The Relationship between Macroeconomic Factors and Sectoral Returns: Evidence from Pakistan

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Abstract—**Stock market is considered as a mirror for an economy because it mobilizes the economic resources and makes them as a creative investment. Stock market plays an imperative role in economic development of any country. The intent of current study is to explore the relationship between macroeconomic variables and stock returns of different sectors in Pakistan. The macroeconomic variables under consideration are exchange rate, interest rate, money supply, industrial production index, and consumer price index with stock returns of construction and material, chemical, banking, oil and gas, textile and financial sectors. Monthly data has been taken from Jan 2006 to Dec 2012. Vector Error Correction Model (VECM) and Granger causality test shows long run as well as short run causality among the variables. The results of VECM show that it takes approximately two to three months for shocks adjustment toward the mean. The results of Granger causality show the unilateral, bilateral and no causality of sectoral returns with macroeconomic variables.**

Keywords—**macroeconomic factors, Pakistan.**

I.   Introduction

Stock market has a significant impact on the economy of any country through facilitating the capital flow. During the implementation of financial planning, policy makers have to keep in mind its impact on stock market. Financial sector plays an important role in planning and development of an economy. It also plays a significant role in the growth of a country[1]. The important player of financial sector is a stock market which provides a platform for buyers and sellers for trading of securities [2]. Stock market works as an intermediary for removing the gap between stock buyers and sellers. The relationship between macroeconomic variables and stock returns has become a debatable area of research in the literature of finance and economics for developed, developing and emerging economies. Its impact is certain at industry level, sectors and market level.

The primary purpose of the study is to find the relationship between macroeconomic variables and Stock Returns of top six sectors listed at Karachi Stock Exchange (KSE).

The KSE performance was quite satisfactory till 2002 but after that it started to decline. Uncertain political condition, poor law-and-order condition, tight monetary policy and rise in cost of production affected the performance of different sectors badly.

The financial crunch of 2007 has affected the Pakistan's economy badly. Pakistani rupee has started to depreciate, interest rate is increasing and inflation is uncontrollable. The cost of production is increasing day by day and affecting the production of the economy negatively. So an applied research is to be conducted for analyzing the impact of macroeconomic variables on return of sectors. "It is already been identified that there is a relationship among macroeconomic variables and stock returns. But it is pertinent to explain the effect of macroeconomic variables on sectoral unweighted returns. So that industrial impacts can be analyzed in casual manner and can have a policy implication".

Theoretical and Empirical studies analyzed the relationship among macroeconomic variables and stock returns. [3] has studied the impact of macroeconomic variables on stock market in emerging economies like Malaysia. The study had used seven macroeconomic variables that are consumer prices, credit aggregates, exchange rates, foreign reserves, industrial production index, M1 and M2. Granger causality results showed a unilateral causality between official role and stock prices. Similarly, [4] has analyzed the impact of macroeconomic variables stock market returns on Turkish economy. Similar studies are conducted in a developing country like Pakistan. [5]has investigated the impact of macroeconomic factors on the returns of oil and Gas sector. In the same year another study was conducted by Akhtar (2012), who had identified the impact of macroeconomic variables on the index of banking sector of Pakistan. [6]

A researcher has empirically tested the performance of Arbitrage Pricing Theory (APT) in the Nigerian Stock Exchange. These studies also found no significant effect of inflation and interest rate on stock returns. Another study on the market efficiency is [7], studied the effect of exchange rate and oil prices on stock market of Brazil, Russia India and China and found the mixed results. [8]and [9] had investigated that New Zealand stock market is very sensitive for changes in macroeconomic variables. Effectiveness of APT is also tested in a developing country like Pakistan. A study that has examined the effectiveness of Arbitrage Pricing Theory on stock equity returns of Pakistani market [10].

Short run relationship run relationship is reported between expected inflation and stock market. Mixed results of unilateral and bilateral causality between the variables [12]Similarly, the studies in Pakistan had examined long run and short run relationship between macroeconomic variables and stock prices [11, 12].

Previous studies had used composite index or cumulative index for the whole market with different economic factors. But the present study is analyzing the impact of macroeconomic variables on sectorial returns.

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II. Data Collection

Secondary data is collected for top 6 sectors with high market capitalization. The studied sectors are construction and material, financial services, banks, chemicals, oil and gas and textile sector. The selection of firms is on the basis of data availability. This resulted sample of 137 firms. The economic variables under consideration are consumer price index, real effective exchange rate, industrial production index, money supply (M2) and three months treasury bills rate. CPI is an indicator of inflation, RFR for 3 months T-bills yield rate is an indicator of interest rate and REER is real effective exchange rate, IPI is the index of industrial production and M2 is the indicator of money supply and is rupees per dollar. Sectorial return is calculated as a weighted average of the return of stocks.

Data is available from 2006 to 2011 on monthly basis. There are 72 monthly observations. Data of firms is taken from the website of Karachi Stock Exchange and Business Recorder and data for each firm is the monthly closing price of each firm from Jan-2006 to Dec-2011.By taking the weighted average of the monthly stock returns, return of each sector is to be formed. As far as data of economic variables is taken from the website of Karachi stock Exchange, Business Recorder and International Financial Statistics (IFS) IMF CD-ROM.

III. Methodology

A. Dependent Variables

Stock return is the dependent variable for all the sectors. Top six sectors are selected (on the basis of market capitalization) that have highest participation in the stock exchange. Sectors under study are construction and material, financial services, commercial banks, chemicals, oil and gas and Textile.

B. Independent Variables

Real Effective Exchange Rate- REER is the relative value of currency with respect to the other currencies in index. It is adjusted for inflation. Real effective exchange rate is an indicator for trade competitiveness which shows the behavior of Pakistani currency against the basket of currencies. If the exchange rate of home currency with respect to dollar increases, it will have a negative relationship.

Treasury Bills Rate- Treasury bills rate is the proxy used for risk free short term interest rate. An increase in interest rate is the factor that may contribute in the slowing down of economy. So, it will affect negatively to the economy.

Consumer Price Index- It is the measure for change in price level of consumer goods and services that are bought by household. Inflation in Pakistan is increasing and it gives a huge rise in food products that affects individual buying pattern negatively.

Money Supply- M2 is the measure used for money supply. M2 includes money in circulation, savings, time deposits, overnight reports and non-institutional accounts in money market. The relationship is to be assumed as positive in short run because increase in money supply will lead to increase in economic activity which affects positively to sectorial returns.

Industrial Production Index- IPI is an economic indicator that is meant for growth in real sector. It is assumed that if increase in industrial production affects cash flow of banks, it will affect positively to bank returns and if an investor will invest in stock market, its impact will be positive for other sectors.

$$R = b_0 + b_1 REER + b_2 TBR + b_3 CPI + b_4 M2 + b_5 IPI + et \quad (1)$$

The dependent variable R represents stock Return of the sector and bt where $t=1,2…5$ is the sensitivity of sector returns with each independent variable. b0 represents the intercept. The intercept is the value that the dependent variable has without any influence of independent variable. b1 …. b5 are slope coefficient. et represents error term.

IV. Results and Discussion

A. ADF Stationarity test

[13] have devised a procedure for checking the non stationarity of time series data. The time series data has a trend and is not stationary at level. Before starting the Augmented Dickey Fuller Test (ADF) optimal lag length is selected. The criteria to check optimal lag length is with Akaike Information Criteria. Based on Akaike Information Criteria (AIC) lag is selected where value of AIC is minimum.

Augmented Dickey Fuller test hypothesis is H0: $\beta = 0$; and H1: $\beta <$

TABLE 1: ADF RESULTS AT LEVEL AND FIRST DIFFERENCE

Var	Test Spec	ADF t-Stats	CV1 %	CV 5%	P.V	ADF t-Stats	CV1 %	CV 5%	P.V
		ADF test at level				ADF test at first difference			
Sectoral Returns Unit Root									
Banks	IT-1	-1.88	-4.1	-3.4	0.63	-4.09	-3.4	-3.1	0.00
Chem.	IT-1	-2.34	-4.1	-3.4	0.40	-4.09	-3.4	-3.1	0.00
C&M	IT-1	-2.28	-4.1	-3.4	0.43	-4.09	-3.4	-3.1	0.00
Fin.	IT-1	-1.63	-4.1	-3.4	0.76	-4.06	-3.4	-3.1	0.00
O&G	IT-1	-2.26	-4.1	-3.4	0.44	-4.09	-3.4	-3.1	0.00
Tex.	IT-1	-2.22		-3.4	0.46	-4.09	-3.4	-3.1	0.00
Macroeconomic Variables Unit Root									
ER	IT-1	-2.06	-4.1	-3.4	0.55	-6.06	-4.1	-3.4	0.00
TBR	IT-1	-2.13	-4.1	-3.4	0.51	-7.02	-4.1	-3.4	0.00
CPI	IT-3	-2.61	-4.1	-3.4	0.26	-3.18	-4.1	-3.4	0.09
MS	IT-1	-2.44	-4.1	-3.4	1.35	-7.96	-4.1	-3.4	0.00
IPI	IT-2	-2.87	-4.1	-3.4	0.17	-3.54	-4.1	-3.4	0.04
				-3.4				-3.4	

The variable is stationary if we accept the alternate hypothesis and p<0.05. However, if null hypothesis is accepted (p>0.05) it means that time series data is non stationary. Results of ADF test show that data is stationary at first difference.

B. Descriptive Statistics

For checking normality of the data, descriptive statistics is applied. Normality of data is assessed by three measures that

are Skewness, Kurtosis and Jarque-Bera. Skewness shows the distribution of time series around its mean.

TABLE 2: RESULTS OF DESCRIPTIVE STATISTICS (INDEPENDENT VARIABLES)

	ER	CPI	TBR	MS	IPI
Mean	4.62	4.98	2.40	15.35	5.03
Std. Dev.	0.03	0.22	0.18	0.21	0.26
Skewness	-0.66	-0.06	-0.29	-0.10	0.13
Kurtosis	2.61	1.55	1.41	1.94	1.72
Jarque-Bera	5.81	6.34	8.62	3.49	5.10
Probability	0.05	0.04	0.01	0.17	0.07

Table 2 shows the mean values of all the independent variables that is low and ranges from 2.40 to 15.35. The value of standard deviation shows is low for exchange rate and high for all other variables. It is positively skewed for industrial production index and negative for other variables. Jarque-Bera probability value shows that it is not normal distribution except for money supply.

Similarly mean value for sectorial returns is shown in Table 3. The value of standard deviation is high for financial and construction and material sector and low for others. The data is positively skewed for banking, chemical and construction and material sector and negative for other sectors.

TABLE 3: RESULTS OF DESCRIPTIVE STATISTICS (DEPENDENT VARIABLES)

Bank	Banks	Chemical	CM	Financial	OG	Textile
Mean	3.57	4.06	3.23	2.44	5.22	3.96
Std-Dev	0.36	0.19	0.52	0.97	0.21	0.17
Skewness	0.25	0.35	0.01	-0.19	-0.55	-0.35
Kurtosis	1.99	2.75	1.42	1.72	4.63	2.01
Jarque-Bera	3.77	1.67	7.43	5.35	11.77	4.42
Probability	0.15	0.43	0.02	0.06	0.002	0.10

Kurtosis shows that the distribution is flat for all sectors and it is peak for oil and gas sector. Jarque-Bera probability value shows that it is a normal distribution except for chemical, textile and banking sector.

C. *Cointegration Analysis Results*

To investigate the long run relationship between economic variables and stock market return cointegration technique is applied.

In Johansen approach first step is to find the order of integration of all variables. If order of integration is same for all the variables this test is appropriate for estimating the long run relationship among variables. The most important procedure to select optimal lag length is VAR lag order selection criteria.

TABLE 4: RESULTS OF COINTEGRATION (JOHANSON COINTEGRATION TECHNIQUE)

Sectors	**Trace Statistics**				**Maximum Eigen value**			
	Hypo No. of CE(s)	Statistic	CV 5%	Prob.**	Hypo No. of CE(s)	Statistic	CV 5%	Prob.**
Banking	r = 0*	152.44	103.84	0.00	r = 0*	59.66	40.95	0.00
	r ≤ 1 *	92.77	76.97	0.00	r ≤ 1	32.79	34.80	0.08
	r ≤ 2 *	59.98	54.07	0.01	r ≤ 2	27.15	28.58	0.07
Chemical	r = 0*	151.90	103.84	0.00	r = 0*	56.68	40.95	0.00
	r ≤ 1 *	95.22	76.97	0.00	r ≤ 1	34.65	34.80	0.05
	r ≤ 2 *	60.57	54.07	0.01	r ≤ 2	25.49	28.58	0.11
C & M	r = 0*	130.77	103.84	0.00	r = 0*	44.00	40.95	0.02
	r ≤ 1 *	86.76	76.97	0.00	r ≤ 1	34.00	34.80	0.06
Financial	r = 0*	155.88	103.84	0.00	r = 0*	56.53	40.95	0.00
	r ≤ 1 *	99.35	76.97	0.00	r ≤ 1 *	36.81	34.80	0.02
	r ≤ 2*	62.53	54.07	0.00	r ≤ 2	27.79	28.58	0.06
O&G	r = 0*	143.10	103.84	0.00	r = 0*	47.98	40.95	0.00
	r ≤ 1 *	95.11	76.97	0.00	r ≤ 1 *	35.98	34.80	0.03
	r ≤ 2*	59.12	54.07	0.01	r ≤ 2*	29.33	28.58	0.04
Textile	r = 0*	145.91	103.84	0.00	r = 0*	57.75	40.95	0.00
	r ≤ 1 *	88.16	76.97	0.00	r ≤ 1	29.83	34.80	0.17
	r ≤ 2*	58.32	54.07	0.01	r ≤ 2	27.19	28.58	0.07

The numbers of co-integrating relations that are determined by testing for co-integration rank test are stated in Table 4. The cointegrating rank test is for identifying the no of cointegrating equations. If Trace statistics is greater than critical value at 5% level of significance, we will reject the null hypothesis H0, that there is no cointegration among macroeconomic variables and sector returns and accept the alternate hypothesis that is there is cointegration among macroeconomic variables and sector returns. There exist three cointegrating equations where trace statistics values are greater than critical values at 5% level of significance. As far as p values are concerned three values are less than 0.01 so the results are significant at 1% level of significance.

D. *Long Run Causal Relationship/VECM*

In order to analyze the long run dynamics or causal relationship, we apply VECM approach. The coefficient of error correction term shows the speed of adjustment of disequilibrium toward mean. If the coefficient of error term is negative, it shows adjustment of disequilibrium toward the mean while no adjustment for positive coefficient. Negative significant coefficient depicts that some error is corrected in current period while the remaining are carried forward for the next month. Negative insignificant results show that all the shocks are corrected in current period.

For banking sector, the coefficient is significant with t value 0f -5.46 with negative sign. It depicts that returns of banking sector adjusted by 45% in current month which showed it will take (1/0.45=2.22) two to three months to eliminate disequilibrium. Short run dynamics also tested for chemical sector the coefficient of error term is statistically significant with negative sign. Returns of chemical sector showed that it takes approximately two months (1/0.46=2.13) for adjustment of shocks or disequilibrium. Similarly the coefficient of error term is significant and negative in oil and Gas sector return. -0.267 shows that approximately 27% shocks are adjusted in current month and it takes approximately 4 months for returns to adjust toward long run equilibrium.

While the coefficient of error term is negatively signed in financial, construction, and material sector, but the coefficients are statistically insignificant. The insignificant coefficient depicts that all the returns of both financial and construction and material sectors are adjusted in current period for long run equilibrium. While an insignificant positive coefficient shows that there is no adjustment of shocks towards the mean in long run equilibrium.

E. *Granger Causality Test*

Results of correlation show the association between two variables but it does not show the direction of causality. For causality of direction granger causality test is appropriate. The [14] not only describes the causation between two variables but also explains that how previous values affect the current values. The estimated results of causality showed that variables have a unilateral, bilateral or no causality among economic variables and sectoral returns. There are two type of

hypothesis, the null hypothesis is economic variables which cause sectoral returns and alternate hypothesis is sectoral returns which causes economic variables. The causality is found to be significant at 5% level of significance.

Consumer price index has a bilateral causality for oil and gas sector which means that economic variables cause sectoral return and sectoral returns cause economic variables. No causality in banking and textile and banking sector mean that both do not cause one another in short run. A unilateral causality is found in financial, construction and material, and chemical sectors. The alternate hypothesis is accepted that is CPI cause return for financial and construction and material sector and return cause CPI for chemical sector. A unilateral causality is found between Exchange rate and stock returns in financial and textile sectors. Exchange rate causes return is accepted for financial and textile sector and return causes exchange rate is accepted for chemical and construction and material sector, while no causality is found for banking and oil and gas sector.

There exists a unilateral causality for all the sectors for industrial production index. The result of unilateral causality shows that industrial production index is the cause of returns and returns does not cause industrial production index. In case of interest rate bilateral causality that is interest rate cause return and return cause interest rate is found in banking, financial and oil and gas sector. A unilateral causality for return causes interest rate is observed in construction and material sector, while interest rate cause return for chemical and textile sector. Money supply and return relationship showed no causality for financial, chemical and oil and gas sector. A unilateral causality is found from money supply to return in textile and construction and material sector and from return to money supply for banking sector.

V. **Conclusion and Recommendation**

It is concluded that there exists a relationship among macroeconomic variables and sectoral return of six sectors. The relationship of macroeconomic variables with stock returns is tested by applying Johansson cointegration technique. Results showed that there exist three cointegrating equations in oil and gas sector, banking, chemical, textile and financial sector and two cointegrating equations in construction and material sectors on the basis of trace statistics. It shows that there exists a long run relationship among the independent and dependent variables.

The coefficient of error correction term showed the speed of adjustment of disequilibrium. It takes approximately 2 months for adjustment of disequilibrium toward the mean in banking and chemical sector and 4 months in oil and gas sector. All the shocks are adjusted in the current period in construction and material and financial sector while no adjustment of returns toward the equilibrium in manufacturing sector was noticed.

While the results of causality showed that consumer price index have a bilateral causality oil and gas sector, no causality in banking and textile sector and unilateral causality in other sectors. A unilateral causality is found between Exchange rate and stock returns in financial, construction and material,

chemical and textile sectors and no causality for banking and oil and gas sector. In case of money supply, no causality is found in financial, chemical and oil and gas sector and unilateral causality in all other sectors. A unilateral causality is found with interest rate in construction and material, textile and chemical sector and no causality a bilateral causality is in financial, banking and oil and gas sectors. A unilateral causality is found in all sectors for industrial production index.

On the basis of results it is proved that there exists a long run relationship among macroeconomic variables and sectors returns. Causality of relationship is also significant at long run and short run. Inflation has a significant impact on economy. So some measures are to be taken to control the inflation in order to control volatility in real sectors. Due to increase in industrial production there is increase in economic activity that affects significantly to the capital markets. So, government must have to take under consideration the factor of industrial production.

The increase in money supply causes inflation that has negative impact on the economy, consequently the government must have to control inflation through changes in policy and monitor its impact on stock market sectoral returns. Stability of currency and control over inflation can have a positive impact on the economic activity. So for stock market exposure, the government must have to take steps as per keeping in view its impact on different sectors and also on overall economy of the country. Thus, stability of the currency will increase investor's confidence and have a positive effect on stock market.

The current study has selected the six sectors on the basis of highest market capitalization. The other sectors having less and medium market capitalization can also be studied for more good understanding of the stock market. Data is taken from 2006 to 2011 on monthly basis, time period of the study may also improve for prediction of stock market movement. Current study has only been done in a Pakistan. Future research can be enhanced by comparative analysis between the countries. There are some other variables that affect the stock market that are oil prices, GDP and GNP.

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