IOSR Journal of Business and Management (IOSR-JBM)
e-ISSN: 2278-487X, p-ISSN: 2319-7668. Volume 19, Issue 1. Ver. VI (Jan. 2017), PP 28-33
www.iosrjournals.org

Relationship between Oil Price, Exchange Rates and Stock Market: An Empirical study of Indian stock market

Rohit Kumar
Research Scholar Dept. of Applied Economics & Commerce, Darbhanga House, Patna University, Patna

Abstract: *The theories consider macroeconomic variables to be major determinants of stock market returns or performance. But, the empirical evidence collected from different countries over the world is ambiguous. The effect of macroeconomic variables on stock market has been very popular among the researchers from past many decades. This study chooses two macro variables, i.e., oil price and exchange rate because of their increasing importance nowadays. The variables chosen do not show long run association, while short run association was evident from the analysis.*

Keywords: *Oil price, Exchange rate, Stock market, VAR analysis*

I. Introduction

The theories consider macroeconomic variables to be major determinants of stock market returns or performance. But, the empirical evidence collected from different countries over the world is ambiguous. The variables which were found to have bilateral casual relationship with one stock market's return shows unilateral or no casual relationship with some other market. The effect of macroeconomic variables on stock market has been very popular among the researchers from past many decades. Fama was among few of the earliest contributors to this part of literature. In his article, Fama tried to explain the stock return-inflation relationship and found negative simple correlation between the variables stated (Fama, 1981). In 1986, another group of researchers studied stock market's relationship with few macroeconomic variables, viz., short term and long term interest rates, expected and unexpected inflation rate and industrial production growth. The results showed a strong relationship between macro variables specified and stock market returns (Chen, Roll, & Ross, 1986). In similar type of study in Japanese stock market in 1988, Hamao found similar results but for industrial production (Hamao, 1988).

While there is abundance of literature on this particular topic for developed countries, only few are found for developing countries. But with the limited empirical evidences, it can be believed that the effect of macroeconomic variables on stock market performance does not remain same for both developing and developed countries. Moreover, not all the variables are equally important to explain the variations in the stock market.This study chooses two macro variables, i.e., oil price and exchange rate because of their increasing importance nowadays. While oil has become a commodity of global importance today, exchange rate has become crucial because of increasing globalization. Globalization has affected almost every business unit, whether multinational or domestic, extensively from last few decades. This made exchange rate a major factor affect company's operating profit. Thus, if the market is even slightly rational the exchange rate becomes extremely important factor affecting it. On the hand, oil price becomes important variable for the study not only because of its inherent importance but also as it has major impact of India's economy. The huge part of India's current account deficit is because of the oil import, which gave the theoretical ground to consider oil price as important macro variable affecting stock market.

Stock Market and Exchange Rate

Many studies performed in US have shown that changes in exchange rate or its level affect stock market. It was further concluded that depreciation in domestic currency is beneficial for an export oriented economy (Soenen & Hennigar, 1988).

In another study, researchers used co-integration test and granger causality to find the relationship between stock prices and effective exchange rate of the dollar. The results showed no long run relationship but bi-directional causality between the variables. (Oskooe & Sohrabian, 1992)

In a similar kind of study of eight advanced economy for a time period of 1985-1991, analysis of daily data using vector error correction model and causality test suggests following results:

1. In long run, domestic currency values and stock prices have bi-directional causality.
2. In short run, increase in stock prices negatively affects domestic currency value. Whereas decrease in domestic currency value further depreciates stock price. (R.A.Ajayi & Mougone, 1996)

When such research was performed in seven Asian countries, during Asian crisis, results of granger causality showed bi-directional causality between stock prices and exchange rate for few countries while uni-directional causality for other countries. (Ganger, Huang, & C.W.Young, 2000)

Stock Market and Oil price

In a study conducted in 2011 on six countries (three oil exporting and three oil importing) using monthly data from January, 1987 to September, 2009, it was found that demand side oil price shocks have positive correlation with stock market, whereas supply side oil price shocks have no effect on the stock market (Degiannakis, Filis, & Floros, 2011). A study conducted on thirteen European countries showed negative effect of oil price on stock market for every European country except for Norway, which showed positive effect of oil price on Norwegian stock market. (Park & Ratti, 2008) A different research showed no effect of oil price on the stock market irrespective of whether the country in oil-exporting or oil-importing. (Apergis & Miller, 2009)

II. Methodology

The research tries to find an empirical evidence for both the relationship between stock market and foreign exchange and relationship between stock market and the oil price. The study hypothesizes significant relationship between stock market and foreign exchange as well as a significant relationship for stock market and oil price.The study uses monthly data of Brent Crude Price, exchange rate INR/USD from September, 2005 to August, 2015 to understand the effect of the oil price and exchange rate during the period on stock market index-Sensex and vice-versa. The granger causality test has been used to test the causality among the variables, as this test checks whether one time series explains the changes in other. Moreover, co-integration test has been used to test for any long term relationship between variables. The data were checked for nonstationarity using the Augmented Dickey Fuller test. Finally, VAR model has been used to predict thesensex value with the help of oil price and exchange rate. All these tests and estimates are performed with a maximum four lags as monthly data have been used.

III. Analysis And Findings

The Granger Causality test found a bi-directional relationship between Sensex and US Dollar price while it showed no relationship between Brent Crude price and Sensex. Moreover, at 10% significance level Brent Crude price granger cause US Dollar price. The results are present in the summary Table 1. The Johansen Cointegration test found no long term association among the three variables. Both Trace statistics and Max-Eigen value statistics showed similar result which can be seen in summary Table 2.

The Augmented Dickey Fuller test found unit roots in all the three variables, viz. Sensex, US Dollar price, and Brent Crude price at level, i.e., the three variables are non stationary. The presence of nonstationarity or stochastic trend was removed using first order differencing. The related result can be found in summary Table 3.

The VAR estimates, presented in the Table 4, are used to develop the system equations. The following are the equations thus formed:-

SENSEX = C(1)*SENSEX(-1) + C(2)*SENSEX(-2) + C(3)*SENSEX(-3) + C(4)*SENSEX(-4) + C(5)*USDP(-1) + C(6)*USDP(-2) + C(7)*USDP(-3) + C(8)*USDP(-4) + C(9)*BCP(-1) + C(10)*BCP(-2) + C(11)*BCP(-3) + C(12)*BCP(-4) + C(13)……..(eq.1)

USDP = C(14)*SENSEX(-1) + C(15)*SENSEX(-2) + C(16)*SENSEX(-3) + C(17)*SENSEX(-4) + C(18)*USDP(-1) + C(19)*USDP(-2) + C(20)*USDP(-3) + C(21)*USDP(-4) + C(22)*BCP(-1) + C(23)*BCP(-2) + C(24)*BCP(-3) + C(25)*BCP(-4) + C(26)……(eq. 2)

BCP = C(27)*SENSEX(-1) + C(28)*SENSEX(-2) + C(29)*SENSEX(-3) + C(30)*SENSEX(-4) + C(31)*USDP(-1) + C(32)*USDP(-2) + C(33)*USDP(-3) + C(34)*USDP(-4) + C(35)*BCP(-1) + C(36)*BCP(-2) + C(37)*BCP(-3) + C(38)*BCP(-4) + C(39)…….(eq. 3)

Where USDP = US Dollar Price (Units of Indian Rupees required to purchase one unit US Dollar)

BCP = Brent Crude Price (Units of US Dollar required to purchase on barrel)

The coefficients of the lagged variables are VAR estimates used to frame the above equation. In equation 1, two variables Sensex (-1) and USDP (-2) were found to be significant. In equation 2, three variables viz. Sensex (-3), Sensex (-4) and USDP (-1) were found to be significant. In the final equation only BCP (-1) was found to be significant.

IV. Conclusion

The variables chosen do not show long run association, while short run association was evident from the analysis. This means that the macro variables chosen here affect the stock market indices in short run but not in long run. Moreover, the US Dollar price is found to be a significant determinant of Sensex and vice-versa;

whereas Brent Crude price neither affect Sensex nor gets affected. The result that exchange rate and Indian stock market index have a significant relationship is in alignment with few past studies (Soenen & Hennigar, 1988), while contradictory to other few (Gay, 2008). Absence of any significant relationship between oil prices and stock market index (Sensex) is in alignment with few research(Gay, 2008), (Apergis & Miller, 2009) whereas contradicts the many researches (Degiannakis, Filis, & Floros, 2011). Further research can be performed using daily data to test the results of this study using same method or using other time series models like ARIMA, ARCH, etc.

References

[1]. Apergis, N., & Miller, S. (2009). Do structural oil - market shocks affect stock prices? Energy Economics, 31 (4), 569-575.
[2]. Chen, N., Roll, R., & Ross, S. (1986). Economic Forces and the Stock Market. Journal of Business, 59 (3), 83-403.
[3]. Degiannakis, S., Filis, G., & Floros, C. (2011). Dynamic Correlation between Stock Market and Oil Prices: The Case of Oil-Importing and Oil-Exporting Countries. Retrieved from www.sciencedirect.com/science/article/pii/S1057521911000226
[4]. Fama, E. F. (1981). Stock Returns, Real Activity, Inflation and Money. American Economic Review, 71 (4), 545-65.
[5]. Ganger, C., Huang, B., & C.W.Young. (2000). A Bivariate Causality between Stock Prices and Exchange rates: Evidence from Recent Asian Flu. The Quarterly Review of Economics and Finance, 40, 337-354.
[6]. Gay, R. D. (2008). Effect Of Macroeconomic Variables on Stock Market Returns for Four Emerging Economies: Brazil, Russia, India and China. International Business & Economics Research Journal, 7 (3), 1-8.
[7]. Hamao, Y. (1988). An Empirical Investigation of the Arbitrage Pricing Theory. Japan and the World Economy, 1, 45-61.
[8]. Oskooe, B., & Sohrabian. (1992). Stock Prices and Effective Exchange Rate of the Dollar. Applied Economics, 24, 459-464.
[9]. Park, J., & Ratti, R. (2008). Oil prices and stock markets in the U.S. and 13 European countries. Energy Economics, 30, 2587-2608.
[10]. R.A.Ajayi, & Mougone, M. (1996). On the Dynamic Relation between Stock Prices and Exchange Rates. Journal of Financial Research, 19, 193-207.
[11]. Soenen, L., & Hennigar, E. S. (1988). An Analysis of Exchange Rates and Stock Prices: the U.S. experience between 1980 and 1986. Akron Business and Economic Review, 19, 7-16.

Appendix
Summary Tables

Table 1

Pairwise Granger Causality Tests Sample: 2005M09 2015M08			
Lags: 4			
Null Hypothesis:	Obs	F-Statistic	Prob.
BCP does not Granger Cause SENSEX	116	0.49448	0.7398
SENSEX does not Granger Cause BCP		0.56755	0.6867
USDP does not Granger Cause SENSEX	116	3.30601	0.0135
SENSEX does not Granger Cause USDP		2.85313	0.0272
USDP does not Granger Cause BCP	116	0.73627	0.5692
BCP does not Granger Cause USDP		2.42384	0.0526

Table 2

Johansen Cointegration Test				
Sample (adjusted): 2006M02 2015M08				
Included observations: 115 after adjustments				
Trend assumption: Linear deterministic trend (restricted)				
Series: SENSEX USDP BCP				
Lags interval (in first differences): 1 to 4				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.168560	42.14132	42.91525	0.0596
At most 1	0.122353	20.91275	25.87211	0.1832
At most 2	0.050044	5.904045	12.51798	0.4726
Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.168560	21.22856	25.82321	0.1802
At most 1	0.122353	15.00871	19.38704	0.1931
At most 2	0.050044	5.904045	12.51798	0.4726
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

Table 3

Augmented Dickey-Fuller Test (t-statistics)				
	Level		First Difference	
Variables	Intercept	Intercept and Trend	Intercept	Intercept and Trend
Sensex	-1.257541	-2.39159	-8.446786***	-8.405966***
USDP	-0.382787	-2.162411	-9.777157***	-9.814095***
BCP	-2.405202	-2.104343	-6.67725***	-6.77071***
*** means significant at 10%, 5%, and 1%				

Table 4

Vector Autoregression Estimates			
Sample (adjusted): 2006M01 2015M08			
Included observations: 116 after adjustments			
Standard errors in ( ) & t-statistics in [ ]			
SENSEX(-1)	1.109139	0.000194	0.000792
	(0.10385)	(0.00016)	(0.00080)
	[10.6802]	[1.22739]	[0.98650]
SENSEX(-2)	-0.249690	-3.25E-06	-0.001631
	(0.15821)	(0.00024)	(0.00122)
	[-1.57826]	[-0.01348]	[-1.33375]
SENSEX(-3)	0.197113	-0.000535	0.001328
	(0.15648)	(0.00024)	(0.00121)
	[1.25967]	[-2.24141]	[1.09737]
SENSEX(-4)	-0.120722	0.000380	-0.000413
	(0.10070)	(0.00015)	(0.00078)
	[-1.19888]	[2.47367]	[-0.53046]
USDP(-1)	-97.59776	1.036019	-0.378610
	(65.9784)	(0.10057)	(0.51010)
	[-1.47924]	[10.3012]	[-0.74223]
USDP(-2)	187.7175	-0.113000	0.581504
	(92.7580)	(0.14139)	(0.71714)
	[2.02373]	[-0.79919]	[0.81087]
USDP(-3)	-25.54454	0.053080	-0.781384
	(94.4127)	(0.14392)	(0.72993)
	[-0.27056]	[0.36882]	[-1.07049]
USDP(-4)	-5.367193	-0.016200	0.413537
	(67.1788)	(0.10240)	(0.51938)
	[-0.07989]	[-0.15820]	[0.79621]
BCP(-1)	-0.538429	-0.005260	1.342077
	(13.5217)	(0.02061)	(0.10454)
	[-0.03982]	[-0.25518]	[12.8379]
BCP(-2)	10.48606	0.005301	-0.284917
	(22.4541)	(0.03423)	(0.17360)
	[0.46700]	[0.15487]	[-1.64123]
BCP(-3)	0.321939	0.020770	-0.216291
	(22.4061)	(0.03415)	(0.17323)
	[0.01437]	[0.60812]	[-1.24859]
BCP(-4)	-15.56829	-0.005551	0.110210
	(14.0589)	(0.02143)	(0.10869)
	[-1.10736]	[-0.25903]	[1.01395]
C	-1201.937	0.162255	10.99200
	(758.575)	(1.15632)	(5.86478)
	[-1.58447]	[0.14032]	[1.87424]
R-squared	0.974474	0.967474	0.934921
Adj. R-squared	0.971500	0.963685	0.927339
Sum sq. resids	70762825	164.4224	4229.712
S.E. equation	828.8653	1.263461	6.408210
F-statistic	327.6748	255.3081	123.3071
Log likelihood	-937.2296	-184.8301	-373.1822
Akaike AIC	16.38327	3.410864	6.658314
Schwarz SC	16.69186	3.719456	6.966906
Mean dependent	17704.40	49.49285	87.26172
S.D. dependent	4909.781	6.630042	23.77306
Determinant resid covariance (dof adj.)		37547369	
Determinant resid covariance		26285559	
Log likelihood		-1484.693	
Akaike information criterion		26.27058	
Schwarz criterion		27.19635	

Table 5

System: UNTITLED				
Estimation Method: Least Squares				
Date: 01/31/16 Time: 10:23				
Sample: 2006M01 2015M08				
Included observations: 116				
Total system (balanced) observations 348				
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	1.109139	0.103850	10.68024	0.0000
C(2)	-0.249690	0.158206	-1.578263	0.1155
C(3)	0.197113	0.156480	1.259674	0.2087
C(4)	-0.120722	0.100695	-1.198881	0.2315
C(5)	-97.59776	65.97839	-1.479238	0.1401
C(6)	187.7175	92.75803	2.023733	0.0439
C(7)	-25.54454	94.41274	-0.270562	0.7869
C(8)	-5.367193	67.17878	-0.079894	0.9364
C(9)	-0.538429	13.52168	-0.039820	0.9683
C(10)	10.48606	22.45412	0.467000	0.6408
C(11)	0.321939	22.40610	0.014368	0.9885
C(12)	-15.56829	14.05891	-1.107361	0.2690
C(13)	-1201.937	758.5754	-1.584467	0.1141
C(14)	0.000194	0.000158	1.227394	0.2206
C(15)	-3.25E-06	0.000241	-0.013481	0.9893
C(16)	-0.000535	0.000239	-2.241411	0.0257
C(17)	0.000380	0.000153	2.473666	0.0139
C(18)	1.036019	0.100573	10.30120	0.0000
C(19)	-0.113000	0.141394	-0.799189	0.4248
C(20)	0.053080	0.143916	0.368825	0.7125
C(21)	-0.016200	0.102402	-0.158198	0.8744
C(22)	-0.005260	0.020611	-0.255178	0.7988
C(23)	0.005301	0.034227	0.154868	0.8770
C(24)	0.020770	0.034154	0.608124	0.5436
C(25)	-0.005551	0.021430	-0.259034	0.7958
C(26)	0.162255	1.156316	0.140321	0.8885
C(27)	0.000792	0.000803	0.986503	0.3247
C(28)	-0.001631	0.001223	-1.333748	0.1833
C(29)	0.001328	0.001210	1.097368	0.2733
C(30)	-0.000413	0.000779	-0.530462	0.5962
C(31)	-0.378610	0.510099	-0.742228	0.4585
C(32)	0.581504	0.717141	0.810865	0.4181
C(33)	-0.781384	0.729934	-1.070486	0.2852
C(34)	0.413537	0.519380	0.796213	0.4265
C(35)	1.342077	0.104540	12.83789	0.0000
C(36)	-0.284917	0.173600	-1.641229	0.1018
C(37)	-0.216291	0.173228	-1.248589	0.2128
C(38)	0.110210	0.108694	1.013953	0.3114
C(39)	10.99200	5.864778	1.874240	0.0618
Determinant residual covariance		26285559		
Equation: SENSEX = C(1)*SENSEX(-1) + C(2)*SENSEX(-2) + C(3)				
*SENSEX(-3) + C(4)*SENSEX(-4) + C(5)*USDP(-1) + C(6)*USDP(-2) +				
C(7)*USDP(-3) + C(8)*USDP(-4) + C(9)*BCP(-1) + C(10)*BCP(-2) +				
C(11)*BCP(-3) + C(12)*BCP(-4) + C(13)				
Observations: 116				
R-squared	0.974474	Mean dependent var		17704.40
Adjusted R-squared	0.971500	S.D. dependent var		4909.781
S.E. of regression	828.8653	Sum squared resid		70762824
Durbin-Watson stat	1.977173			
Equation: USDP = C(14)*SENSEX(-1) + C(15)*SENSEX(-2) + C(16)				
*SENSEX(-3) + C(17)*SENSEX(-4) + C(18)*USDP(-1) + C(19)*USDP(				
-2) + C(20)*USDP(-3) + C(21)*USDP(-4) + C(22)*BCP(-1) + C(23)				
*BCP(-2) + C(24)*BCP(-3) + C(25)*BCP(-4) + C(26)				
Observations: 116				
R-squared	0.967474	Mean dependent var		49.49286
Adjusted R-squared	0.963685	S.D. dependent var		6.630042
S.E. of regression	1.263461	Sum squared resid		164.4224
Durbin-Watson stat	1.983941			
Equation: BCP = C(27)*SENSEX(-1) + C(28)*SENSEX(-2) + C(29)				
*SENSEX(-3) + C(30)*SENSEX(-4) + C(31)*USDP(-1) + C(32)*USDP(				
-2) + C(33)*USDP(-3) + C(34)*USDP(-4) + C(35)*BCP(-1) + C(36)				
*BCP(-2) + C(37)*BCP(-3) + C(38)*BCP(-4) + C(39)				

Observations: 116			
R-squared	0.934921	Mean dependent var	87.26173
Adjusted R-squared	0.927339	S.D. dependent var	23.77306
S.E. of regression	6.408210	Sum squared resid	4229.711
Durbin-Watson stat	1.959985		