International Journal of Business and Economics, 2020, Vol. 19, No.1, 91-108

Brent Prices and Its Impact on Financial Markets of BRIC Nations

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Abstract

The paper examines, the relationship and impact between Brent Prices and the Stock Market Indices of the BRIC Nations over both the short-run and the long-run. The paper revisits the traditional behavioral finance wisdom that higher Brent prices hurt Stocks. And it is studied with the time-series data of respective vital indices of Bovespo, MICEX, Nifty and Shanghai Composite in relation to Brent Price Index. The stochastics are studied with tools like ERS Unit Root Test, Johansen Co-integration Test, Vector Error Correction Model and Impulse Response Analysis. Not only that the traditional view of inverse relationship between Brent Prices and Stock prices is no longer valid, it is clearly established that the relationship attributes cannot be generalized, even amongst emerging economies in BRIC Nations. Further, the Paper examines both the short-run and long-run aspects in these markets and clearly establishes the relationships are not similar. The results from the impulse response function clearly reveals that in the case of oil exporting countries like Brazil and Russia, higher Brent prices have positive impact and effects on Stock indices. But, in India higher Brent prices has negative effect.

The Vector Error Correction Model reveals that in the case of Brazil and China, Brent prices and the respective Stock indices are in a long-run equilibrium relationship, and the Stock indices follows and adjusts to Brent shocks much faster than it does in case of Russia and India. The findings from Impulse Response Function, further establishes that in oil-exporting Nations like Brazil and Russia, higher Brent Prices raises the respective Stock Indices, whereas in the case of India and China, higher Brent Prices has muted response in Stock Performances. The outcomes of the study debunk the traditional behavioral finance theory after careful evaluation.

Key words: BRIC Indices & Brent Prices, Oil Price impact on Stock Prices, VECM Estimations for BRIC, Impulse Response Function on BRIC Indices, Conventional Wisdom debunked

JEL classification: G15; N20; O16

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1. Introduction

Brent or Crude Oil, as it is commonly known, is possibly the most traded commodity in the World, when it comes to global finance and geo-politics. Financial market data reveals, from just being a commodity in the 20th Century, it has already metamorphosed into a financial product with millions of future contracts being traded on it, for trillions of dollars expecting a supply crunch due to cartelized behavior of major oil producing Nations. Often, many geo-political actions by way of sanctions / relaxations of it, had effects on Oil prices and spillover effects on Financial markets. It is more so, since majority of the reserves and production of this finite energy source, happens in one of the turbulent regions of the World. People and businesses all over the World, are heavily dependent on this energy source and its consumption continues unabated. As per the International Energy Agency (IEA), the World's energy body 2017 report, the World consumes 99.5 millions of barrel per day, the highest being US which consumed 19.88 millions of barrels per day, followed by China which consumed 13.22 million of barrels. India stood third as per this report after Japan by consuming 4.69 million barrels per day. The same Report cites Russia and Brazil of having consumed 3.22 (6th position) and 3.01 million barrels per day (7th position) respectively. The IEA also reports that India and China collectively will contribute 47 % of the increase in oil demand globally, going forward and sooner than anticipated, the world consumption is to touch 100 million barrel per day mark.

This ubiquitous commodity in every sense and its price actions, affects other markets. One Asset class that is generally responsive to Brent prices is Equities. Many Companies being upstream or downstream users of Crude variants in their products get impacted directly. That apart, Oil price changes, contributes by way of increase in input factor cost indirectly, and stokes inflation. On the contrary, lower energy costs decreases the cost of goods sold, makes the companies / products more competitive and thus increases profit margins, which get factored ultimately in the Market value of the Equity of the Corporate. For individual consumers, lower Brent prices means more discretionary income, which further flows into products / markets by other expressions. However, for those involved in oil production, exploration or services for the Oil industry, a lower Brent price would mean quite the opposite. Lower Brent prices would even affect the totality of their Business. Do higher oil prices hurt Stocks or do not they? is a behavioral finance or economics question nagging the economists for long with behavioral business connotations. The traditional wisdom holds that higher oil prices hurt stocks, and when oil prices rise, stocks fall, and vice versa. Is the traditional view still valid? Does higher oil prices always result in a drag on Corporate Earnings or Vice Versa? Does it behave the same way, over short-term and long-term? Is the behavior same in Developed World and Emerging Economies? These are trivial behavioral economic / finance questions requiring validation.

Especially so, at a time when the growth poles of the World economy are shifting, and the emerging market economies are predicted to contribute nearly two thirds of the World's GDP by 2030. There is a need to understand, analyze these linkages of Oil / Brent Prices and the Stock Indices from the emerging market economies perspective, especially the BRIC Nations. It makes a compelling requirement to

choose BRIC Nations, as BRIC Nations would be consuming more oil, incrementally in marching to become World's largest economies by surpassing the G-6 Countries.

Though there are lot of head winds and tail winds to be endured, including many blips and black swans by these Nations, to clock growth, the role oil would play, is a given as no alternative major energy resource is in sight. It is in this backdrop, this study is conceptualized to clearly understand the dynamic relationship between Brent prices and stock markets of BRIC Nations.

2. Literature Review

Studies examining the influence of oil price on Economies, Countries, and Currencies are many and dates back to the unstable political conditions in the Middle East in the 70s and 80s and the spike in consumption of oil in the developed countries in the Post-Industrialization era. Number of Economics / Finance researchers and modelers have concentrated on exploring the relationship between Oil prices and Macro economic variables like Inflation, Growth rates, GDP, Employment, Prices etc. Authors like Rasche and Tatom (1981) examined the increase in price of energy on output in economies of Canada, US, France, UK and Japan. Hamilton (1983) analyzed the impact oil induces on the US output. The relationship between input price shocks majorly induced by oil on the decelerating UK economy, was captured in the work of Bruno and Sachs (1982). The economic impact at the Price level and Industrial output due to oil price increases in the highly Industrialized Nations of US, Japan, Germany, UK and Canada, was the focus in the work of Burbidge and Harrison (1984). High relationship between Oil price increases and Macro Economic indicators of the US was reported in the defining work of Gisser and Goodwin (1986). Mork's (1989) empirical work suggests asymmetry as regards the impact of oil price increase / decrease on the US output at the time when Crude oil prices were over USD 30 per barrel in 1980s, which later plunged to USD 15 by 1986.

More recent studies linking Oil prices or Oil shocks to Macro Economic aggregates include: Jimenez- Rodriquez and Sanchez (2005), Cunado and Perez de Garcia (2005) Kilian (2008), Cologni & Manera (2008), Kilian & Park (2009), Basher et al. (2010), Fang (2010), Ono (2011), Ghorbel and Boujelbene (2013), Morales and Gassie-Falzone (2014), Chaterjee et al. (2016). From a detailed review of the above works, we can unravel as follows: Jimenez Rodriquez and Sanchez work using G-7 data revealed that, effects of increase on Oil prices on real GDP numbers, was totally different from that of time, when the behavior of Oil prices were of decreasing trend. The paper by Cunado and Perez de Garcia (2005) indicated that while Oil prices have significant impact on industrial and economic activity in six Asian Countries, it found evidence of asymmetries to economic variables in certain other Countries. Kilian's works singly and along with Park were more related to effects of exogenous shocks in the Oil markets and such supply-side issues causing reduction in real GDP growth in economies. The joint paper with Park employs auto-regression model with real oil price, oil supply data and proxies for global demand for industrial commodities.

Basher et al. (2010) work deployed a SVAR model and impulse response functions to gauge the relationship between oil price shock, exchange rates and some stock Indices to conclude that oil prices positively react to sudden hike in oil demand, whereas it reacts negatively to sudden spurt in oil supply. Fang (2010) and Ono (2011) have studied effects of oil prices on stock returns of Countries like Brazil, Russia. India, China using VAR models by taking data of periods from 1999 till 2009. Ono reported that real stock returns positively responded to oil price indicators in China, Russia, India whereas in Brazil the response was reported as insignificant. The volatility spillovers were the focus in the work of Morales and Gassie-Falzone between Oil prices and Energy markets constituting Oil, natural gas and electricity. Chatterjee et al. (2016) work also focused on Oil price shocks on emerging economies but of a different period.

In the studies in this domain, it could also be noticed that the focus in the initial years were the data from developed and Industrialized Nations, whereas post 2010, the study focus has shifted to emerging market economies including BRICS. By evaluating the Literature on the above subject empirically over the years, we could clearly notice the methodologies and methods are also improving, with SVAR, Impulse Response Analysis and GARCH models being used in some studies. In the Literature Review above, the later works cited in the last two paragraphs and reviewed post 2010, are closer to the theme of this paper. However, even in the subject of Oil prices and its impact on the stock market performances (including some of the emerging economies like BRICS), deep scrutiny of the Literature reveals mixed results, as the empirical findings show both positive and negative impact between oil prices and stock returns. Timeline changes, trend-line changes and volatile behavior could also be contributing to different inferences in the outcomes. Hence, there is a requirement to continue these studies to capture more scenarios of cyclicality (both increasing and decreasing trends, over long/ medium / short terms) in market variables so that both long-run and short-run relationships are understood more precisely with better tools, though it would still be germane to the period and markets studied.

Obviously, over the years, many refinements have also happened in the financial and oil markets of the world. In the integrated and technology-driven World, the deals / transaction volumes happening in mechanized exchanges in the T+2 settlement have all gone up sharply. So are the volatility in the markets. The objective of this paper is to examine the relationship between Brent prices and emerging market indices. Economic intricacies of these variables are many times complex, nebulous, very difficult to model and hence challenging to the researchers and modelers.

From the above discussions, it would be clear that the factors, context (including the geo-politics) and volatility in the markets have all changed over the years and many studies done were germane to an environment or polity or economic setting and the inferences were also path-dependent. There is a need to unravel more and from a behavioral business perspective, requires constant re-validation. The primacy and motivation for this paper emanates from the above theoretical and empirical underpinnings cited. Studies of this nature linking Oil prices to the fortunes of economies / markets are bound to accelerate further, as Oil and Energy security has

become defining tools, even in the constructs of national security and geo-politics in many regions of the World.

The outline of this paper is as follows: Section 2 reviews the literature on the theme both from the theoretical and empirical point of view. Section 3 discusses the Data sources for the analysis; Section 4 discusses the Methodological issues and the theoretical constructs. Section 5 discusses the analyzes and inferences from the empirical tools deployed. Section 6 discusses the conclusions by way of contributions of the paper and the direction for future research.

3. Data Sources

The Central research problem of the study is to understand the relationship and impact between Oil Prices and the Stock Market Indices of the BRIC Nations over both the short-run and the long-run. The period analyzed is set from Jan 2007 to Dec 2017, a period of 10 defining years majorly characterized by fall in prices of Oil in the World and a recovery phase. In the stock side also, the period selected had a bear-phase, post Sub-prime fiasco and the world-wide contagion followed by upswings on the back of recovery in developed markets. The period selected has or incidentally coincided with both decreasing and increasing trends in Oil Prices and Stock indices. In studies of this nature, studying both the short run and long run impact, amidst dramatic volatility in the Stock and Brent prices are essential to reduce pro-cyclicality factors. Unravelling behavioral patterns across continuous but eventful happenings (positive and negative Shocks) affecting the variables, is what is sought to be captured. Standardized benchmark of the Business cycle dating committee of the US National Bureau of Economic Research has been used for global recession / recovery timeline data, wherever required.

When it comes to data on Crude Oil / Brent Prices, there are different prices that get quoted in the World market. However major types of crude are light sweet crude (generally known as Brent Crude) or heavy sour crude (West Texas Intermediate or WTI Crude). Though various other Crude / Brent Prices get quoted in the World's Oil market, the Brent Crude and WTI Crude have become the benchmark prices in the World Oil Market. Though time-series data for both the Brent prices are available for the period selected, after examining volumes of trade, Price differentials, stability etc., the daily Brent prices was considered.

For the Stock related data on BRIC financial markets, the daily data with closing Indices of Bovespa (Brazil's Stock Index), MICEX (Russia's Stock Index), Nifty (India's Stock Index), Shanghai Composite (China's Stock Index) were taken for the analysis. The relatively broader benchmark indices were taken, in the case of all the four BRIC Nations, as studying the relationship of Brent prices over stocks from more and varied sectors or industries is beneficial for the theme of the study.

4. Methodology, Theoretical, Variable Constructs

The study uses financial econometric and stochastic tools viz., ERS Unit Root

Test, Johansen Co-integration Test, Vector Error Correction Model (VECM) and Impulse Response function to study the relationships with the Ten-year time-series data.

First, to determine whether the time series is non-stationary, Elliott, Rothenberg and Stock point optimal (ERS) unit root test (1996) was performed. ERS Test was selected and used, as it is a modified version of the Dickey-Fuller Unit root test and is an improvement over the DFU Test. Lagrange and model of the test were performed according to the MAIC (Modified Akaike Info Criterion). Embedding the MAIC in the expectation- maximization function allows us to exclude sequentially, one-by-one, the least informative components from their initially excessive, or over-fitting set. The outcome and inference are codified / discussed under **Section 5.1 and Table 5.1** below.

After considering the above- mentioned ERS Unit root test results, the Johansen co-integration test was done to ascertain whether the set of endogenous variables for each of the BRIC Nations, share a common long-run stochastic trend, while allowing for the possibility of short-run divergences. To evaluate whether the non-stationary series acts together in the long-run, Johansen co-integration test developed by Johansen and Juselius (1990) was used. Further, as there is a need to identify the number of characteristic roots that are not different from unity, the trace test and maximum Eigen value test was also used with the following

Hypothesis *Ho: Co-integration relationship between variables exists.*

The results of Johansen co-integration tests for each of the BRIC Nations are tabulated in **Tables – 5.2** and discussed under **5.2 below**.

The third leg in the study, was to determine co-integration relationship (co-integration vector), which captures the existence of long-run relationship amongst endogenous variables, causal relations. This was examined with Vector Error Correction Model (VECM). It was also important to examine very short-term relationships that may exist with dis-equilibrium for the objectives of the study to be met. The VECM is useful for estimating both short-run and long-run effects of one time series on another. VECM which was initially used by Sargan and later greatly popularized by Granger and others have co-integration relationships built into the specifications. It restricts the long-run equilibrium of the endogenous variables to converge to its co-integrating relationships, while allowing for short-run dis-equilibrium. Thus, the co-integration term is known as the error correction term in the model, and the deviation from long-run equilibrium is sought to be corrected gradually through a series of partial short-run adjustments in the model. This could be achieved with considerable number of iterations.

Based on the above theoretical precepts and understanding of similar works reviewed specific to Oil/ Stock indices, for this study, the following VEC model was used :

$$\Delta S_t = \beta_0 + \sum_{i=1}^{q} \beta_{1i} \Delta S_{t-i} + \sum_{i=1}^{q} \beta_{2i} \Delta BP_{t-i} + \alpha_1 Z_{t-1} + e_{1t} \quad (1)$$

$$\Delta BP_t = \delta_0 + \sum_{i=1}^{q} \delta_{1i} \Delta BP_{t-i} + \sum_{i=1}^{q} \delta_{2i} \Delta S_{t-i} + \sigma_1 Z_{t-1} + e_{2t} \quad (2)$$

In the above equation (1), S_t represents stock indices and BP indicates Brent Prices. Z_{t-1}. is the error correction term which we get from the co-integration equation, for the changes in variables ΔS_t and ΔBP which are driven by past values of Zt. The error correction terms α_1 and σ_1 are expected to capture the long-run dynamic adjustments of S_t and BP, while the co-efficients ΔS_{t-i} and ΔBP_{t-i} are expected to capture Short-run dynamics of the VEC Model. The estimations from the responses of the VECM are codified under **Table 5.3a to 5.3d** and are discussed in **Para 5.3.**

From the works of many earlier researchers on similar themes, it was brought out that estimated lagged coefficients of Vector auto regression (VAR), generally fails to establish the dynamic affiliation between the variables in the system, but are supportive in tracing the responses of the system to random shocks. Thus capturing and measuring the impulse response in understanding the translations of Shocks, becomes crucial. It is for this purpose that the Impulse Response functions, using the Structural VAR (SVAR) model, as codified by Kilian & Park (2009) was used. It states that, a shock to the i^{th} variable has a straightforward and direct impact on the i^{th} variable and at the same time it is also transmitted to the other endogenous variables in the system with the help of the dynamic lagged structure of the VAR. The adapted SVAR used was:

$$e_t = \begin{pmatrix} e_{1t}^{Brent\ \ Prices} \\ e_{2t}^{Stock\ \ Indices} \end{pmatrix} = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix} \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \end{pmatrix} \quad (3)$$

Here, ε_{1t}, and ε_{2t}, correspond to the noise error term and e_{1t} and e_{2t} represents the residuals from VECM equations. Any disturbance in ε_{1t} is quickly and directly transmitted to e_{1t} through the first equation and to e_{2t} through the second equation, respectively. Similar reactions occur in case of any disturbances in ε_{2t}. Therefore, it is found that a random shock is one innovation in SVAR model which forms a chain reaction with the other variables over time in the system.

The figures from the impulse response innovations studied under Cholesky 1 SD Innovations with ± 2 S.E are tabulated below from **Figure-5.4a to Figure -5.4d.** The response behavior for each BRIC Nations are discussed under **paragraph 5.4.**

5. Analyzes & Discussions:

5.1 Test of Stationarity - ERS Unit Root Test

The ERS Unit Root test was run by taking first differences of all the series allowing intercept and deterministic time trend in the regression. The results are captured in Table 5.1 below. It can be noted that the null hypothesis is rejected at 1 per cent level of significance indicating that all the series are stationary. This means that the selected series are integrated of order one, i.e. I (1) and are suitable for long memory test.

Table 5.1 ERS Unit Root Test Results

Indices	Differences of all series (First)	
	Constant	+ Trend
Bovespa	0.035211***	0.16321***
MICEX	0.04999***	0.124380***
Nifty	0.043314***	0.156391***
Shanghai Composite	0.044743***	0.171927***
Brent Price	0.071109***	0.162981***

*** represents 1 % statistical significance level.

5.2 Johansen Co-integration Test

Analyzing the results captured in Table 5.2 below, we can notice that for Brazil, Russia, India and China, the trace statistic indicates, one co-integrating equation and maximum Eigen value. Statistic indicates one co-integrating equation in each case except in the case of Russia which is significant at 5 per cent level. The results clearly show that in all cases viz., Brazil, Russia, India and China, the set of variables (Brent prices and stock market index) are co-integrated, as both the trace statistic and maximum Eigen value statistic reject the null hypothesis of no co-integration and therefore, there exists a stationary long-run relationship between the set of variables. This implies that there are common stochastic trends indicating a degree of economic integration between Brent prices and Stock index for Brazil, Russia, India and China during the whole study period of 10 years.

Table 5.2 Multivariate Co-integration Test Results for BRIC Nations

Test Results for → Hypothesis ↓	Brazil		Russia		India		China	
	Trace Test	Critical Values at 5 %	Trace Test	Critical Values at 5 %	Trace Test	Critical Values at 5 %	Trace Test	Critical Values at 5 %
Null r =0 & Alt r =1	15.8380 (0.0431)	15.0814 (3.8331)	17.228 (0.0201)	15.2431	19.0891* (0.03932)	14.8410	37.5321* (0.0000)	14.4208
Null r ≤ 1 & Alt r = 2	1.9225 (0.1542)	3.8331	3.0563 (0.0907)	3.5134	8.2306 (0.3024)	4.1437	2.2415 (0.1223)	3.7613
Maximum Eigen Value Test: r =0 and r =1	13.8120 (0.0504)	14.0027	14.5315 (0.0413)	13.1412	16.0607* (0.0344)	15.8719	33.3018* (0.0000)	13.7811
Maximum Eigen Value Test: r ≤ 1and r =2	--	--	3.0498 (0.0907)	3.3011	8.0521 (0.0307)	4.0643	2.2279 (0.1154)	3.2432

* Significant at 5 % Critical values as per Mackinnon-Haug-Michelis (1999), p-values

5.3 Vector Error Correction Model (VECM)

The estimations from the responses of the selected series over the short-run and long-run dynamics of the variables were analyzed for each of the BRIC Nations. Accordingly, by the significance and size of the estimated co-efficients α1 and σ1 of the VECM equations 1 and 2, are codified in the **Tables- 5.3a to 5.3d**.

From the analysis it could be noticed that about 2.43%, 1.002% and 4.67% of dis-equilibrium is corrected each day by changes in Bovespa, Nifty and Shanghai Composite, respectively. In the case of Brazil, India and China α1 is found to be statistically significant (at 1% level) where as σ_1 is not. This means that as regards these three countries in the Model, only stock indices follow and adjusts to disturbances to restore long-run equilibrium, but that the Brent prices do not react significantly. However, we can notice that for Russia, both α_1 and σ_1 are significant at 1% level, i.e. both MICEX and Brent prices react significantly and only 1.04% and 0.14% of disequilibrium is corrected each day by changes in MICEX and Brent prices. Closer analyses with Russian data reveal that dis-equilibrium is adjusted by the long-run co-efficients, of both stock indices and Brent prices.

Further, analysis on the rapidity of the shocks translating and adjusting, it was noticed that in the case of China and Brazil, stock indices series with larger long-run adjustment coefficient, adjust more rapidly to Shocks. However, in the case of Russia and India, the speed of the long-run adjustment is seen much slower and diffused as shown below. In short, it can be surmised that in the case of Brazil, India and China, while the stock indices and Brent prices are bound together in a long-run equilibrium and adjusts to innovations in the Brent prices, the co-efficients lagged differenced terms capturing short-run dynamics aren't at play. Thus, there are not any evidence to suggest short-term dynamics in the model in the BRIC Nations studied.

Table 5.3a Brazil - VECM Estimations

	Δ Bovespa	Δ Brent Price
Zt-1	-0.024305*** [-4.31603]	-7.10E-01 [-0.23826]
R2	0.024306	0.004165
Adj. R2	0.011603	-0.000954
F-statistics	3.051056	0.421943
Δ Bovespa t - 1	0.029481 [1.18531]	-7.97E-05 [-1.29034]
Δ Bovespa t - 2	-0.031552 [0.50609]	-3.04E-06 [0.44620]
Δ Brent Price t - 1	-11.71754 [-0.889428]	-0.003010 [-0.06041]
Δ Brent Price t - 2	28.53473** [1.93031]	-0.010021 [-0.32500]
Constant	10.54573 [0.35090]	-0.024697 [-0.28790]

Figures in [ ] denotes t statistics;

*,** and *** denotes significance at 10%, 5 % and 1 % levels respectively.

Table 5.3b Russia - VECM Estimations

	Δ MICEX	Δ Brent Price
Zt-1	-0.010451*** [-2.01332]	-0.0014530*** [2.26643]
R2	0.006328	0.003159
Adj. R2	0.01621	0.016434
F-statistics	1.32108	3.044321
Δ MICEX t - 1	0.010010 [0.33510]	0.000435 [0.23478]
Δ MICEX t - 2	-0.0231511 [-0.087221]	-0.002002 [-1.53274]
Δ Brent Price t - 1	0.017312 [0.032132]	-0.002066 [-0.10642]
Δ Brent Price t - 2	0.684133** [-1.03021]	-0.010021 [-0.32500]
Constant	-0.041132 [-1.002376]	-0.024656 [-0.64275]

Figures in [ ] denotes t statistics;

*,** and *** denotes significance at 10%, 5 % and 1 % levels respectively.

Table 5.3c India - VECM Estimations

	Δ NIFTY	Δ Brent Price
Zt-1	-0.010020*** [-2.11008]	3.84E-02 [1.43022]
R2	0.020645	0.01050
Adj. R2	0.019607	0.005443
F-statistics	3.556050	2.066011
Δ Nifty - 1	0.058121** [2.11025]	-0.000542*** [-2.19622]
Δ Nifty t - 2	-0.002525 [-0.09611]	0.000276*** [-2.44140]
Δ Brent Price t - 1	4.47508 [1.84253]	0.007660 [0.2611]
Δ Brent Price t - 2	8.03422** [1.52298]	0.002655 [0.11354]
Constant	-5.003451 [-1.02875]	-0.024697 [-0.54420]

Figures in [ ] denotes t statistics;

*,** and *** denotes significance at 10%, 5 % and 1 % levels respectively

Table 5.3d China - VECM Estimations

	Δ Shanghai Composite	Δ Brent Price
Zt-1	-0.046686*** [-4.14428]	-8.00E-02 [0.35226]
R2	0.0385687	0.0000765
Adj. R2	0.0198454	-0.003442
F-statistics	5.58984	0..102387
Δ Shanghai Composite t- 1	-0.046537* [-1.54002]	-0.001060 [-0.49612]
Δ Shanghai Composite t - 2	- 0.044880 * [-1.56142]	0.000090 [0.17235]
Δ Brent Price t - 1	-4.17205 ** [-2.32358]	-0.001654 [0.04202]
Δ Brent Price t - 2	2.005202 [1.32211]	-0.004360 [-0.18434]
Constant	0.12765 [0.0890]	-0.031567 [0.40203]

Figures in [ ] denotes t statistics;

*,** and *** denotes significance at 10%, 5 % and 1 % levels respectively

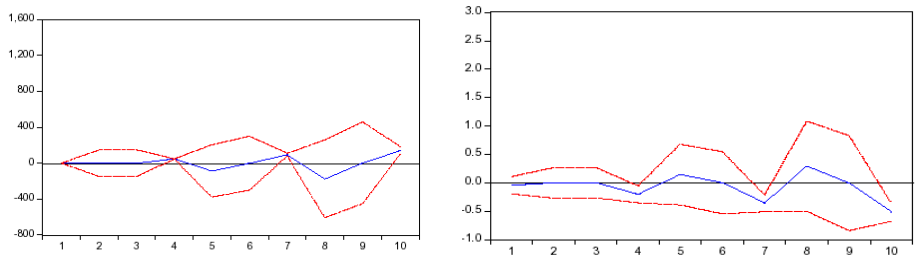
5.4 Impulse Response Analyzes

All the figures from the Impulse Response Analyzes are tabulated below from **Figure-5.4a to Figure -5.4d**. The Impulse Response Analyzes of the study suggests, that in the case of Brazil, Brent price shocks have positive impact on Bovespa and Brent prices was seen directly related with Bovespa and moving in tandem. Brazil being an oil exporting country, higher crude oil prices boosts Brazilian stock markets is a phenomenon that was noticed. Similarly, in Russia too, response analyzes captures direct relationship between oil prices and stock markets. This means when Brent prices increases, MICEX also increases and vice versa. In India, Brent price shocks have less significant effect on Nifty. Nifty adjusts to oscillations in Brent prices, but the relative speed of the adjustment is slow with lagged effect. On the other hand, when response of Brent price to Nifty is studied, an inverse relationship between these

two variables could be observed. Analyzes of Shanghai Composite Index to Brent price in Fig. 5,4d, indicates a very flat trend. Experiments / innovations even at very high lagged intervals of 6, 6 and 7,7 does not produce much of an impulse response. In the second figure, which captures the response of Brent Prices to Shanghai Composite, it was noticed that the index adjusts to Brent price shocks after certain intervals, with the innovations. To summarize, it was noticed that in the case of oil exporting Nations, Brazil and Russia, higher Brent prices elevates stock indices and there exists a direct relationship, where as in the case of India and China, the response is either negative or at best neutral. In the overall analysis, we can note that the results of VECM are further strengthened by the findings of the Impulse response Functions studied.

There are many volatility spillovers which the models does not capture in the estimations or innovations. This requires further studies with conditional correlational based Models and constructs, which is now beyond the scope of this paper. Piqued economists and modelers could further push the envelope to solve more riddles in this domain, as behavioral economics / finance would warrant answers and validations.

Figure 5.4a Impulse Reponse of BOVESPO to Brent Prices
(Cholesky One SD Innovations ± 2 S.E.)

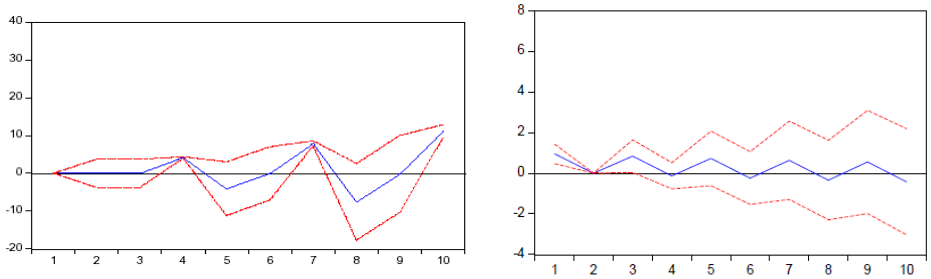


Response of BOVESPO to Brent_Prices

Response of Brent_Prices to BOVESPO

Figure 5.4b Impulse Response of MICEX to Brent Prices

(Cholesky One SD Innovations ± 2 S.E.)

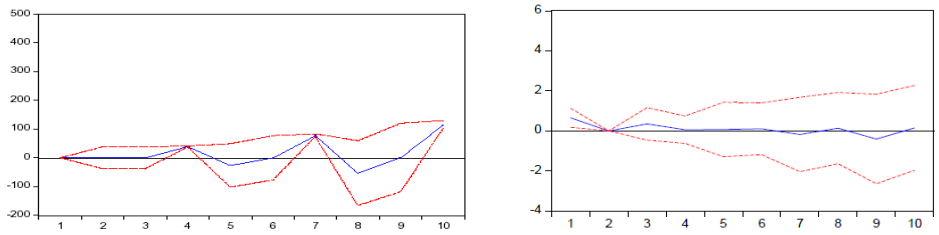


Response of MICEX to Brent_Prices

Response of Brent_Prices to MICEX

Figure 5.4c Impulse Response of NIFTY to Brent Prices

(Cholesky One SD Innovations ± 2 S.E.)

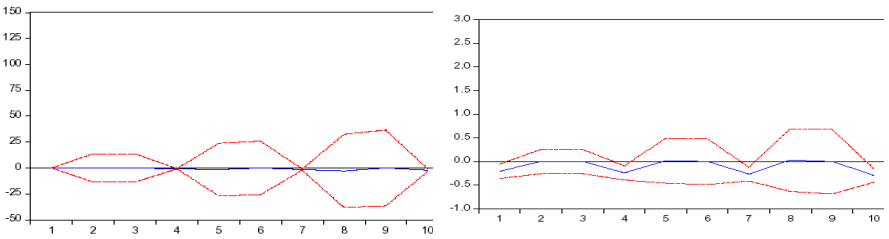


Response of NIFTY to Brent_Prices

Response of Brent_Prices to NIFTY

Figure 5.4d Impulse Response of Shanghai Composite to Brent Prices

(Cholesky 1 SD Innovations ± 2 S.E.)



Response of Shanghai Composite to Brent_Prices

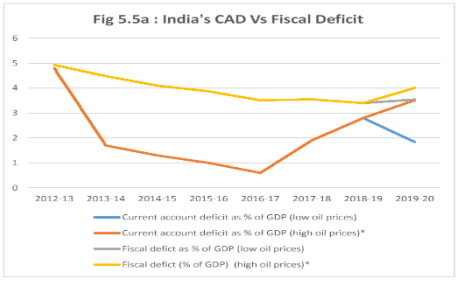
Response of Brent_Prices to ShanghaiComposite

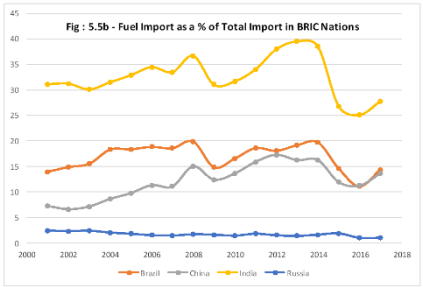
5.5 Summary of Contributions and Connotations

The co-integration analysis established long-run relationship and common stochastic trends between Brent Prices and the Stock Indices of each of the BRIC Nations studied. It also allows for short-run divergences in the variables, in the time periods studied. The results from VECM for Brazil and China proved a long-run equilibrium relationship between Brent prices and Stock Indices. VECM further established that the Stock indices of Brazil and China follows and adjusts to Brent Price shocks (both positive and negative) much faster than it does for Russia and India. The above major contributions from this paper are further reinforced with the findings of Impulse Response Functions, which established that in oil-exporting Nations like Brazil and Russia, higher Brent Prices raises the respective Stock Indices, whereas in India and China, higher Brent Prices negatively impacts the Stock Performances.

The study has major connotations for the economic policy managers in BRIC Nations from a behavioral perspective. Brent exporters like Brazil and Russia need to make financial adjustments by way of maintenance of buffers from the windfall gains during bull phases of Brent exports to tide over fiscal vulnerability, when they see downward trends in exports. The size, speed and magnitude of such adjustments need to be decided by factoring the macro economic variables of interests. Policy implications of the study also signifies, that the Monetary Policy frameworks for Brent importing countries should use the lull periods of Brent prices to reinforce and fortify its Current Account Deficits (CAD) Management frameworks, which will give them headroom for managing cyclical risks and managing economic growth, when Brent Prices start creeping up.

Figure 5.5a and 5.5b below indicates the data on 'Fuel Import as a % of Total Import in BRIC Nations' and the data on 'Current Account Deficit (CAD) Vs Fiscal Deficit' in the case of India, which is the biggest oil importer. While it is clear from Fig 5.5b that typically the twin deficits ie., both at the Current Account level and at Fiscal level is creating the harm in India's case, the fuel dependency in BRIC Nations (as measured by % of imports to total imports) is also seen volatile in all Nations except in the case of Russia. These are major takeaways which connects the core theme of the paper to the macro economic framework.





6. Conclusions

Do higher Brent Prices hurt stocks, or do not they? The answer for the behavioral finance poser seems moving away from the traditional wisdom that higher oil prices hurt stocks, and the theory that when oil prices rise, stocks fall, and vice versa. In fact, from the above analysis in the paper, it is becoming clear that it is not always the case. Not only that the traditional view of inverse relationship between Brent Prices and Stock prices is no longer valid. The above discussions clearly establish that the relationship attributes cannot be generalized, even amongst emerging economies in BRIC Nations. Further, the relationship over short-run vs long-run is also not similar. It varies, which has been brought out clearly from the markets studied. Further, there seems to be far more dimensions, influence of germaneness and context to the research theme, which is impacting the relationships. There are volatility spillover effects, which lie beyond the scope of this research paper but are trivial in understanding the relationship between Brent Prices and Stock Indices further. No doubt, these will continue to be pursued by researchers passionate to study volatile market behaviors.

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