Long-run and Short-run Relationship between Macroeconomic Factors and Returns on Sectoral Indices in Saudi Arabia: An Empirical Analysis

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Abstract

The study analyses the relationship between the select macroeconomic variables, inflation, industrial production, money supply, exchange rate, oil prices and global stock prices on the returns of the 15 sectors listed on Saudi stock market. The study applies cointegration technique and finds that there exists at least one cointegration vector between the chosen macroeconomic variables and the sector indices. Error correction model and Wald test to check the long-run and short-run causality relationship between the macroeconomic variables and sectoral stock indices. Results show that the effect of the macroeconomic variables on the returns of the various sectors is varied. The speed of adjustment of the system in case of short run deviations from the long run equilibrium is also found to be different for the various sectors. This study offers important inputs for investment decision making for the investors in the specific sectors of the Saudi stock market.

Keywords: *Macroeconomic factors, Cointegration, Vector Error Correction Model, Causality, Unit Root*

Present value model and arbitrage pricing theory provide the theoretical background on how the fluctuations in macroeconomic factors affect stock returns. According to the present value model, stock prices are determined by the discounted value of the expected future cash flows. Fluctuations in macroeconomic factors can be expected to affect either the expected future cash flows or discount rate o both. Macroeconomic variables represent the economy wide risk factors in arbitrage pricing model. (Burmeister and McEloy 1988) However, there is no theory that decisively suggests the list of macroeconomic variables that affect stock prices. Macroeconomic variables are selected on the basis of intuitive finance theory. (McMillan 2010)

Previous works have brought out the increasingly important role that the stock markets can play in promoting the development of emerging markets. (Kose et al. 2006; Deb and Mukherjee 2008) In order to exploit it to their advantage, policy makers will have to understand the association between macroeconomic factors and stock prices. By formulating appropriate policies, they can impact macroeconomic variables and accelerate stock market development and economic growth.(Yartey 2008) Similarly, investors in the stock market can profitably the information on the relationship between macroeconomic variables and stock prices to enhance their profits or mitigate risks.

Many studies are carried out that examine the relationship between macroeconomic factors and composite stock index. Studies that analyse the impact of macroeconomic factors on specific sectoral indices are very few. Such a study does not exist in Saudi Arabia. This study intends to fill the gap. The results of this study have important inputs for decision making for investors and mutual funds who invest in specific sectors of the market as well as to the policy makers.

1. Objective of the Study

This study analyses the following:

i. Is there a long run equilibrium relationship between the chosen five macroeconomic variables, consumer price index, industrial production, money supply, exchange rate and oil prices along with the global stock prices measured by MSCI index and returns on sectoral indices in Saudi Arabia?
ii. Is there long run and short run causality relationship between the selected macroeconomic variables and returns on sectoral indices in Saudi Arabia?

This paper proceeds along the following lines. Section 2 reviews the previous works. Section 3 presents data on some indicators relating to the sectors listed on Saudi stock market. Section 4 describes the data and methodology. Section 5 presents the results. Section 6 provides concluding remarks.

2. Literature Review

Many previous works bring out a significant relationship between macroeconomic variables and stock prices. (Fama 1981, Mukherjee and Naka 1995, Tatom 2002, Hope and Kang 2005) Most of the earlier works concentrate on the aggregate stock market index to evaluate the impact of macroeconomic variables on stock prices. Studies that analyse the impact of macroeconomic variables on specific sectoral stock indices are extremely scanty. Such studies are important because the changes in the macroeconomic variables may affect specific sectoral indices differently. Analysis of previous works in this section is restricted to the studies that examine the relationship between stock returns and sectoral indices.

Ewing (2002) examined the association between selected macroeconomic factors, monetary policy, inflation, real economic activity and market risk, and financial sector. He shows that monetary policy has a significant persistent negative impact on stock returns. Inflation and interest rate affect the stock returns negatively which last for a month. Market risk has an immediate impact on stock returns with no persistence in the long run.

Ewing, Forbes and Paynes (2003) analyse the relationship between macroeconomic shocks and sectoral indices. They find that macroeconomic variables and sectoral indices are associated. They show that macroeconomic shocks result in different levels of volatility in sectoral indices.

Maysami, Howe and Hamza (2004) study the long-run equilibrium relationship between some macroeconomic variables and finance index, property index and hotel index along with Singapore stock market index. They show that finance index is affected by fluctuations in inflation rate, exchange rate and the short-term and long-term interest rates. Property index has a positive relationship with consumer price index, industrial production, short-term interest rate and money supply. Long-term interest rate and exchange rate have a negative impact on the index. In case of hotel index, industrial production, exchange rate and long-term interest rate have a positive impact while consumer price index, short-term interest rate and money supply have a negative impact.

Ibrahim (2005) evaluate the effect of monetary policy shocks on different sectors in Malaysia by employing vector autoregressive framework. Some sectors like manufacturing, construction, finance, insurance, real estate and business services are found to be sensitive to fluctuations in interest rates. Sectors like agriculture, forestry, fishing, mining, quarrying, electricity, gas and water are found to be insensitive to interest rate fluctuations.

Pyeman and Ahmad (2009) study long-run and short-run relationships between sectoral indices and macroeconomic variables in Malaysia. Innovations in macroeconomic variables namely real economic activity, interest rate, inflation rate, money supply and exchange rate results in varied responses from sectoral indices. Unanticipated changes in macroeconomic variables result in different speeds of adjustments towards long-run equilibrium among different sectors.

Saeed (2012) analyse the effect of macroeconomic variables on stock returns on nine sectors listed on Karachi stock exchange. They show that macroeconomic variables have significant impact on the returns of the sectors. They find that only short-term interest rate affects the returns of various sectors significantly, while exchange rate and oil prices affect only specific sectors like oil and gas sector, automobile and cable and electronics.

Saeed and Akhter (2012) analyse the impact of macroeconomic factors, money supply, exchange rate, industrial production, short term interest rate and oil prices on the banking index of Pakistan that comprises of 29 banks. They show that money supply, exchange rate, industrial production and short term interest rate have a negative impact on banking index while the oil prices affect the index positively.

3. Data on Some Indicators on Sectoral Indices in Saudi Stock Market

Table 1 presents some indictors on Saudi stock market. The companies listed on Saudi stock exchange, Tadawul, span over 15 sectors. These 15 sectors are Agriculture & Food industries (AGR), Banks & Financial Services (BAN), Building & Construction (BUI), Cement (CEM), Energy & Utilities (ENE), Hotel & Tourism (HOT), Industrial Investment (IND), Insurance (INS), Media & Publishing (MED), Multi-investment (MUL), Petrochemical Industries (PET), Real Estate Development (REA), Retail (RET), Telecommunication & Information Technology (TEL) and Transport (TRA). As of 2012, 158 companies are actively traded in the market. In terms of number of companies, insurance is the largest sector which has 33 companies while energy is the smallest sector comprising of just 2 companies. Petrochemical industries sector comprises of 14 companies and has the highest market capitalization of 31.4% of the market as of 2012. Insurance, the largest sector in terms of number of companies has a meagre market capitalization share of 2.8% as of 2012. However, it is the most actively traded sector with 31% share in the number of executed transactions and 23.4% in terms of value of traded shares. Real estate enjoys the maximum share of the number of traded shares at 21.3% as of the same period.

Media and publishing sector that includes just 3 companies contributes the least to the total number of traded shares, value of traded shares and market capitalization which stand at 0.4%, 0.7% and 0.4% respectively.

Earlier works show the macroeconomic factors have varying impact on the various sectors. Hence, it becomes important for investors in the specific sectors to evaluate the specific impact of fluctuations in the macroeconomic factors on the sectors of their interest. Since such a study is not carried out in Saudi Arabia, this study is made to fill this gap and equip the investors in Saudi stock market with inputs.

Table 1: Saudi Stock Market Indicators

Sector	Total Number of Companies	Number of Traded Shares		Value of Traded Shares		Number of Executed Transactions		Market Capitalization	
		Billion Shares	Ratio to Total %	Billion Riyals	Ratio to Total %	Thousand	Ratio to Total %	Billion Riyals	Ratio to Total %
AGR	16	3.67	4.5	122.7	6.4	3,047.9	7.2	66.7	4.8
BAN	11	9.49	11.5	163.0	8.5	1.960.7	4.7	307.5	22.0
BUI	15	4.02	4.9	90.3	4.7	2,323.6	5.5	19.3	1.4
CEM	12	2.88	3.5	70.2	3.6	2,176.4	5.2	75.2	5.4
ENE	2	1.23	1.5	18.2	0.9	220.7	0.5	57.2	4.1
HOT	3	0.44	0.5	18.8	1.0	601.3	1.4	8.1	0.6
IND	14	2.15	2.6	83.0	4.3	2,028.2	4.8	50.7	3.6
INS	33	11.59	14.0	451.0	23.4	13,036.7	31.0	38.7	2.8
MED	3	0.30	0.4	13.4	0.7	372.0	0.9	5.4	0.4
MUL	7	4.29	5.2	86.8	4.5	2,164.2	5.1	82.9	5.9
PET	14	11.00	13.3	311.2	16.1	4,484.7	10.7	439.9	31.4
REA	8	17.56	21.3	211.6	11.0	3,546.0	8.4	54.5	3.9
RET	11	1.72	2.1	48.7	2.5	1,393.0	3.3	30.6	2.2
TEL	5	9.76	11.8	194.7	10.1	3,825.8	9.1	152.8	10.9
TRA	4	2.34	2.8	45.6	2.4	924.1	2.2	10.9	0.8
Total	158	82.54	100	1,929.3	100	42,105.0	100	1,400.3	100

Source: Annual report on the performance of Saudi stock exchange company (Tadawul), 2012

4. Data and Methodology

4.1 Data

Data used in this study is monthly observations that span from January 2007 to June 2013.

4.2 Methodology

After checking if the variables are I(1), cointegration procedure is applied. Cointegration allows the data representation to take advantage of its theoretical properties. The methodology recognises that some variables drift together. Johansen-Juselius (1990) approach is based on maximum likelihood estimates and provides framework for testing cointegration in the context of vector autoregressive approach.

$$x_t = A_o + \sum_{j=1}^{k} A_j x_{t-j} + \varepsilon_t$$

A_0 = (n×1) vector of constants

x_t = (n×1) vector of non-stationary I(1) variables

k = number of lags

Aj = (n×n) matrix of coefficients

ε_t = (n×1) vector of error terms

The above vector autoregressive process is reformulated into a vector error correction model as follows assuming cointegration of order p.

$$\Delta x_t = A_0 + \sum_{j=1}^{k-1} \Gamma_j \Delta x_{t-j} + \Pi x_{t-k} + \varepsilon_t$$

$$\Gamma_j = \sum_{i=j+1}^{k} A_j$$

$\Pi = -I + \sum_{i=j+1}^{k} A_j$

Γ_j represents the dynamics of the model in the short run. Π represents the long run relationship among the variables included and I is the identity vector. Rank of matrix Π represents the number of independent cointegrating vectors. Π is defined as the product of two matrices, α and β'. B gives the long run coefficients of the cointegrating vectors. A is the adjustment parameter and is similar to an error correction term.

In making inferences about the number of cointegrating relations, trace statistic and maximal eigenvalue statistic are used. The trace statistic is determined by using the following formula.

$\lambda_{trace} = -T \sum_{i=r+1}^{n} \log(1 - \hat{\lambda}_i)$

r = 0,1,2,...,n-1

T=Number of observations

$\hat{\lambda}_i$ =ith eigenvalue

The maximal eigenvalue statistic is determined using the following formula.

$\lambda_{max} = -Tlog(1 - \hat{\lambda}_{r+1})$

r = 0,1,2,..., n-2,n-1

The trace and maximal eigenvalue statistics are compared with the critical values tabulated in Osterwald-Lenum (1992) for drawing inferences.

According to Granger (1988), causality can be divided into long-run and short-run. Long-run causality is determined by the error correction term. A significant error correction term indicates that there is long-run causality from the explanatory variables to the dependent variable. However, in a multivariate analysis, it is difficult to figure out which explanatory variable is responsible for the causality reflected in the error correction term. Short-run causality is determined with a test on the joint significance of the lagged explanatory variables using Wald test. It is possible to have evidence of long-run causality and not on short-run causality and vice versa. Hence, both the tests are carried out.

4.3 Variables

The variables studied are listed below.

4.3.1 Inflation

There is no unified opinion on the relationship between inflation and stock returns. Fisher (1930) argues that inflation causes a rise in the nominal stock return. This keeps the real stock return constant. This argument is supported by Bodie (1976). He suggests that stock investment acts as an effective hedge against inflation.

However, some authors are in favour of a negative relationship between inflation and stock prices. (Fama 1981) They argue that investors will divert their investments to real assets in case of high inflation. This results in a fall in share prices. Rise in inflation will result in tight money supply. When the money in circulation falls, demand remaining the same nominal interest rate will increase. An increase in discount rate will result in a decrease in stock prices. DeFina (1991) supports the notions that rise in inflation will push up the costs of inputs for corporations. They may increase the output prices but only after a lag.

Empirical results are mixed. Schwert (1981) found a negative relationship between inflation and stock prices. This is confirmed by many studies. (See for example Geske and Roll 1983, Gan et. al. 2006) Hasan (2008) produced results that show a statistically significant positive relationship between stock returns and inflation in United Kingdom.

This study uses consumer price index to measure inflation.

4.3.2 Industrial Production

Industrial production measures the real output of the economy. Increase in industrial production will mean increased economic activity and higher earnings for companies. Higher expected earnings result in a rise in stock prices and returns. Chen, Roll and Ross (1986) show that future growth in industrial production can explain stock returns. They find a positive significant relationship between the two variables. Tainer (1993) argues that industrial production index increases during economic expansion and the opposite is true during recession.

As many earlier works, we include industrial production.

4.3.3 Money supply

Empirical works have documented the relationship between money supply and stock prices. Increased nominal money supply results in a portfolio rebalancing. This alters the demand for assets like equity shares in their competition with money balances. An increase in demand for equity shares will result in an increase in stock prices. Tightening of money supply will increase the real interest rate which will result in investors employing an increased discount rate. An increase in the discount rate decreases the present value of the future cash flows on the investment and results in a decrease in the stock prices. (Bernanke and Kuttner, 2005)

According to Mukherjee and Naka (1995), the impact of money supply on stock prices is an empirical question. A rise in money supply will increase inflation and discount rate. This will result in stock prices fall. (Fama 1981) However, increase in money supply will also induce more corporate investments. This will result in an increase in future cash flows and stock prices. The negative impact of money supply on the stock prices will be set off by the optimistic outlook for the corporate earnings

M2 is used as the measure of money supply. An increase in M2 will provide the required liquidity for buying stock. Earlier works find a strong linkage between M2 and stock prices. (See for example Kraft and Kraft 1977)

4.3.4 Exchange Rate:

Goods market approach and portfolio balance approach evaluate the relationship between exchange rate and stock prices. According to goods market approach, variations in the exchange rates will impact the relative competitiveness of the domestic goods in the international market. Local firms get more competitive with depreciation in the domestic currency. This increases exports and profits that arise from exports. This results in an increase in cash flows from equity investment and increases the stock prices. A negative relationship between exchange rates and stock prices can be expected. (Dornbusch and Fischer 1980) However, this point of view depends on how important is the role played by international trade on the domestic economy and the level of imports and exports by the listed firms.

Arguments based on portfolio balance approach expect a positive relationship between exchange rates and stock prices. An increase in stock prices attracts higher foreign capital inflows. This leads to an appreciation in domestic currency. Stock market fall will cause an opposite impact. According to Frankel (1993), capital account transactions determine the relationship between exchange rate and stock prices. However, this point of view depends on the level of domestic and foreign assets held by the investors.

Saudi Arabia is an open economy with no restrictions on capital flows. Saudi Arabia's merchandise trade is 82.6% of its Gross Domestic Product as of 2011. Net inflow of foreign direct investment is $16,308 million as of 2011. (World Bank, 2013) These figures show to prove that Saudi Arabia has strong global links. Exchange rates are bound to impact stock prices.

Nominal effective exchange rate is used to study the relationship between exchange rate and stock prices.

4.3.5 Oil Prices

Oil must be in the list systematic factors that influence stock prices. (Chen, Roll and Ross 1986) Oil is one of the most important input costs for the final products. Increase in oil prices increases the cost of input for the firms and decreases the expected future cash flows from stock investment. Oil price changes also impacts the discount rate applied to equity investments. Increase in oil prices increases the inflation and the required rate of return from equity investment. Hence, stock prices fall. (Huang et al. 1996)

Impact of oil prices on stock prices depends on if the economy that is being studied is an oil importer or oil exporter.

Several works have researched the effect of oil prices and stock prices. (see for example Anoruo and Mustafa 2007) Empirical works carried out in the context of oil importing countries show that oil price variations have strong and negative consequences on the economy. (See for example Hamilton 2003) Research carried out in the context of oil exporting countries brings out different results. Bjornland (2008) examines the relationship between oil price shocks and stock returns in an oil exporting economy, Norway. He shows that a 10% rise in oil price results in an increase of 2.5% in stock returns. The effect fades afterwards. Aggregate wealth and demand of Norwegian economy reacts to oil prices. Arouri and Fauquau (2009) apply linear and nonlinear models and shows that stock market returns in Qatar, Oman, Saudi Arabia and UAE react to oil price shocks.

Oil prices have particular relevance to Saudi Arabia. It is an oil based economy being the world's largest producer

and exporter of oil. Oil represents 90% of total export earnings, 80% of government's revenue and 45% of its GDP. Fluctuations in oil prices affect the major economic variables of the country.

4.3.6 MSCI index

Integration of domestic markets with the global markets will make the domestic stock prices move in unison with the global stock prices. Saudi Arabia follows a fixed peg to American dollar since 1986. The country has no restrictions on capital account and current account convertibility. Stock markets across the globe can offer an attractive alternative investment avenue for the Saudi stock investors. MSCI index is used as a proxy for global stock prices.

4.3.7 Sectoral returns

This study analyses the returns on all the 15 sectors listed on the Saudi stock market. Monthly stock returns (r_t) at time t is defined as the logarithm of sectoral indices.

$$r_t = log(\frac{P_t}{P_{t-1}})$$

where, r_t is the logarithmic monthly return at time t. P_{t-1} and P_t are the monthly values of sectoral index at two consecutive months, t-1 and t.

Table 2: Descriptive Statistics for Macroeconomic Variables

	CPI	IP	MS	EX	OIL	MSCI
Mean	4.836603	9.666577	6.785951	4.598499	4.481276	7.135765
Median	4.843398	9.655026	6.768396	4.594716	4.546470	7.167310
Maximum	4.986343	9.931589	7.162803	4.676467	4.940427	7.427947
Minimum	4.642466	9.400961	6.330891	4.541591	3.819688	6.621219
Standard Deviation	0.103214	0.105781	0.226381	0.032385	0.272743	0.175767
Skewness	-0.353987	0.739697	-0.137503	0.245804	-0.664846	-0.708856
Kurtosis	2.055015	3.878095	2.157498	2.626457	2.676606	3.249465
Jarque-Bera	4.531228 (0.103766)	9.618891 (0.008152)	2.552671 (0.279058)	1.238943 (0.538229)	6.086162 (0.047688)	6.734457 (0.034485)

Notes: 1. Probability values in parenthesis

Banks and financial services sector has the highest mean return during the study period and insurance sector has the least mean return. Data relating to the sectors agriculture, cement, energy, industrial investment and petrochemical is negatively skewed. It can be seen from the results of Jarque-Bera (1987) test that data relating to the sectors banks, building, energy, hotel, industrial investment, multi-investment, petrochemical is non-normally distributed.

Table 3: Descriptive Statistics for Sectoral Indices

Sector	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
AGR	8.57	8.56	8.96	8.16	0.17	-0.20	3.22	0.68 (0.71)
BAN	9.75	9.70	10.33	9.40	0.18	1.01	3.57	14.26 (0.00)
BUI	8.29	8.19	9.06	7.89	0.32	1.01	2.86	13.34 (0.00)
CEM	8.49	8.52	8.89	8.02	0.23	-0.20	1.75	5.55 (0.06)
ENE	8.43	8.46	8.67	8.12	0.12	-0.78	3.00	7.88 (0.02)
HOT	8.70	8.70	9.39	8.13	0.24	0.65	4.07	9.17 (0.01)
IND	8.56	8.58	8.85	8.02	0.18	-0.97	3.70	13.95 (0.00)
INS	7.04	7.00	7.82	6.26	0.32	0.19	3.03	0.45 (0.80)
MED	7.74	7.79	8.39	7.13	0.35	0.03	1.87	4.18 (0.12)
MUL	8.05	7.94	8.80	7.58	0.36	0.61	2.11	7.39 (0.02)
PET	8.68	8.69	9.16	7.93	0.25	-0.70	4.33	12.25 (0.00)
REA	8.21	8.14	8.81	7.75	0.27	0.49	2.22	5.04 (0.08)
RET	8.57	8.52	9.16	8.07	0.24	0.49	2.81	3.22 (0.20)
TEL	7.63	7.57	8.11	7.31	0.19	0.58	2.48	5.23 (0.07)
TRA	8.23	8.22	8.71	7.74	0.23	0.00	2.06	2.88 (0.24)

Table 4: ADF Test Results

Variables	Level		First Difference	
	Intercept	Intercept and Trend	Intercept	Intercept and Trend
AGR	-0.872989(0)	-1.748426(0)	-8.235029(0)	-8.312724(0)
BAN	-2.120404(0)	-2.614068(0)	-9.750470(0)	-9.724035(0)
BUI	-1.295937(0)	-2.460905(1)	-7.724296(0)	-7.670827(0)
CEM	-1.352599(1)	-1.140504(0)	-7.452087(0)	-7.653821(0)
ENE	-1.999033(0)	-2.126013(0)	-8.930987(0)	-8.895683(0)
HOT	-1.093419(0)	-1.472750(0)	-8.470377(0)	-8.556992(0)
IND	-2.290578(1)	-2.733553(1)	-7.749325(0)	-7.729479(0)
INS	-2.453669(1)	-2.354567(1)	-7.171192(0)	-7.163640(0)
MED	-1.501111(0)	-0.878939(0)	-7.997262(0)	-8.438559(0)
MUL	-1.655955(0)	-1.199921(0)	-8.387316(0)	-8.667528(0)
PET	-2.500468(1)	-2.484854(1)	-6.387500(0)	-6.338574(0)
REA	-1.631379(1)	-0.706124(0)	-7.225004(0)	-7.344909(0)
Retail	-0.040506(0)	-1.364366(0)	-8.587279(0)	-8.803294(0)
TEL	-1.686676(0)	-1.376125(0)	-8.305359(0)	-8.456458(0)
TRA	-1.904113(1)	-1.273727(0)	-7.405326(0)	-7.496817(0)
CPI	-2.137769(0)	-0.716810(0)	-6.751592(0)	-7.291847(0)
IP	-1.566837(1)	-4.570711(0)	-9.161576(1)	-9.224598(1)
MS	-1.449989(0)	-2.860890(0)	-9.671378(0)	-9.748443(0)
EX	-3.026269(1)	-2.927008(1)	-5.850882(0)	-5.863903(0)
OIL	-2.462157(1)	-2.768030(1)	-5.596715(0)	-5.562855(0)
MSCI	-1.895918(1)	-1.794236(1)	-6.629678(0)	-6.664801(0)
Test critical values: 1%	-3.517847	-4.081666	-3.519050	-4.083355
5%	-2.899619	-3.469235	-2.900137	-3.470032
10%	-2.587134	-3.161518	-2.587409	-3.161982

Table 4 presents the results of the augmented Dickey-Fuller test if the variables are stationary in level and first differenced.

5. Results

Cointegration test results are presented in table 4. Both the trace test and maximum Eigen-value test are based on the likelihood ratio. Results of both the tests converge for all the sectors except for energy, hotel and industrial investment. For these 3 sectors, trace test shows that there are at least 2 cointegrating vectors whereas maximum Eigen-value test suggests only one cointegrating vector for all the sectors. Enders (2003) suggests that maximum Eigen-value test should be preferred in deciding on the number of cointegrating vectors. This suggestion is supported by Banerjee et al. (1993). We infer that macroeconomic variables in the system share a long-run relationship with all the sectoral indices returns.

Table 5: Johansen Test for Cointegrating Vectors

Panel (a): Unrestricted Cointegration Rank Test Based on Trace Statistic Test

Hypothesized No. of CEs													
None		At most 1		At most 2		At most 3		At most 4		At most 5		At most 6	
(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
AGR													
0.49	137.75*	0.32	87.41	0.27	58.26	0.18	34.27	0.14	19.10	0.07	7.71	0.03	2.15
BAN													
0.52	146.06*	0.34	90.54	0.28	59.48	0.19	34.64	0.15	19.18	0.08	7.03	0.01	0.74
BUI													
0.48	140.36*	0.35	90.76	0.26	58.87	0.23	36.26	0.15	16.14	0.05	3.91	0.00	0.00
CEM													
0.49	142.36*	0.34	91.59	0.28	60.78	0.20	35.80	0.16	19.08	0.06	5.67	0.01	0.77
ENE													
0.48	149.59*	0.39	100.68*	0.32	63.22	0.19	34.07	0.14	18.62	0.07	7.58	0.02	1.72

HOT													
0.52	160.08*	0.36	104.71*	0.30	70.88*	0.26	44.07	0.16	21.10	0.07	8.31	0.03	2.67
IND													
0.51	15.35*	0.37	100.16*	0.32	65.22	0.21	36.58	0.14	19.24	0.07	7.73	0.03	2.08
INS													
0.48	139.21*	0.35	90.00	0.26	57.91	0.19	35.62	0.14	19.67	0.09	8.30	0.02	1.36
MED													
0.49	139.94*	0.31	89.30	0.28	61.77	0.23	37.42	0.13	17.50	0.06	6.71	0.03	2.08
MUL													
0.48	134.42*	0.31	85.43	0.27	57.43	0.20	34.19	0.14	17.18	0.04	5.54	0.03	2.49
PET													
0.49	149.78*	0.38	98.74	0.29	63.04	0.21	36.82	0.13	18.95	0.09	8.21	0.02	1.24
REA													
0.47	136.21*	0.33	88.73	0.29	59.12	0.20	33.81	0.16	17.27	0.05	4.40	0.01	0.71
RET													
0.47	136.85*	0.29	88.53	0.26	62.27	0.18	40.03	0.18	24.76	0.09	10.20	0.04	3.37
TEL													
0.48	141.17*	0.36	91.35	0.29	57.23	0.19	31.44	0.13	15.81	0.05	5.35	0.02	1.60
TRA													
0.49	131.20*	0.29	80.23	0.24	54.61	0.21	34.35	0.14	16.14	0.04	4.52	0.02	1.71

Panel (b): Unrestricted Cointegration Rank Test Based on Maximum Eigenvalue Statistic Test

Hypothesized No. of CEs													
None		At most 1		At most 2		At most 3		At most 4		At most 5		At most 6	
(1)	(3)	(1)	(3)	(1)	(3)	(1)	(3)	(1)	(3)	(1)	(3)	(1)	(3)
AGR													
0.49	50.35*	0.32	29.15	0.27	23.99	0.18	15.17	0.14	11.39	0.07	5.55	0.03	2.15
BAN													
0.52	55.52*	0.34	31.06	0.28	24.84	0.19	15.45	0.15	12.15	0.08	6.29	0.01	0.74
BUI													
0.48	49.60*	0.35	31.89	0.26	22.61	0.23	20.11	0.15	12.23	0.05	3.91	0.00	0.00
CEM													
0.49	50.77*	0.34	30.82	0.28	24.97	0.20	16.72	0.16	13.41	0.06	4.90	0.01	0.77
ENE													
0.48	48.90*	0.39	37.46	0.32	29.16	0.19	15.45	0.14	11.04	0.07	5.86	0.02	1.71
HOT													
0.52	55.36*	0.36	33.83	0.30	26.81	0.26	22.96	0.16	12.79	0.07	5.64	0.03	2.67
IND													
0.51	53.19*	0.37	34.93	0.32	28.64	0.20	17.34	0.14	11.50	0.07	5.65	0.03	2.08
INS													
0.48	49.22*	0.35	32.08	0.26	22.29	0.19	15.95	0.14	11.37	0.09	6.94	0.02	1.36
MED													
0.49	50.64*	0.31	27.52	0.28	24.35	0.23	19.92	0.13	10.78	0.06	4.63	0.03	2.08
MUL													
0.48	48.99*	0.31	28.00	0.27	23.24	0.20	17.01	0.14	11.64	0.04	3.05	0.03	2.49
PET													
0.49	51.04*	0.38	35.69	0.29	26.23	0.21	17.87	0.13	10.73	0.09	6.97	0.02	1.24
REA													
0.47	47.49*	0.33	29.60	0.29	25.31	0.20	16.55	0.16	12.86	0.05	3.69	0.01	0.71
RET													
0.47	48.32*	0.29	26.27	0.26	22.23	0.18	15.27	0.18	14.55	0.09	6.83	0.04	3.37
TEL													
0.48	49.82*	0.36	34.12	0.29	25.79	0.19	15.63	0.13	10.46	0.05	3.75	0.02	1.60
TRA													
0.49	50.97*	0.29	25.62	0.24	20.26	0.21	18.21	0.14	11.61	0.04	2.81	0.02	1.71

Notes: * denotes significance at 5% level

(1) denotes Eigenvalue; (2) denotes Trace Statistic; (3) denotes Maximum-Eigen Statistic

An OLS estimation of cointegrating equations is given in table 5. Consumer price index affects stock prices of firms from 11 sectors. Consumer price index and stock prices are positively associated in case of agriculture, energy, industrial investment, petrochemical and retail. Investment in these sectors is considered as a hedge against inflation. The two variables are negatively related in case of building, cement, hotel, insurance, media, multi-investment, real estate, telecommunication and transport. Investment in these sectors is not considered as a hedge against inflation. Industrial production is found to have no impact on the stock prices in any sector. Real economic activity changes do not seem to impact equity investment in Saudi Arabia. Money supply is found to have a statistically significant impact on the stock prices of 11 sectors namely building, cement, energy, hotel, insurance, media, multi-investment, petrochemical, real estate, telecommunication and transport. Money supply has a positive impact on the stock prices of building, cement, hotel, insurance, media, multi-investment, real estate, telecommunication and transport. It has a negative association with the stock prices of energy and petrochemical firms. Nominal effective exchange rate affects the stock prices of agriculture, cement, hotel, industrial investment, media, multi investment, petrochemical, real estate, retail, telecommunication and transport. Nominal effective exchange rate affects the stock prices of all these sectors positively excepting in case of petrochemical industry. Saudi Arabia is an open economy. It has no restrictions on capital account and current account convertibility. Saudi Arabia's merchandise trade stood at 82.6% of its gross domestic product at the end of 2011. Its net inflow of foreign direct investment was around US $ 16,308 million as at the end of 2011. (World Bank, 2013) This absolute free mobility of funds explains the positive relationship between the foreign exchange rate and stock prices. Saudi Arabia is the world's largest exporter of oil. Exchange rate movements affect the relative competitiveness of its oil industry. Hence, it has an inverse relationship with stock prices of firms in petrochemical industry. Oil prices and stock prices of 7 sectors, banks, building, cement, industrial investment, petrochemical, real estate and transport, are related. Oil prices and stock prices of all these sectors are positively related. This finding is in line with the findings brought out by studies on oil exporting economies. (Bjornland 2008) Global stock price as measured by MSCI is related to the stock prices of all sectors except banks and real estate. Global stock price and stock price of building and construction firms are inversely related while global stock price is found to have a positive relationship with the stock prices of rest of the sectors. Saudi Arabia's currency is pegged to US dollar since 1986. The country has no restrictions on currency convertibility for capital and current account transactions. American market is an alternative investment market for Saudi investors. Hence, a positive relationship exists between global stock prices and stock prices. Probably, an all-round optimism about stock investments results in less money being spent on building and construction activities in Saudi Arabia and vice versa. Banks and financial services sector is affected by only oil prices. Stock prices of companies from the transport sector are impacted by all the chosen macroeconomic variables and global stock prices except industrial production.

Table 6: Regression Results

Sector	Constant	CPI	IP	MS	EX	OIL	MSCI
AGR	-13.7426* (-4.3006)	2.5718* (3.6402)	-0.2119 (-1.3338)	-0.5089 (-1.5687)	1.8681* (3.5797)	0.0431 (0.4255)	0.9249* (7.9495)
BAN	11.1986* (2.9304)	-0.7001 (-0.8286)	0.0052 (0.0276)	-0.3740 (-0.9640)	0.2470 (0.3958)	0.3306* (2.7285)	0.2531 (1.8192)
BUI	30.8569* (5.4051)	-6.4292* (-5.0937)	-0.1456 (-0.5129)	1.2452** (2.1482)	0.2502 (0.2684)	0.8765* (4.8418)	-0.5034* (-2.4221)
CEM	-8.3736 (-1.6534)	-2.3557** (-2.1038)	0.0159 (0.0632)	1.0006** (1.9459)	2.9487* (3.5652)	0.5660* (3.5247)	0.7309* (3.9643)
ENE	-0.0889 (-0.0288)	2.5562* (3.7438)	-0.0969 (-0.6316)	-0.9599* (-3.0614)	-0.1592 (-0.3157)	0.0270 (0.2758)	0.5906* (5.2532)
HOT	-6.8463 (-1.0172)	-3.7078* (-2.4918)	0.1235 (0.3692)	2.0767* (3.0391)	2.6958* (2.4526)	0.2032 (0.9524)	0.6841* (2.7920)
IND	-5.1226 (-1.8830)	0.3201 (0.5322)	-0.0078 (-0.0580)	-0.0467 (-0.1693)	1.3946* (3.1392)	0.4728* (5.4817)	0.5603* (5.6578)
INS	4.8036 (0.6068)	-4.5891* (-2.6220)	0.0691 (0.1756)	1.6570** (2.0616)	0.8049 (0.6225)	0.1793 (0.7145)	1.1237* (3.8990)
MED	-9.5684 (-1.0861)	-8.1368* (-4.1775)	-0.0644 (-0.1472)	3.1379* (3.5080)	5.8766* (4.0845)	0.4892 (1.7512)	0.9503* (2.9627)
MUL	-4.4554 (-0.7182)	-5.5355* (-4.0362)	-0.1298 (-0.4211)	1.8235* (2.8953)	3.6849* (3.6375)	0.3614 (1.8377)	1.3443* (5.9526)
PET	8.9384*	1.2024	0.0229	-0.9782*	-1.1411**	0.7091*	0.3374*

	(2.5329)	(1.5412)	(0.1308)	(-2.7301)	(-1.9799)	(6.3376)	(2.6267)
REA	10.9942 (1.7215)	-6.5910* (-4.6679)	-0.2554 (-0.8045)	2.1669* (3.3417)	2.5914* (2.484687	0.4792** (2.3664)	0.3912 (1.6826)
RET	-18.6204* (-5.1685)	0.6964 (0.8744)	-0.0062 (-0.0351)	0.5346 (1.4616)	2.7190* (4.6213)	0.1220 (1.0680)	1.0099* (7.6996)
TEL	3.0027 (0.7350)	-2.8043* (-3.1051)	-0.0506 (-0.2494)	0.9707** (2.3404)	1.4005** (2.0993)	0.1657 (1.2795)	0.6877* (4.6239)
TRA	-4.9034 (-0.6604)	-3.8718** (-2.3587)	-0.3411 (-0.9240)	1.5696** (2.0822)	3.9457* (3.2541)	0.5189** (2.2042)	0.5651** (2.0906)

Notes:
1. t-statistic in parentheses
2. *denotes significance at 1% level
3. ** denotes significance at 5% level

Both long-run and short-run causality tests are carried out. Presence of long-run causality can be inferred from a significant negative error correction term. Long-run causality is detected in case of seven sectors, agriculture and food industries, building and construction, cement, industrial investment, insurance, telecommunication and information technology and transport. Error correction terms indicate the speed of adjustment to long-run equilibrium whenever deviations occur. Industrial investment sector correct at the rate of 46.05% of the short-run deviations every month. Insurance industry adjusts at 17.45% every month to bring back the long-run equilibrium. All other sectors adjust at a slower pace. Consumer price index bears a short-run causality relationship with banks and financial services and building and construction sectors. Industrial production affects the share prices of firms from agriculture and food industries, cement, energy and utilities, hotel and tourism, real estate development and retail in the short-run. Variations in money supply cause changes in share prices of firms belonging to building and construction sector only. Exchange rates and oil prices have no short-run association with any of the sectoral indices. Global stock prices affect petrochemical industries and telecommunication and information technology sectors in the short-run.

Table 7: Causality Tests Results

Dependent Variable	Independent Variables						ECT
	ΔCPI	ΔIP	ΔMS	ΔEX	ΔOIL	ΔMSCI	
AGR	1.8808	6.9820*	2.1175	1.6094	1.0887	0.4372	-0.1274* (-1.9919)
BAN	3.7251*	0.0627	3.0776	0.2600	0.7135	2.8921	-0.0188 (-0.8671)
BUI	5.9119*	0.1816	4.4645*	0.1455	0.6761	2.3697	-0.0819* (-2.3555)
CEM	1.3530	4.6822*	1.8741	0.0016	0.0267	0.9949	-0.0466* (-2.3147)
ENE	0.3058	4.4951*	0.3028	0.0883	0.60730	0.1920	-0.0047 (0.5191)
HOT	0.8584	5.6625*	1.2659	1.4088	0.6692	0.00951	-0.0508 (1.2843)
IND	0.5553	2.3081	0.5788	0.1587	0.8701	3.0295	-0.4605* (-4.2010)
INS	0.2699	0.2895	0.1200	3.3529	2.7395	0.0037	-0.1745* (-3.3993)
MED	1.7908	2.7840	2.0395	0.5400	0.0816	0.1301	-0.0115 (-0.8488)
MUL	0.0611	1.6611	0.0906	1.6588	1.0598	0.2482	-0.0392 (-1.3812)
PET	0.4082	1.0676	0.3034	0.3078	0.3179	6.4795*	-0.1033 (1.4949)
REA	0.0202	5.9425*	0.0259	1.6107	0.3651	2.6946	-0.0226 (1.1546)
RET	2.2555	4.8372*	2.6669	2.1209	0.9922	1.0733	-0.0169 (-0.9475)

TEL	0.0039	2.3076	0.0136	1.0079	0.1190	3.9452*	-0.1064* (2.8188)
TRA	0.2058	1.0629	0.3265	0.2590	0.1010	0.5676	-0.0300* (-1.9238)

Notes:
1. *denotes significance at 5% level
2. ECT column gives error correction term with t statistic in parenthesis
3. All other columns give χ^2 statistic

6. Conclusion

The objective of this paper is to examine the relationship between sectoral returns and select macroeconomic variables by a time series analysis. Both the short-run and long-run causality relationship between sectoral indices and macroeconomic variables are analysed. This study shows that the chosen macroeconomic variables share a long-run relationship with many of the sectors listed on Saudi stock market. Only industrial production does not affect any sectoral return. The impact of these macroeconomic variables on different sectors is found to be varied. Consumer price index is found to affect the returns of agriculture, energy, industrial investment, petrochemical and retail positively and building, cement, hotel, insurance, media, multi-investment, real estate, telecommunication and transport negatively. Money supply, exchange rate and global stock prices are all found to affect the returns on some sectoral indices positively while they affect a few others negatively. The speed of adjustment of the specific sectors in case of short-run deviations is also found to be different. The results show that the chosen macroeconomic variables share a long-run causality relationship with the returns of agriculture, building & construction, cement, industrial investment, insurance, telecommunication and transport. Consumer price index causes variations in stock returns in banking and building & construction sectors in the short run. Industrial production affects agriculture, cement, energy, hotel, real estate and retail sectoral returns in the short-run. Money supply causes fluctuations in short-run returns from building & construction sector. Exchange rate and oil prices fluctuations do not share a short-run causality relationship with the returns from any of the sectors. Variations in the global stock prices cause variations in petrochemical and telecommunication sectors in the short-run. This study offers important information to the investors and policy makers in the Saudi stock market. Investors in specific sectors of the market should analyse the relevant macroeconomic variables and its impact on the specific sector. Investors in the specific sectors of Saudi stock market can either enhance their profit or reduce their risk exposure in the event of macroeconomic policy changes. Investors can also liquidate or shift their portfolios in the face of policy changes that affect macroeconomic variables. Policy makers will also benefit from the results of this study. By understanding the relationship between macroeconomic variables and sectoral returns, they can formulate policies suitably to promote focused growth of various sectors of the economy.

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