by [1]. But the study by Abdalla on Philippine market showed that the stock prices are effected by exchange rates. This is similar to [8] findings that exchange rate hase significant effect on stock prices in Germany, Japan and the USA. [21] found the interrelationships between important macroeconomic variables, namely index of industrial production, money supply, prime lending rate and narrow money supply.

[19] analyzed the relationships between key macroeconomic variables and stock prices. The macroeconomic variables representing real and financial sector of

the economy of India were taken quarterly for the period from March 1995 to March 2007. These variables taken were the industrial production index, foreign direct investment, exports, money supply, exchange rate, interest rate, NSE Nifty and BSE in India. To determine long-run relationship, Johansen's approach of cointegration and Granger causality test were used, whereas BVAR modeling for variance decomposition and impulse response functions were used to examine the short-run relationships. The study of the long-run results disclosed differential causal links among aggregate macroeconomic variables and stock index, while the results showed similar pattern in both markets in the shortrun. The study showed that in India stock prices lead economic activity excepting movement in interest rate. Interest rate seems to guide stock returns. The study showed that Indian stock market is not only derived by actual performance but also derived by expected potential performances.

[29] examined the relationship between share prices and macroeconomic variables in emerging economies including Brazil, Russia, India and China. There is a well-documented relationship between share prices and macrovariables for the USA and other major economies. The model used to examine the relationship between stock prices and macroeconomic variables was Box-Jenkins ARIMA model. No significant relationship was found between stock returns and independent variables of oil price and exchange rate of either BRIC country, this may be because of the influence of other domestic and international macroeconomic factors on stock market index. Also, there was no significant relationship among present and past stock market prices, suggesting that the markets of Brazil, Russia, India and China show weak form of market effectiveness.

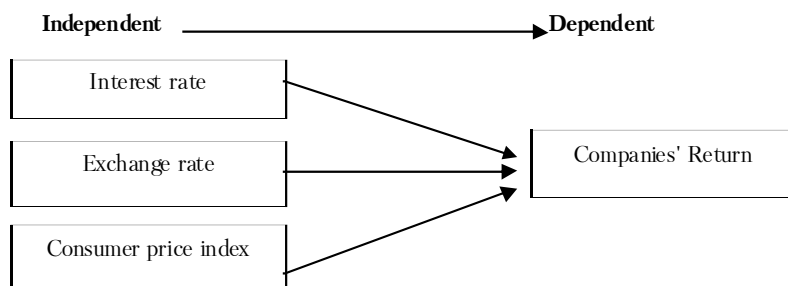


Figure 1. **Conceptual Framework**

3. Methodology

3.1. Data. In this study the quarterly data for 3 variables for the period from January 2004 to December 2010 was used. The objective behind collection of quarterly data was to have in-depth analysis of these variables. The key macroeconomic variables included in this study are nominal exchange rate, interest rate and consumer price index. For stock prices, the stock market index is calculated for 4 industries which are oil and gas, cement, chemicals and insurance. Insurance is the only service industry and the other 3 are manufacturing industries. Each industry included 4

companies selected on the basis of market capitalization. Top 4 companies with the highest capitalization were taken and the quarterly indices are formed.

3.2. Statistics. [30] initially analyzed the linkage between exchange rate and inflation on stock prices. The tool used to determine the causal relationship between exchange rate, inflation, interest rate and stock exchange prices is ordinary least square (OLS) regression. The data was compiled from the site "Business Recorder" and IMF site. SPSS software was used to analyse the data.

3.3. Procedure. Regression analysis was used to examine the relationship between macroeconomic variables and stock index of 4 industries. The regression equation is:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3,$$

Y = dependent variable

α = intercept, β = slope

X = independent variables

The equations formed for analyzing the results are:

$$ROGD = \alpha + \beta_1 I + \beta_2 CPI + \beta_3 ER. \quad (1)$$

This equation is used to determine the relationship between stock prices of oil & gas exploration industry and macroeconomic variables. ROGD is a dependent variable which represents quarterly stock price index of oil & gas. While I represents interest rate, CPI (consumer price index) and (ER) exchange rate are independent variables used quarterly.

$$RCHM = \alpha + \beta_1 I + \beta_2 CPI + \beta_3 ER \quad (2)$$

This equation is used to determine the relationship between stock prices of chemical industry and macroeconomic variables. RCHM is a dependent variable which represents quarterly stock price index of chemistry. While I represents interest rate, CPI and ER are quarterly independent variables.

$$RCEM = \alpha + \beta_1 I + \beta_2 CPI + \beta_3 ER \quad (3)$$

This equation is used to determine the relationship between stock prices of cement industry and macroeconomic variables. RCEM is a dependent variable which represents quarterly stock price index of cement. While I represents interest rate, CPI and ER are quarterly independent variables.

$$RINS = \alpha + \beta_1 I + \beta_2 CPI + \beta_3 ER \quad (4)$$

This equation is used to determine the relationship between stock prices of insurance industry and macroeconomic variables. RINS is a dependent variable which represents quarterly stock price index insurance. While I represents interest rate, CPI and ER are quarterly independent variables.

The parameters of regression model are being estimated using a method of ordinary least squares which is a method to solve overdetermined systems and is often applied in statistical contexts, particularly regression analysis. Least squares is a method of fitting the data.

4. Results and Discussion

Table 1. Relationship between macroeconomic variables and oil and gas industry return

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5733.273	810.5970	7.072902	0.0000
I	84.46110	52.20386	1.617909	0.1206
CPI	44.73527	16.76067	2.669062	0.0144
ER	-149.1976	35.80927	-4.166452	0.0004
R-squared	0.583703			
Adjusted R-squared	0.524232	S.E. of regression		420.1558

O&G = oil & gas industry; I = interest rate; CPI = consumer price index; ER = exchange rate

After analyzing the results of oil and gas companies it is found that in the macro perspective, on taking companies' returns as dependent and interest rate, CPI, and exchange rates as independent variables, the result of interest rate is insignificant so it has no effect on the return of oil and gas companies. CPI has significant effect on the companies' returns, it means that when the value of CPI increases the companies' returns also increase and while the value of CPI decreases the companies' returns also decrease. While the result of exchange rate is highly significant, the increase in the value of this variable has negative impact on the companies' return and companies' return decreases. Conversely the result shows that decline in the value of this variable leads to increasing returns. The probabilities of interest, CPI and exchange rate are 0.1206, 0.0144 and 0.0004 correspondingly.

[7] documented significant contribution of interest rate and exchange rate in the long-run relationship between Singapore's stock prices and various macroeconomic variables. Evaluating Korean equity market, [8] provided support for the oil prices, exchange rate, dividend yield and money supply as being significant macroeconomic factors. Similarly, [9] established a long-run relationship between stock prices and 4 macroeconomic variables – industrial production index, exchange rate, trade balance and money supply for Korea.

Table 2. Relationship between macroeconomic variables and cement industry return

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5386.138	643.9306	8.364470	0.0000
I	40.24925	41.47025	0.970557	0.3428
CPI	34.97810	13.31452	2.627064	0.0158
ER	-130.8565	28.44655	-4.600086	0.0002
R-squared	0.669553			
Adjusted R-squared	0.622346	S.E. of regression		333.7678

CEM = cement industry; I = interest rate; CPI = consumer price index; ER = exchange rate

After analyzing the results of cement companies it is found that in the macro-perspective, on taking companies' returns as dependent and interest rate, CPI, and exchange rates as independent variables, the result of interest rate is insignificant so it has no effect on companies' returns. CPI has significant effect on the companies' returns, it means that when the value of CPI increases the companies' returns also increase and while the value of this variable decreases the companies' returns also

decrease. While the result of exchange rate is highly significant, if this variable's value increases, there is a negative impact on the companies' return and companies' return decreases. Conversely the result shows that decline in the value of this variable leads to increasing returns. The probabilities of interest, CPI and exchange rate are 0.3428, 0.0158 and 0.0002 correspondingly.

Table 3. Relationship between macroeconomic variables and chemical industry return

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2523.160	257.8406	9.785738	0.0000
I	-24.86288	16.60538	-1.497279	0.1492
CPI	29.33664	5.331355	5.502661	0.0000
ER	-71.43910	11.39047	-6.271830	0.0000
R-squared	0.656871			
Adjusted R-squared	0.607853	S.E. of regression		
				133.6462

CHM = chemical industry; I = interest rate; CPI = consumer price index; ER = exchange rate

After analyzing the results of chemical companies it is found that in the macro perspective, on taking companies' returns as dependent and interest rate, CPI, and exchange rates as independent variables, the result of interest rate is insignificant, so it has no effect on companies' returns. CPI has highly significant effect on the companies' returns, it means that when the value of CPI increases the companies' return also increase and when the value of this variable decreases the companies' return also decreases, while the result of exchange rate is significant. Conversely the result shows that decline in the value of this variable leads to increasing returns. The probabilities of interest, CPI and exchange rate are 0.1492, 0.0000 and 0.0000 correspondingly.

Table 4. Relationship between macroeconomic variables and insurance industry return

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	3313.431	321.6579	10.30110	0.000
I	-33.36949	15.90761	-2.097706	0.049
CPI	43.68675	4.774914	9.149221	0.000
R-squared	0.969704			
Adjusted R-squared	0.963326	S.E. of regression		
				111.983

INS = insurance industry; I = interest rate; CPI = consumer price index; ER = exchange rate

After analyzing the results of insurance companies it was found that in the macro perspective, on taking companies' returns as dependent and interest rate, CPI, and exchange rates as independent variables, the result of interest rate is significant, it means that when the value of interest increases the companies' return also increases, when the value of this variable decreases the companies' return also decreases. CPI has high significant effect on the companies' returns, it means that when the value of CPI increases the companies' return also increases and if the value of this variable decreases the companies' return also decreases. While the result of exchange rate is highly significant, if the variable's value increases, there is a negative impact on the companies' return and companies return decreases. Conversely the result shows that decline in the value of this variable leads to increasing returns. The probabilities of interest, CPI and exchange rate are 0.0495, 0.0000 and 0.0000 correspondingly.

[17] conducted research on the long-term relationships between macroeconomic variables and Karachi Stock Exchange index. The macroeconomic variables included are industrial production index (IPI), consumer price index (CPI), narrow money (M1), and the value of investment return market rate. The data used for analysis is collected quarterly from 1973 to 2004. The model used is vector error correction model. Findings showed that these 5 variables are co-integrated and two long-term equilibrium relationships exist between these variables. A causal relationship was found between the stock market and the economy. According to the finding, the largest positive determinant of Pakistani stock prices is industrial production index, while the largest negative determinant of stock prices in Pakistan is inflation.

5. Conclusions and Recommendations. The study has analyzed the causal relationship between macroeconomic indicators and stock index in Pakistan. It is found that the impact of interest rate on oil and gas, chemical and cement industry are insignificant, while interest showed negatively significant effect on insurance industry, which means the increase in interest rate decreases the stock price. When the impact of consumer price index is determined it shows positively significant effect on oil and gas, chemical, cement industry and insurance industry, which means the increase in CPI also increases stock price and when CPI decreases the stock return will also decrease. The exchange rate showed significantly negative effect on all 4 industries, which means that with the increase in exchange rate, stock prices will decrease and with decrease in exchange rate the stock prices of these companies will increase.

The result provides an opportunity for risk diversification at Pakistani stock market. Since stock prices of different industries behave differently in similar economic conditions, an investor should analyze the nature of industry before making investment decisions. The result can help investors and portfolio managers in extending their understanding of the risk-return relationship as well as pricing of macroeconomic risk. The value of Pak. rupee is consistently declining over the period which is adversely affecting stock returns. Money supply in the country is controlled and regulated by the State Bank of Pakistan (SBP) within of monetary policy framework. In this situation it is important for a future researcher to see the relationship between money supply and Pakistani stock market prices because in previous literature deep connection is found between money supply and stock market prices.

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