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IMPACT OF OIL PRICE FLUCTUATIONS ON STOCK RETURNS AND EXCHANGE RATE: A CASE STUDY OF BRAZIL, CHINA, MEXICO, RUSSIA, SAUDIA ARABIA, VENEZUELA

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Abstract

The purpose of this research is to investigate the impact of oil price variation on stock returns and exchange rate on country's economy. It estimates a Vector Auto-Regressive model with Impulse Response function. In addition to that ADF test and granger causality test has also been applied. The countries under consideration are Russia, China, Brazil, Mexico, Saudi Arabia, and Venezuela .These are all oil producing and exporting countries with the exception of Brazil and China who only produce oil. Independent variable under consideration is crude oil price and dependent variables are stock market returns and exchange rate. Data was collected on monthly basis and data range is from January 2001 to July 2016 with 187 total observations. It is shown that oil price variation does not make significant impact on Russia, Mexico and Venezuela's Stock market returns and exchange rate. Saudi Arabia is the only country among oil exporters in which oil price volatility made a significant impact on exchange rate. As for as China and Brazil are concerned impact of oil variation on both countries exchange rate is not significant but on stock market returns it is statically significant. A key limitation of this study is that, it is based on daily data base and due to this reason some of the countries are not included due to non-availability of data and absence of registered stock markets.

Keywords: OPEC, CPI, PIC, EIA, ARDL, VAR, CCI, ARMA

Introduction

The Crude oil is singled out as one of the most dominant natural energy resources and prominently serving as lifeblood of the world economy. Hamilton (1983) observes that seven of the eight major recessions since World War II in the United States are preceded by a drastic surge in the oil prices.A sudden disappearance of oil would make the majority of industries, especially transport sector, come to screeching halt and human's daily lives become stagnant. Hence, the global rapid growth combined with a strong tie of many economies to crude oil has been making it the most-frequently traded and highly competitive commodity in the centralized international exchange markets and its impact is also evident on stock returns as well. Nargan (2013) confirmed the relationship between exchange rate and oil prices and it was also second by kisswani (2015) who elaborated that a highly significant bidirectional causality exists which proves that oil variation do influence exchange rates. Diez et al (2016) declared that oil price variation impact on stock returns is imminent and bouri (2015) did also correspond that oil prices do affect stock returns but it totally depends that up to what extent countries economy is dependent on oil. Oil volatility has influenced almost every macroeconomic variable and it was confirmed by the Diez et al

(2016).in addition oil volatility impact will depend on countries position that whether country is importer or exporter and it was confirmed by Bouri (2016).

Statement of problem

The subject of oil variation impact on exchange rate and stock returns is very important for scholars of different area. Oil volatility and its effect can be very useful when it comes to hedging or investment. In simple words, results obtained from this study have important policy implications for investors and market participants. Market participants and investors can use linkages between oil price uncertainty and equity return to hedge and diversify equity.

Objectives

The rationales behind choosing the topic are

- To find out relationship between oil prices and currency exchange rates of the world's major oil exporting countries.
- To search out the crude oil prices effect on exchange rates of these given countries in a long and short run
- To investigate oil prices influence on stock returns of these given countries in a long and short run

Literature Review

Nguyen and Bhatti (2012) studied the Copula model dependence between oil prices and stock markets. Purpose of the research is to find out the relationship between oil price variation and stock markets by using parametric and non-parametric methods. Two variables oil price and stock market index are used and data is taken on daily basis. For china data is taken from Shanghai price index and for Vietnam it is taken from VN index in dollars. Methodology is based on plots (chi- and k-plots) and copula model. Results of the study indicated that the presence of left tail dependency between global oil price variation and stock market movements for Vietnam by explaining that if global oil price decreases than Vietnam stock market will also follow the pattern. Study also explored that there is presence of left tail dependency in china as well and this was the findings which made this paper different from previous studies. Study also suggested guidelines for policy making and is also useful for investors and risk managers as they can diversify their risk by investing in both china and Vietnamese market. Study conducted not only showed that parametric and non-parametric provided the same results but it also discovered two informative flexible and effective methods for measuring dependence structures between variables.

Boubaker and Sghairer (2013) analyzed the Instability and time- varying dependence structure between oil price and Stock Market in GCC Countries. Stock market Indices and Crude oil prices are two variables which are used in this study and a total of 1939 observations regarding data are Included. Methodology contains Archimedes Copulas, Gumbel, Claston and Frank and they are useful for different tail dependence structures. Study conclusion revealed evidence of asymmetric tail dependence in all countries. In exact terms results showed lower tail dependence in all countries with the exceptions of Oman. That means that oil prices variables and stock market returns crash at same time. However in case of Oman results were different as it showed a upper tail dependence by showing that the stock market returns and oil price variation boom at same time. Study provided a guide line to investors to invest in GCC markets and to manage their portfolio. Study also declared that tail dependence co-efficient and copula model parameters are higher in financial period than in normal period with contagion effect.

Jouini (2013) measured the return and volatility interaction between oil prices and stock markets in Saudi Arabia. Geographical location is Saudi Arabia. Data is collected for several sectors namely Brent oil, market index, telecom and IT, Industrial invest, Insurance, energy and utilities and banks and finance services. Methodology consists of VAR Graph model. Study conclusion declared that different industries response may vary to oil price shocks. International study analysis showed that proof of significant unilateral return spillover influence running from Brent oil price to three out of total six sectors exist only over the turmoil period. Study also concluded that returns are not much helpful to predict oil price variation. study also suggested concentration showed be paid to study spillover effects of stock market to oil price instead of only observing oil price shocks. study also advised that these empirical finding should be used by authorities to make policies about the regulation of stock sector market and oil price variation and should also be used by investors and market participant for decision making.

Kisswani (2015) investigated that does oil price variability affect ASIAN exchange rates? Five Asian countries are taken as a sample for the study is Indonesia, Malaysia, Philippines, Singapore and Thailand. Variables of interest are oil prices and exchange rate. Data is collected quarterly and data range is for the period of 1973 to 2013. Methodology consists of panel co integration test of Mandela and Wu (1999). Evidence revealed by study showed that co integration exists between real exchange rates and real oil prices. Study also declared results of non-causality test which was used to find relationship between oil prices and exchange rates that there is a highly significant bidirectional causality which shows that oil variation impact exchange rates. Results of this study also provided evidence that oil prices are one of time series tests and non-causality tests. The major source of real exchange rate developments is due to its oil prices as they are charged in US dollars.

Shafi et. al (2015) analyzed the exchange rate volatile and oil price shocks and its impact on economic sustainability. Data is taken annually for forty years from 1971 to 2012.Variables included in this study are GDP oil prices and exchange rate. Data source is international financial statistic. Methodology is based on VAR model. Study results showed that relationship of exchange rates and oil prices with GDP of Germany is positive. According to the study positive sign has indicated that any increase in oil prices would be affecting positively to GDP and exchange rate would also increase GDP. Study outcomes also showed that interest rate, government consumptions and import of the Canada had significant effect and positively reacted with exchange rate while inflation, exports and foreign direct investment had negatively associated with the real effective exchange rate.

Methodology

The data is based on 187 observations from the period of 2001 to 2016. Sources of data are Bloomberg, yahoo finance and investing.com. Collected data analyzed through E-views 8.

Research Questions

Study objectives leads to some research questions

- How oil price variation is going to affect real exchange rate?
- What is the impact of oil variation on countries stock market index?

Hypothesis

H0: There is no relationship between oil variation and exchange rate.
H1: There is relationship between oil variation and exchange rate.
H0: There is no relationship between oil variation and stock returns.
H1: There is significant relationship among oil variation and stock returns.

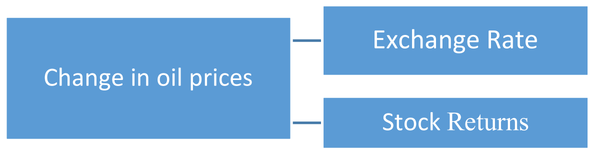
Economic Model

The approach used in this study is the linear dynamic VAR method of Sims (1980). Vector auto regression (VAR) is an econometric model that is use to capture the linear inter dependencies between multiple time series. VAR models usually generalize the uni variant autoregressive model (AR model) by allowing for more than one evolving variable. Sometime economic theory may not be adequate to determine the specific relationship between variables according to Rubin Fled and Pindyik then there are scenarios when it is important to consider logic and to allow the data to notify dynamic in a relationship. VAR have very low theoretical demands on the structure of the relationship in a model. VAR guides researchers to understand interrelating among economic variables. Before applying, the VAR model one should ensure that data is stationary at level or one difference or lag and to check the stationary of data tests like ADF can be applied. If data is non-stationary then we have to run co-integration test and in that case we have to include error correction term in VAR model and will become Vector error correction model. Moreover, unrestricted VAR model of order P is presented in equations and the structure is that each variable is a linear function of past lags of itself and past lags of the other variables.

$$\begin{pmatrix} y_{1,t} \\ y_{2,t} \\ \vdots \\ y_{k,t} \end{pmatrix} = \begin{pmatrix} c_1 \\ c_2 \\ \vdots \\ c_k \end{pmatrix} + \begin{pmatrix} A_{11}^{(1)} & A_{12}^{(1)} & \cdots & A_{1k}^{(1)} \\ A_{21}^{(1)} & A_{22}^{(1)} & & A_{2k}^{(1)} \\ \vdots & & \ddots & \vdots \\ A_{k1}^{(1)} & A_{k2}^{(1)} & \cdots & A_{kk}^{1} \end{pmatrix} * \begin{pmatrix} y_{1,t-1} \\ y_{2,t-1} \\ \vdots \\ y_{k,t-1} \end{pmatrix} + \cdots\cdots + * \begin{pmatrix} A_{11}^{(p)} & A_{12}^{(p)} & \cdots & A_{1k}^{(p)} \\ A_{21}^{(p)} & A_{22}^{(p)} & & A_{2k}^{(p)} \\ \vdots & & \ddots & \vdots \\ A_{k1}^{(p)} & A_{k2}^{(p)} & \cdots & A_{kk}^{p} \end{pmatrix} * \begin{pmatrix} y_{1,t-p} \\ y_{2,t-p} \\ \vdots \\ y_{k,t-p} \end{pmatrix} + \begin{pmatrix} \varepsilon_1 \\ \varepsilon_2 \\ \vdots \\ \varepsilon_k \end{pmatrix}$$

Where $y_{1,t}$ represents stock returns and $y_{2,t}$ is exchange rate. In above equation $y_{k,t}$ stands for oil prices but we will not evaluate it as its not in our objectives of study to treat oil as dependent variable. Unit root test also be used to check stationary of data. On the results of unit root test one can decide that whether co-integration test should apply or not and in addition to above granger causality and impulse response function are also be used to analyze the data.

Conceptual Framework



Interpretation

All analysis was done using E-Views in following manner.

(a) Unit Root Test
(b) Vector Autoregressive Model (VAR)
(c) Granger Causality Test
(d) Impulse Response Function (IRF)

Testing Stationary – Unit Root Testing

Unit roots test was applied to reject presence of non-stationary in the time series. To apply unrestricted VAR model, all model variables should be stationary. Each variable for each country was tested for presence of any unit roots in oil prices, stock returns and exchange rates. ADF test was applied for this purpose. Sequence charts were developed followed by application of ADF test to confirm series stationary. When series was not found stationary, its first difference was tested against presence of unit roots.

ADF test showed the following results regarding stationary

1. International oil prices are stationary I(1)
2. Brazil stock returns are stationary I(0)
3. Brazil exchange rates are stationary I(1)
4. China stock returns are stationary I(0)
5. China exchange rates are stationary I(1)
6. Mexico stock returns are stationary I(0)
7. Mexico exchange rates are stationary I(1)
8. Russia stock returns are stationary I(0)
9. Russia exchange rates are stationary I(1)
10. Saudi stock returns are stationary I(0)
11. Saudi exchange rates are stationary I(0)
12. Venezuela stock returns are stationary I(0)
13. Venezuela exchange rates are stationary I(1)

Vector Auto-Regression (VAR) Model

Before VAR model is applied on study data one of the critical decisions that have to be made is to choose appropriate number of lags. Following criteria was applied in selection of best numbers of lags for each model.

- LR: sequential modified LR test statistic (each test at 5% level)
- FPE: Final prediction error
- AIC: Akaike information criterion
- SC: Schwarz information criterion
- HQ: Hannan-Quinn information criterion

Starting from Brazilian model, following table presents the lag selection criteria

Table:1

VAR Lag Order Selection Criteria						
Endogenous variables: D(BRAZIL EXCHANGE RATE) BRAZIL STOCK RETURNS D(OIL PRICES)						
Exogenous variables: C						
Sample: 2001M01 2016M07						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-1101.772	NA	65.68672	12.69853	12.75299*	12.72062*
1	-1088.102	26.71052	62.25559	12.64486	12.86272	12.73323
2	-1077.114	21.09283	60.85526	12.62200	13.00326	12.77666
3	-1068.280	16.65236	60.98682	12.62391	13.16857	12.84486
4	-1063.088	9.608628	63.74442	12.66768	13.37574	12.95491
5	-1059.429	6.643952	67.83007	12.72907	13.60054	13.08259
6	-1051.871	13.46651	69.03634	12.74564	13.78050	13.16545
7	-1038.586	23.21015	65.81461	12.69639	13.89465	13.18248
8	-1027.016	19.81548	64.02190	12.66685	14.02851	13.21922
9	-1014.808	20.48722	61.85602	12.62997	14.15504	13.24863
10	-1010.641	6.849267	65.59014	12.68553	14.37399	13.37047
11	***-978.0271***	***52.48179****	***50.18651****	***12.41410****	***14.26596***	***13.16533***
12	-971.1456	10.83635	51.65534	12.43846	14.45371	13.25597
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

In the above table * indicates lag order selection by criteria. It is not always the case that all criteria point to single lag number to be chose. Researcher has selected the lag based on maximum number of criteria to meet. Lag selection was run on 12 lags as research data was monthly. Above table show that 11 lags were appropriate for the model to be estimated Brazil. Similarly 8 lags were selected for running China's model below.

Table: 2

VAR Lag Order Selection Criteria						
Endogenous variables: D(CHINA EXCHANGE RATE) CHINA STOCK RETURNS D(OIL PRICES)						
Exogenous variables: C						
Sample: 2001M01 2016M07						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-954.4184	NA	12.07549	11.00481	11.05928*	11.02690
1	-937.8937	32.28954	11.07524	10.91832	11.13618	11.00670*
2	-932.1476	11.02996	11.49852	10.95572	11.33698	11.11038
3	-919.1750	24.45406	10.98803	10.91006	11.45472	11.13101
4	-906.5875	23.29417	10.54896	10.86882	11.57689	11.15606
5	-900.8805	10.36433	10.96386	10.90667	11.77814	11.26019
6	-893.4758	13.19231	11.17859	10.92501	11.95987	11.34481
7	-883.8518	16.81440	11.11490	10.91784	12.11610	11.40393
8	***-863.6079***	***34.67059****	***9.786183****	***10.78860****	***12.15026***	***11.34097***
9	-857.7620	9.810237	10.17248	10.82485	12.34991	11.44351
10	-851.6663	10.01950	10.55007	10.85823	12.54669	11.54318
11	-849.7867	3.024558	11.49278	10.94008	12.79194	11.69131
12	-845.1767	7.259435	12.14206	10.99054	13.00580	11.80805
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

For running Exchange Rate, Stock Returns and Oil Prices model for Mexico, one lag was used. This selection of lag was made on the basis of VAR Lag Order Selection Criteria as shown in the table below.

Table:3

VAR Lag Order Selection Criteria						
Endogenous variables: D(MEXICO EXCHANGE RATE) MEXICO STOCK RETURNS D(OIL PRICES)						
Exogenous variables: C						
Sample: 2001M01 2016M07						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-1546.234	NA	10868.83	17.80729	17.86175	17.82938
1	***-1517.319***	***56.50020***	***8645.310***	***17.57838***	***17.79625****	***17.66676****
2	-1513.059	8.176327	9130.416	17.63287	18.01413	17.78753
3	-1502.598	19.72047	8980.566	17.61607	18.16073	17.83702
4	-1494.338	15.28588	9061.406	17.62457	18.33264	17.91181
5	-1489.033	9.633777	9461.447	17.66705	18.53851	18.02057
6	-1481.075	14.17901	9585.542	17.67902	18.71388	18.09882
7	-1467.537	23.65156	9111.713	17.62687	18.82513	18.11295
8	-1452.254	26.17420*	8493.219	17.55465	18.91631	18.10702
9	-1443.157	15.26650	8504.630	17.55353	19.07859	18.17219
10	-1433.162	16.42953	8433.667*	17.54209*	19.23055	18.22703
11	-1425.017	13.10689	8548.894	17.55192	19.40378	18.30314
12	-1417.418	11.96556	8726.870	17.56802	19.58328	18.38554

* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

For running Exchange Rate, Stock Returns and Oil Prices model for Russia, one lag was used. This selection of lag was made on the basis of VAR Lag Order Selection Criteria as shown in the table below.

Table:4

VAR Lag Order Selection Criteria						
Endogenous variables: D(RUSSIA EXCHANGE RATE) RUSSIA STOCK RETURNS D(OIL PRICES)						
Exogenous variables: C						
Sample: 2001M01 2016M07						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-1652.689	NA	36948.36	19.03091	19.08537	19.05300
1	***-1623.868***	***56.31647***	***29421.34***	***18.80308***	***19.02095****	***18.89146****
2	-1618.771	9.783303	30774.67	18.84795	19.22921	19.00261
3	-1596.688	41.62918	26484.34	18.69756	19.24222	18.91851
4	-1585.089	21.46441	25716.66	18.66769	19.37575	18.95492
5	-1582.442	4.806610	27685.03	18.74072	19.61218	19.09423
6	-1570.312	21.61046	26735.11	18.70474	19.73960	19.12455
7	-1556.457	24.20786	25320.71	18.64893	19.84719	19.13502
8	-1543.058	22.94780	24118.61*	18.59836*	19.96003	19.15074
9	-1536.917	10.30578	24985.70	18.63122	20.15629	19.24988
10	-1534.676	3.683159	27087.17	18.70892	20.39738	19.39386
11	-1520.267	23.18681*	25549.84	18.64674	20.49860	19.39797
12	-1516.016	6.692987	27105.10	18.70134	20.71660	19.51885
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

For running Exchange Rate, Stock Returns and Oil Prices model for Saudia, 12 lags were used. This selection of lag was made on the basis of VAR Lag Order Selection Criteria as shown in the table below

Table:5

VAR Lag Order Selection Criteria						
Endogenous variables: SAUDIA EXCHANGE RATE SAUDIA STOCK RETURNS D(OIL PRICES)						
Exogenous variables: C						
Sample: 2001M01 2016M07						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-510.4635	NA	0.073406	5.901880	5.956346*	5.923975*
1	-498.0460	24.26408	0.070580	5.862598	6.080464	5.950978
2	-492.2131	11.19653	0.073204	5.899001	6.280267	6.053666
3	-481.4692	20.25298	0.071770	5.878956	6.423621	6.099905
4	-460.2498	39.26796	0.062394	5.738504	6.446568	6.025738
5	-448.5627	21.22487	0.060540	5.707617	6.579081	6.061137
6	-436.1223	22.16405	0.058254	5.668072	6.702935	6.087876
7	-433.6668	4.289992	0.062897	5.743296	6.941559	6.229385
8	-407.3906	45.00177	0.051669	5.544719	6.906381	6.097093
9	-393.4747	23.35318	0.048950	5.488214	7.013276	6.106873
10	-380.8734	20.71243	0.047110	5.446821	7.135281	6.131764
11	-371.3623	15.30524	0.047009	5.440946	7.292806	6.192174
12	***-347.5044***	***37.56937****	***0.039808****	***5.270165****	***7.285424***	***6.087678***
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

For running Exchange Rate, Stock Returns and Oil Prices model for Venezuela, one lag was used. This selection of lag was made on the basis of VAR Lag Order Selection Criteria as shown in the table below

Table:6

VAR Lag Order Selection Criteria						
Endogenous variables: D(VENEZUELA EXCHANGE RATE) VENEZUELA STOCK RETURNS D(OIL PRICES)						
Exogenous variables: C						
Sample: 2001M01 2016M07						
Lag	Log L	LR	FPE	AIC	SC	HQ
0	-1497.624	NA	6216.247	17.24855	17.30302*	17.27065*
1	***-1483.611***	***27.38169***	***5868.328****	***17.19093****	***17.40880***	***17.27931***
2	-1477.118	12.46421	6040.508	17.21974	17.60101	17.37441
3	-1470.001	13.41602	6174.213	17.24139	17.78605	17.46234
4	-1468.716	2.377948	6749.823	17.33007	18.03813	17.61730
5	-1464.022	8.524247	7097.480	17.37956	18.25103	17.73308
6	-1455.818	14.61664	7170.296	17.38871	18.42357	17.80851
7	-1448.564	12.67311	7326.357	17.40878	18.60705	17.89487
8	-1430.330	31.22879	6601.272	17.30264	18.66430	17.85502
9	-1417.300	21.86618*	6317.993	17.25632	18.78138	17.87498
10	-1409.060	13.54394	6392.987	17.26506	18.95352	17.95000
11	-1400.410	13.91934	6442.835	17.26908	19.12094	18.02031

12	-1395.759	7.323568	6803.632	17.31907	19.33433	18.13659
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

After deciding the number of lags for each model in the study, next step was to run unrestricted VAR Model for data of each country.

VAR Model 01 for Brazil

Please refer to Appendix A-1 table 1.01 which presents model equations for Brazil. Findings of equations are

1. Oil Prices and Brazil Stock Returns with their 11 lags contribute about 25.1449% in variation of Brazil Exchange Rate.
2. Oil Prices and Brazil Exchange Rate with their 11 lags contributes about 42.9986% in variation of Brazil Stock Returns.
3. With 1% increase in Oil Prices in last period Brazil Exchange Rate decrease by 0.1141 %
4. With 1% increase in Oil Prices in last period Brazil Stock Returns decrease by 4.6206 %

VAR Model 02 for China

Please refer to Appendix A-1 table 1.02 which presents three models equations in VAR System for China. Results of equations are:

1. Oil Prices and china stock returns with their 8 lags contributes about 24.8806% in variation of china exchange rate.
2. Oil Prices and china exchange rate with their 8 lags contributes about 0% in variation of china stock returns.
3. With 1% increase in Oil Prices in last period china exchange rate decrease by 0.048 %
4. With 1% increase in Oil Prices in last period china stock returns decrease by 8.7821 %

VAR Model 03 Mexico

Please refer to Appendix A-1 table 1.03 which presents models equations in VAR System for Mexico and following are the results:

1. Oil Prices and Mexico stock returns with their 1 lag contributes about 13.5189% in variation of Mexico exchange rate
2. Oil Prices and Mexico Exchange Rate with their 1 lag contributes about 1.9275% in variation of Mexico stock returns.
3. With 1% increase in Oil Prices in last period Mexico exchange rate increase by 3.0351 %
4. With 1% increase in Oil Prices in last period Mexico stock returns decrease by 0.1506 %

VAR Model 04 Russia

Please refer to Appendix A-1 table 1.04 which presents three models equations in VAR System for Russia and. Findings of first equations are:

1. Oil Prices and Russian stock returns with their 1 lag contributes about 11.6099% in variation of Russian exchange rate
2. Oil Prices and Russian exchange rate with their 1 lag contributes about 5.5498% in variation of Russian stock returns
3. With 1% increase in Oil Prices in last period Russian exchange rate decrease by -1.5714 %
4. With 1% increase in Oil Prices in last period Russian stock returns decrease by -5.1332 %

VAR Model 05 Saudia

Please refer to Appendix A-1 table 1.05 which presents model equation in VAR System for Saudia and results are following

1. Oil Prices and Saudia stock returns with their 12 lags contributes about 37.7508% in variation of Saudia exchange rate
2. Oil Prices and Saudia exchange rate with their 12 lags contributes about 33.5567% in variation of Saudia stock returns
3. With 1% increase in Oil Prices in last period Saudia exchange rate decrease by 0.00283%
4. With 1% increase in Oil Prices in last period Saudia stock returns decrease by 11.0296%

VAR Model 06 Venezuela

Please refer to Appendix A-1 table 1.0 which presents three models equations in VAR System for Venezuela. Findings of first two equations are:

1. Oil Prices and Venezuela stock returns with their 1 lag contributes about 11.983% in variation of Venezuela exchange rate
2. Oil Prices and Venezuela exchange rate with their 1 lag contributes about 3.0294% in variation of Venezuela stock returns
3. With 1% increase in Oil Prices in last period Venezuela exchange rate increase by 0.3579 %
4. With 1% increase in Oil Prices in last period Venezuela stock returns increase by 6.9124 %

Granger Causality Test

All VAR System Model equations are listed in appendix 2. System equation 2.01, 2.02, 20.03, 2.04, 2.05 and 2.0 represents VAR systems for Brazil, China, Mexico, Russia, Saudia and Venezuela respectively. Granger Causality test tests whether all coefficients of independent variable (with all its lags) jointly have Granger impact on dependent variable or not. Null hypothesis for this test specified as, Independent variable does not have granger impact on independent variable. P-value less than 0.05 will lead towards rejection of above hypothesis.

Conclusions below are made on the basis of outputs present in appendix 3

1. Table 3.01 tests whether Oil Prices shocks Granger Impact on Brazil Exchange Rate. As p-value = 0.4291 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Brazil Exchange Rate.
2. Table 3.02 tests whether Oil Prices shocks Granger Impact on Brazil Stock Returns. As p-value = 0.0155 which is less than 0.05, there is sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks can statistically impact Brazil Stock Returns.
3. Table 3.03 tests whether Oil Prices shocks Granger Impact on China Exchange Rate. As p-value = 0.8231 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact China Exchange Rate.

4. Table 3.04 tests whether Oil Prices shocks Granger Impact on China Stock Returns. As p-value = 0.0004 which is less than 0.05, there is sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks can statistically impact China Stock Returns.
5. Table 3.05 tests whether Oil Prices shocks Granger Impact on Mexico Exchange Rate. As p-value = 0.1729 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Mexico Exchange Rate.
6. Table 3.06 tests whether Oil Prices shocks Granger Impact on Mexico Stock Returns. As p-value = 0.9456 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Mexico Stock Returns.
7. Table 3.07 tests whether Oil Prices shocks Granger Impact on Russia Exchange Rate. As p-value = 0.2527 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Russia Exchange Rate.
8. Table 3.08 tests whether Oil Prices shocks Granger Impact on Russia Stock Returns. As p-value = 0.4717 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Russia Stock Returns.
9. Table 3.09 tests whether Oil Prices shocks Granger Impact on Saudia Exchange Rate. As p-value = 0.0033 which is less than 0.05, there is sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks can statistically impact Saudia Exchange Rate.
10. Table 3.10 tests whether Oil Prices shocks Granger Impact on Saudia Stock Returns. As p-value = 0.2177 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Saudia Stock Returns.
11. Table 3.11 tests whether Oil Prices shocks Granger Impact on Venezuela Exchange Rate. As p-value = 0.2013 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Venezuela Exchange Rate.
12. Table 3.12 tests whether Oil Prices shocks Granger Impact on Venezuela Stock Returns. As p-value = 0.5879 which is greater than 0.05, there is no sufficient evidence to reject the hypothesis at 5% level of significance and conclude that Oil Prices shocks cannot statistically impact Venezuela Stock Returns.

Impulse Response Function

In response to 1 SD error term shock Brazil exchange rates will go down and negative after first period. It will be positive after 4th period and stay positive till sixth period in future. Rest of the behavior can see in the appendix . In response to 1 SD error term shock Brazil stock returns will go down and negative after first period till 8th period..In response to 1 SD error term shock China exchange rate will go down and negative after first period. It will be positive after 4th period and stay positive some time and become negative immediately. Rest of the behavior can see in the appendix.In response to 1 SD error term shock China stock returns will go down and negative after first period till 8th period. In response to 1 SD error term shock Mexico exchange rate will go up and positive after first period. It will stay positive for one period in future and then there will be no impact of that shock.In response to 1 SD error term shockMexico stock returns will have no impact in future periods. Rest of the behavior can be seen in apendix.In response to 1 SD error term shockRussia exchange rate will go down and negative after first period. It will stay negtive till 3rd period in future and then there will be no impact of that shock.In response to 1 SD error term shock Russia stock returns will go down and negative for one period in future with no impact lateron.

In response to 1 SD error term shock Saudia exchange rate will go down and negative after first period. It will stay negtive till 8th period in future. Rest of the behavior can be seen in appendix.In response to 1 SD error term shock, Saudia stock returns willgo down and negative after first period and go up in the next period. In response to 1 SD error term shock, Venezuela exchange rate will go up and positive after first period. In the next period it will go down. Rest of the behavior can seen in the appendix.In response to 1 SD error term shock Venezuela stock returns will go up and positive after first period and stay unaffected in future. After applying different tests we can conclude that results do vary according to scenario, conditions, backround of the countries and oil prices are not the only reason which cause fluctuations in exchange rate and stock returns.

Conclusion

With 1% increase in Oil Prices in last period Exchange Rate decrease by 0.1141 % and with 1% increase in Oil Prices in last period Stock Returns decrease by 4.6206 %. Oil Prices shocks cannot statistically impact exchange rate but can statistically impact stock returns at 5% level of significance. With 1% increase in Oil Prices in last period exchange rate decrease by 0.048 % and with 1% increase in oil prices in last period stock returns decreased by 8.7821 %. Oil prices shocks cannot statistically impact exchange rate but can statistically 58 impact stock returns at 5% level of significance. With 1% increase in oil prices in last period exchange rate increase by 3.0351 % and with 1% increase in oil prices in last period stock returns decrease by 0.1506 %. Oil prices shocks cannot statistically impact both exchange rate and stock returns at 5% level of significance. With 1% increase in Oil Prices in last period exchange rate decrease by -1.5714 % and with 1% increase in oil prices in last period stock returns decrease by -5.1332 %. Oil prices shocks cannot statistically impact both exchange rate and stock returns at 5% level of significance. With 1% increase in oil prices in last period exchange rate decrease by 0.00283% and with 1% increase in oil prices in last period stock returns decrease by 11.0296%. Oil prices shocks can statistically impact Saudi Arabia exchange rate but cannot statistically impact Saudi Arabia stock returns at 5% level of significance. With 1% increase in oil prices in last period exchange rate increase by 0.3579 % and with 1% increase in oil prices in last period stock returns increase by 6.9124 %. Oil prices shocks cannot statistically impact both exchange rate and stock returns at 5% level of significance.

Recommendations

Non-linear effect and a number of possible channels through which the relationship between oil prices and exchange rate is transmitted, for example: net foreign assets or the terms of trade, are beyond the scope of our study, but they could be potential avenues for future research. Dubai should also be included while doing research in future as it is international hub of trade.One might potentially extend the approach to look at relationship between currencies and other commodities rather than oil, such as copper, gold, coal and so on. Trends of global economy should consider in this research perspective that how these trends will affect the market of crude oil.

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