CAUSAL LINK BETWEEN OIL PRICE AND UNCERTAINTY IN INDIA

1. Introduction

According to the US Energy Administration Information (EIA), India was the fourth-largest consumer of oil and petroleum products after the United States, China, and Japan in 2013, and it was also the fourth-largest net importer of crude oil and petroleum products – largely driven by the country's dynamic growth in recent years. India's economy has grown at an average annual rate of approximately 7% since 2000 (EIA, 2013)[1], and it proved relatively resilient following the 2008 global financial crisis.

The gap between India's oil demand and supply is widening, as demand reached nearly 3.7 million barrels per day (bbl/d) in 2013 compared to less than 1 million bbl/d of total liquids production. The high degree of dependence on imported crude oil has led Indian energy companies to diversify their supply sources. However, the majority of imports continue to come from the Middle East, where Indian companies have little direct access to investment.

The gap in demand and supply may be explained by the New Economic Policy in 1991. Following the change in policy, a large proportion of the population moved to cities, and urban households have shifted away from traditional biomass and waste to other energy sources such as hydrocarbons, nuclear, biofuels, and other renewables. The power sector is the largest and fastest-growing area of energy demand, rising from 22 per cent to 36 per cent of total energy consumption between 1990 and 2011, according to the EIA (2013).

Montoro (2012) and Natal (2012) argue that changes in the oil price generate a trade-off between high inflation and low output stabilization that raises the policymakers' concern on the real

[1] EIA (2013), Country Analysis: India, U.S. Energy Information Administration: Washington, DC.

consequences of oil price shocks, thus, contributing to economic policy uncertainty. This is because oil price shocks influence the economy by changing relative prices, thus, affecting inflation, and redistributing income with consequences for consumption, investment, production and welfare that draw the interest of policy makers. This paper aims to investigate the effect of structural oil price shocks on economic policy uncertainty by using Granger-causality regressions that explicitly take parameter instability into account.

Although there is growing literature emphasising the role of economic uncertainty on economic growth, there has not been a lot of studies that focused on the impact of the oil price on economic uncertainty. Moreover, not many studies have shed light on the impact that the oil price has on economic uncertainty in India.

Kang and Ratti (2013a) investigate the effect of structural global oil price shocks on US economic policy uncertainty using a structural VAR model with monthly oil data and economic policy uncertainty indices. They find that positive oil price shocks arising from increased demand for crude oil are associated with significant increases in US economic policy uncertainty. Furthermore, structural oil price shocks appear to have long-term consequences for economic policy uncertainty in that it affects real activity through relative prices. The manner in which policy reacts to the consequence for consumption, investment and production provides an additional channel by which structural oil price shocks have influence on the economy. The results were found to be robust by Kang and Ratti (2013b) upon the inclusion of stock prices with the above set of variables.

Rossi (2005) develops optimal tests for model selection between two nested models in the presence of underlying parameter instability. The test modifies existing tests for parameter instability to allow the parameter vector to be unknown. Rossi points out that these tests statistics are useful if one is interested in testing a null hypothesis on some parameters but is worried about the possibility that the parameters may be time varying.

We apply the methodology put forward by Rossi (2005) to first examine whether the oil price and/or the oil volatility index causes Indian economic and stock market uncertainty based on standard constant parameter predictive regressions, and then test for parameter instability, structural breaks and nonlinearity. Thereafter, we conduct the Rossi (2005) instability-robust test, to check for the robustness of our results, given that we do find evidence of structural breaks and nonlinearity.

2. Data considerations

There is both a daily and a monthly data set. The daily data is for the period 2 March 2009 to 4 August 2014 and contains the daily Brent Crude price (inUS $/bbl), India's daily volatility index[2] as well as the CBOE Crude Oil ETF volatility index[3]. The monthly data contains the monthly Brent Crude price (in US$/bbl) for the period January 2003 to July 2014, the monthly CBOE Crude Oil ETF volatility index for the period May 2007 to July 2014 as well as the monthly news-based uncertainty index[4] for the period January 2013 to July 2014. Note that, we retain the oil price in dollar terms and do not convert it into Indian Rupees to avoid capturing the impact of the exchange rate along with the price of oil, as well as, to retain the oil price as purely exogenous.

A volatility index, or "VIX", is a market estimate of the expected volatility of the underlying stock or exchange-traded fund (ETF) calculated by using present best bid-ask prices of options on the stock traded. A volatility index uses options with at least 8 days left to expiration and weights them to yield a constant measure of the expected volatility.

The daily India volatility index (IVIX) is a volatility index based on the NIFTY Index Option prices. The Nifty is a diversified 50 stock index accounting for 23 sectors of the economy. It is used for a variety of purposes such as benchmarking fund portfolios, index based derivatives and index funds. From the best bid-ask prices of NIFTY Options a contract, a volatility figure (in per cent) is calculated which indicates the expected market volatility over the next 30 calendar days.

The Chicago Board Options Exchange (CBOE) Crude Oil ETF Volatility Index, commonly known as the "Oil VIX", measures the market's expectation of 30-day volatility of the United States Oil Fund (USO), an exchange-traded fund, by applying the VIX methodology described above to USO options spanning a wide range of prices.

The monthly policy-related economic uncertainty (EPU) for India

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[2] NSE (2014), India VIX, National Stock Exchange of India: Mumbai.

[3] FRED (2014), CBOE Crude Oil ETF Volatility Index, Federal Reserve Bank of St. Louis: St. Louis.

[4] Economic Policy Uncertainty (2014), Indian Monthly Index, Economic Policy Uncertainty: Chicago.

is constructed using newspaper articles regarding policy uncertainty. The index is constructed using 7 Indian newspapers: The Economic Times, the Times of India, the Hindustan Times, the Hindu, the Statesman, the Indian Express, and the Financial Express. For each paper, the number of news articles containing at least one term from each of three term sets. The first term set contains "uncertain", "uncertainties", or "uncertainty". The second set is "economic" or "economy". The third set consists of policy relevant terms such as "regulation", "central bank", "monetary policy", "policymakers", "deficit", "legislation", and "fiscal policy". The monthly EPU article counts are scaled by the number of all articles in the same newspaper and month. Thereafter, the time-series standard deviation of scaled article counts is normalised to 1 prior to 2011 for each newspaper separately. These normalised, scaled counts are then summed across the 7 newspapers month-by-month, which is then re-normalised to achieve a mean of 100 prior to 2011. This final step yields the news-based EPU index component for India.

Since the Granger causality test requires the use of stationary variables, we run commonly-used unit root tests including the Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests in order to check the stationarity of the studied variables. The results presented in Table 1 indicate that the natural logarithms of daily and monthly Brent Crude oil prices, the monthly economic policy

TABLE 1 - *Unit Root Results*

	Augmented Dickey-Fuller	**Phillips-Perron**
Monthly Data	**P-values**	
log(EPU)	0.2319	0.0000
Δlog(EPU)**	0.0000	0.0000
log(Br_M)	0.2029	0.2459
Δlog(Br_M)**	0.0000	0.0000
log(OilVIX_M)	0.1029	0.1129
Δlog(OilVIX_M)**	0.0000	0.0000
Daily Data	**P-values**	
log(IVIX)**	0.0074	0.0093
log(Br_D)	0.0701	0.0685
Δlog(Br_D)**	0.0000	0.0000
log(OilVIX_D)**	0.0300	0.0631

Notes: EPU denotes the monthly economic policy uncertainty index for India. IVIX denotes the daily India volatility index. Br_M and Br_D denote the monthly and daily Brent crude oil prices respectively. OilVIX_M and OilVIX_D denote the monthly and daily Oil volatility indexes respectively.

** indicates stationary series.

uncertainty index, and the monthly Oil VIX are non-stationary in levels, but stationary in their first differences. The stationary property of the differenced series is thus suitable for further statistical analysis with the Granger causality test and Rossi (2005) test robust to instabilities. The natural logarithms of the daily IVIX and the daily Oil VIX are stationary in levels and therefore it was not necessary to transform these series for further statistical analysis.

3. Methodology

3.1 Tests for Nonlinearity, Structural Breaks and Stability

BDS Test for Serial Dependence

To check whether there is a misspecification or not in the Granger non-causality test, if the data generating process for the variables is nonlinear, we look at the Brock *et al*. (1996) test of detecting nonlinearity. The test, popularly known as the BDS test, is a portmanteau test detecting serial dependence in time series. It tests the null hypothesis of independent and identically distributed (*iid*) residuals against an unspecified alternative after a linear model has been fitted. The BDS test can detect nonlinearity, provided that any linear dependence, for instance due to non-stationarity, has been removed from the data.

If the null hypothesis of *iid* residuals is rejected, we can conclude that the relationship between the variables is non-linear and therefore an instability-robust causality test is required to assess the statistical strength of causality.

Andrews Quandt Likelihood Ratio Test for Stability

The Andrews (1993) QLR (Quandt Likelihood Ratio) test for stability with unknown breakpoints is used to check whether structural breaks are present in the series of interest. These tests are obtained from the sequence of *LR* statistics that test the null hypothesis of constant parameters against the alternative of a one-time structural change at each possible point of time in the entire sample.

If the evidence of structural breaks is confirmed by the above-mentioned test of break-point detection, the Rossi (2005) instability-robust causality test is used to assess the statistical strength of the causality with respect to the direction of impact identified by the stability test.

3.2 Rossi (2005) Instability-Robust Causality Test

The Rossi (2005) instability-robust causality test is based on the following general regression model,

$$y_t = x_{t-1}\beta_t + \varepsilon_t, t = 1,\ldots,T, \quad (1)$$

where x_{t-1} is a $(p\times 1)$ vector of explanatory variables. x_t and y_t alternatively play the role Oil Price/Oil VIX and EPU/IVIX. The Granger Causality test we described above is only valid under then following assumptions : i) $\{x_t, y_t\}$ are stationary and ergodic; ii) the variance-covariance matrix $E(x_t x_t')$ is non-singular; iii) $E(x_t\,\varepsilon_t)=0$; $\{x_t, \varepsilon_t\}$ satisfies Gordin's condition (Hayashi 2000, pp. 402-403) and its long-run variance is non-singular[5]. Having relaxed these conditions, Rossi (2005) is interested in testing whether the variable x_t has no predictive content for y_t in the case where the parameters β_t might be time-varying. In this paper, we follow Chen *et al*. (2010) and focus on the case in which β_t may shift from β to $\overline{\beta}\neq\beta$ at some unknown points in time. While Rossi (2005) considers the general case of testing possibly nonlinear restrictions in models estimated by the Generalized Method of Moments (GMM), we confine the test to the simple case of no Granger causality restrictions in models whose parameters can be consistently estimated with Ordinary Least Squares (OLS) method. This procedure is advantageous in that it provides necessary consistency with the Granger causality regressions implemented in this paper.

Suppose there is a sudden shift occurring at a particular point in time τ. Let $\hat{\beta}_{1\tau}$ and $\hat{\beta}_{2\tau}$ denote the OLS estimators before and after the time of the shift, they are given by:

$$\hat{\beta}_{1\tau} = \left(\frac{1}{\tau}\sum_{t=1}^{\tau-1} x_{t-1}x_{t-1}'\right)^{-1}\left(\frac{1}{\tau}\sum_{t=1}^{\tau-1} x_{t-1}y_t\right) \quad (2)$$

$$\hat{\beta}_{2\tau} = \left(\frac{1}{T-\tau}\sum_{t=\tau}^{T-1} x_{t-1}x_{t-1}'\right)^{-1}\left(\frac{1}{T-\tau}\sum_{t=\tau}^{T-1} x_{t-1}y_t\right) \quad (3)$$

Rossi (2005)'s test statistic used to decide between the null and alternative hypotheses is
Exp-W*

[5] Let $I_t = (x_t\varepsilon_t, x_{t-1}\,\varepsilon_{t-1}\ldots)$ be the history of $(x_t\varepsilon_t)$ at the time $t\in Z$. Roughly speaking, Gordin's condition implies that the impact of I_{t-n} on the conditional expectation of $(x_t\varepsilon_t)$ vanishes as $n\rightarrow\infty$ and also that the conditional expectations of $(x_t\varepsilon_t)$ do not vary too much in time (Hayashi, 2000).

$$= \frac{1}{T} \sum_{\tau=[0,15T]}^{[0,85T]} \frac{1}{0.7} \exp\left(\frac{1}{2}\right) \left(\left(\hat{\beta}_{1\tau} - \hat{\beta}_{2\tau}\right)' \left(\frac{1}{T} \hat{\beta}_{1\tau} + \left(1 - \frac{\tau}{T}\right) \hat{\beta}_{2\tau} \right)' \right) \tag{4}$$

$$\times \hat{V}^{-1} \begin{pmatrix} \left(\hat{\beta}_{1\tau} - \hat{\beta}_{2\tau}\right) \\ \frac{1}{T} \hat{\beta}_{1\tau} + \left(1 - \frac{\tau}{T}\right) \hat{\beta}_{2\tau} \end{pmatrix}$$

where

$$\hat{V} = \begin{pmatrix} \frac{\tau}{T} S_{xx}' \, \hat{S}_1^{-1} \, S_{xx} & 0 \\ 0 & \frac{T-\tau}{T} S_{xx}' \, \hat{S}_2^{-1} \, S_{xx} \end{pmatrix} \tag{5}$$

with

$$\hat{S}_1 = \left(\frac{1}{\tau} \sum_{t=2}^{\tau} x_{t-1} \, \hat{\varepsilon}_t \hat{\varepsilon}_t x_{t-1}' \right) + \sum_{j=2}^{\tau-1} \left(1 - \left| \frac{j}{\tau^{1/3}} \right| \right) \left(\frac{1}{\tau} \sum_{t=j+1}^{\tau} x_{t-1} \, \hat{\varepsilon}_t \hat{\varepsilon}_{t-j} x_{t-1-j}' \right) \tag{6}$$

and

$$\hat{S}_2 = \left(\frac{1}{T-\tau} \sum_{t=\tau+1}^{T} x_{t-1} \, \hat{\varepsilon}_t \hat{\varepsilon}_t x_{t-1}' \right) + \sum_{j=r+1}^{T-1} \left(1 - \left| \frac{j}{(T-\tau)^{1/3}} \right| \right) \left(\frac{1}{T-\tau} \sum_{t=\tau+1+j}^{T} x_{t-1} \, \hat{\varepsilon}_t \hat{\varepsilon}_{t-j} x_{t-1-j}' \right) \tag{7}$$

Under the joint null hypotheses of no Granger causality and no time-variation in the parameters ($\beta_t = \beta = 0$), Exp – W* has a non-standard distribution whose critical values are tabulated in table B1 of Rossi (2005). High values of Exp-W* statistics will lead to the rejection the joint null hypotheses.

4. Empirical findings

4.1 Linear Models

Table 2 reports the results for the linear models fitted. The results for Brent crude oil price and Oil VIX as dependent variables are not reported as it is very unlikely that the Indian economy will have an effect on the oil price or oil price volatility.

The effect of the Brent crude oil price on economic policy uncertainty in India and the IVIX is insignificant where a linear model is fitted to the data. These results suggest that there is no statistically significant effect of oil price on the Indian economy.

The oil volatility index, however, shows a significant effect in the case of a linear model. The Oil VIX has a significant effect on the economic policy uncertainty index at the 5% level, as well as a significant effect on the IVIX at the 1% level. An increase in oil price volatility causes a statistically significant increase in economic policy uncertainty and stock market volatility in India.

TABLE 2 - *Results of Linear Regressions*

$\Delta log(EPU_{t+1})=\alpha+\beta\ (\Delta log(Br\_M_t)) + u_t$	
Statistic	*p-value*
0.141296	0.7248
$\Delta log(EPU_{t+1})=\alpha+\beta\ (\Delta log(OilVIX\_M_t)) + u_t$	
Statistic	*p-value*
0.509024	0.0256**
$log(IVIX_{t+1})=\alpha+\beta\ (\Delta log(Br\_D_t)) + u_t$	
Statistic	*p-value*
0.520036	0.2805
$log(IVIX_{t+1})=\alpha+\beta\ (log(oilVIX\_D_t)) + u_t$	
Statistic	*p-value*
0.587494	0.0000***

** indicates significance at the 5% level.

*** indicates significance at the 1% level.

However, the BDS tests and Andrews tests conducted detect nonlinearity and instability in the parameters. This indicates that a simple, linear relationship does not exist and the results of fitting a linear model to the data could be misleading. We conclude that the results of the linear models above are dubious and that the Rossi (2005) methodology, which accounts for instability in the parameters, would be a more appropriate test for causality.

The stability tests conducted are discussed in the next section.

4.2 BDS Test for Serial Dependence

The residuals from the linear regressions above were used to test for serial dependence. Results from the BDS test reported in Table 3, indicate that the null hypothesis that the series are *iid* is rejected for all four linear models. Consequently, the results from the test suggest that there may be a nonlinear relationship in the data.

Andrews (1993) Test for Instability

Table 4 reports the results of Andrews' Stability Test for EPU and monthly Brent crude oil price, and IVIX and daily Brent crude oil price. The relationship between economic policy uncertainty and monthly Brent crude oil price, indicates that there are no

TABLE 3 - *Results of BDS Tests*

$\Delta log(EPU_{t+1}) = \alpha + \beta(\Delta log(Br\_M_t)) + u_t$				
Dimension	*BDS Statistic*	*Std. Error*	*z-Statistic*	*Prob.*
2	0.029831	0.006892	4.328263	0.0000
3	0.059522	0.010999	5.411713	0.0000
4	0.073876	0.013151	5.617594	0.0000
5	0.079624	0.013763	5.785374	0.0000
6	0.079451	0.013327	5.961691	0.0000
$\Delta log(EPU_{t+1}) = \alpha + \beta(\Delta log(OilVIX\_M_t)) + u_t$				
Dimension	*BDS Statistic*	*Std. Error*	*z-Statistic*	*Prob.*
2	0.007661	0.007200	1.063973	0.2873
3	0.025906	0.011489	2.254858	0.0241
4	0.033523	0.013733	2.441164	0.0146
5	0.034333	0.014366	2.389826	0.0169
6	0.032349	0.013906	2.326368	0.0200
$log(IVIX_{t+1}) = \alpha + \beta(\Delta log(Br\_D_t)) + u_t$				
Dimension	*BDS Statistic*	*Std. Error*	*z-Statistic*	*Prob.*
2	0.177336	0.001814	97.76592	0.0000
3	0.300274	0.002869	104.6468	0.0000
4	0.383543	0.003400	112.8019	0.0000
5	0.438537	0.003526	124.3708	0.0000
6	0.473663	0.003383	140.0143	0.0000
$log(IVIX_{t+1}) = \alpha + \beta(log(OilVIX\_D_t)) + u_t$				
Dimension	*BDS Statistic*	*Std. Error*	*z-Statistic*	*Prob.*
2	0.167101	0.002146	77.88397	0.0000
3	0.283815	0.003397	83.55727	0.0000
4	0.362038	0.004029	89.86184	0.0000
5	0.412721	0.004182	98.67965	0.0000
6	0.443771	0.004017	110.4675	0.0000

TABLE 4 - *Results of Andrews (1993) Tests (Oil Price)*

Regression	*Break date*	*Sup LR*	*P-value*
$\Delta\log(EPU_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(Br\_M_t)$	October 2012	7.1615	0.4319
$\Delta\log(Br\_M_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(EPU_t)$	October 2012	3.3072	1.0000
$\log(IVIX_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(Br\_D_t)$	11/10/2013	1000***	0
$\Delta\log(Br\_D_{t+1})=\beta_{0t}+\beta_{1t}\ \log(IVIX_t)$	11/10/2013	3.6113	1.0000

Notes: EPU and BR_M denote the monthly series of Indian economic policy uncertainty and Brent crude oil price respectively. IVIX and Br_D denote daily Indian VIX series and Brent crude oil price respectively. We test the stability of (β_{0t}, β_{1t}) in the above regressions.

*** indicates the rejection of the null hypothesis of stability at the 1% level.

significant breaks in the two directions using Andrews (1993) QLR test. Therefore, the null hypothesis of constant parameters is not rejected. In the case of the relationship between the IVIX and daily Brent crude oil price there is a slight difference. The test shows a significant break when IVIX is the dependent variable. Therefore, the null hypothesis of constant parameters is rejected at the 1% level of significance.

TABLE 5 - *Results of Andrews (1993) Tests (Oil VIX)*

Regression	*Break date*	*Sup LR*	*P-value*
$\Delta\log(OilVIX\_M_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(EPU_t)$	03/06/2013	6.2873	0.5532
$\Delta\log(EPU_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(OilVIX\_M_t)$	03/06/2013	3.3283	1.0000
$\log(OilVIX\_D_{t+1})=\beta_{0t}+\beta_{1t}\ \log(IVIX_t)$	15/10/2013	4200^{***}	0
$\log(IVIX_{t+1})=\beta_{0t}+\beta_{1t}\ \log(OilVIX\_D_t)$	15/10/2013	700^{***}	0

Notes: OilVIX_M and EPU denote the monthly series of Oil VIX and Indian economic policy uncertainty respectively. OilVIX_D and IVIX denote the daily Oil VIX series and the Indian VIX series respectively. We test the stability of (β_{0t},β_{1t}) in the above regressions.

*** indicates the rejection of the null hypothesis of stability at the 1% level.

Table 5 reports the results of Andrews' Stability Test for EPU and monthly Oil VIX, and IVIX and daily Oil VIX. The relationship between economic policy uncertainty and the monthly Oil VIX indicates no significant breaks in the two directions. The null hypothesis of constant parameters is not rejected. In the case of the relationship between the IVIX and the daily Oil VIX the test shows a significant break in the two directions. Therefore, the null hypothesis of constant parameters is rejected at the 1% level of significance.

4.3 Rossi (2005) Instability-Robust Causality Test

Table 6 reports the results of the Rossi Instability-Robust Causality Test. The Rossi (2005) test confirms the null hypothesis of stability and no Granger causality in the relationship between Indian economic policy uncertainty and the monthly Brent crude oil price as well as the relationship between the Indian stock market volatility and the daily Brent crude oil price. The oil price does not Granger cause economic policy uncertainty or stock market volatility in India.

TABLE 6 - *Results of Rossi (2005)'s Granger-Causality Test Robust to Instabilities*

H_0: stability and no Granger causality	
$\Delta\log(EPU_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(Br\_M_t)$	
Statistic	*p-value*
3.1767	0.2290
$\log(IVIX_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(Br\_D_t)$	
Statistic	*p-value*
2.7363	0.3170
$\Delta\log(EPU_{t+1})=\beta_{0t}+\beta_{1t}\ \Delta\log(OilVIX\_M_t)$	
Statistic	*p-value*
5.8415	0.0260**
$\log(IVIX_{t+1})=\beta_{0t}+\beta_{1t}\log(OilVIX\_Dt)$	
Statistic	*p-value*
273540	0***

** indicates rejection of the null hypothesis at the 5 and 10% levels.

*** indicates rejection of the null hypothesis at the 1% level.

The Rossi test does, however, find causality in terms of the oil price volatility index. The test confirms a causality running from the monthly oil volatility index to Indian economic policy uncertainty. The null hypothesis of no Granger causality and stability is rejected at the 5% level of significance. The test also confirms significant evidence of causality from the daily oil price volatility index to the Indian stock market volatility. The null hypothesis of no Granger causality and stability is rejected at the 1% level of significance.

5. CONCLUSION

This paper analyses how the Indian economy is affected by changes in the oil price and oil price volatility. This was done by investigating the causality between the Brent crude oil price as well as the crude oil ETF volatility index and the policy-related economic uncertainty index for India as well as the stock market volatility index for India.

The results indicate that the standard Granger causality test fails to detect the causal links between oil price volatility and economic uncertainty due to parametric instability. Rossi's causality test, which is robust to instability, revealed some interesting results and insights.

No causality was found running from the Brent crude oil price to the economic policy uncertainty index or to the stock market volatility index. This result suggests that oil price shocks do not have a causal effect on the Indian economy.

When investigating the causality between the oil price volatility index and the two economic uncertainty indexes for India, significant evidence was found to support this causality. This suggests that oil price volatility has a causal relationship with economic policy uncertainty in India and an even stronger causal relationship with Indian stock market volatility.

The paper contributes to the literature by connecting oil price volatility to economic uncertainty in India. It finds that oil price shocks and volatility have an important causal link to economic uncertainty in India.

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ABSTRACT

This paper investigates the causality between oil price and economic uncertainty in India. In order to test for this relationship, we collect data on the Brent crude oil price as well as the crude oil ETF volatility index. We also use the policy-related economic uncertainty index as well as the stock market volatility index for India. Our results suggest that the standard Granger causality test rejects the hypothesis of causality between oil price changes and economic uncertainty in India. As a result of the shortcoming of the standard Granger test in the presence of parameter instability, we perform Rossi's (2005) test. It shows that the Brent crude oil price does not have a causal impact on India's economic uncertainty but the crude oil ETF volatility index does. Clearly, oil and India's economic uncertainty go hand-in hand. These findings can thus be used in the context of policy recommendation.

Keywords: Economic Policy Uncertainty, Stock Market Uncertainty, Oil Price, Time-Varying Causality, India

JEL Classification: C14, C32, D80, E20, E66, G18, Q43

RIASSUNTO

Relazione di causalità tra prezzo del petrolio e incertezza in India

Questo studio esamina la relazione di causalità tra prezzo del petrolio e incertezza economica in India. A questo fine abbiamo considerato i prezzi del greggio Brent e l'indice di volatilità dell'ETF sul greggio. Abbiamo utilizzato anche l'indice di incertezza economica collegato alla politica e l'indice di volatilità del mercato azionario in India. I risultati evidenziano che il test standard di Granger-causality rifiuta l'ipotesi di causalità tra le variazioni tra il prezzo del petrolio e l'incertezza economica in India. In conseguenza dell'inadeguatezza del test standard di Granger in presenza di instabilità dei parametri, è stato eseguito il test di Rossi (2005). Quest'ultimo mostra che il prezzo del Brent non ha alcun impatto sull'incertezza economica in India mentre l'indice di volatilità dell'ETF sul greggio ha effetto sull'incertezza. Chiaramente, prezzi petrolio e incertezza economica in India vanno di pari passo. Questi risultati possono essere utilizzati per raccomandazioni sulle scelte politiche da attuare.