THE INCREASING INFLUENCE OF OIL PRICES ON THE CANADIAN STOCK MARKET

Shahriar Hasan, Thompson Rivers University
Mohammad Mahbobi, Thompson Rivers University

ABSTRACT

This paper examines the influence of oil prices on Canadian stock market using the cause-effect relationship between oil prices and the TSX index. Additionally, the relationship between the Canadian to US Dollar exchange rate and the TSX index was investigated. Results show that in the last three years, the impact of oil prices on the TSX index has become much stronger than that of the preceding 18 years. Additionally, the importance of the exchange rate compared to oil market in predicting the TSX index seems to be declining. In particular, this decrease is more noticeable after the recent North American financial markets slump in late 2008.

JEL: G15, F31, E44

KEYWORDS: Oil Price, TSX Index, Foreign Exchange, International Financial Markets

INTRODUCTION

Ever since the first commercial oil well was drilled in Cameron Creek, AB, in 1901, Canadian oil production has steadily gone up almost every single year. During the last three decades, this country has quietly become a major player in the oil industry. As of January of 2009, Canada had a proven reserve of 178 billion barrels which is only third to that of Venezuela and Saudi Arabia. This is about 13% of all proven oil reserves in the world. It is also the top supplier of US oil imports, currently supplying about 2.5 million barrels per day. About 25% of crude oil imports and 26% of petroleum imports of the US comes from Canada. Consequently, about 98% of Canadian petroleum exports go to the United States.

Both the quality and the quantity of individual firms in the oil industry have grown with the development of oil fields. As of December 31, 2009, the Toronto Stock Exchange (TMX) listed 365 issuers in the energy sector with a total of $261b in trading for the year. This is the highest number of issues of all the stock exchanges in the world. The Australian Securities Exchange (ASX) lists 230 oil and gas companies and trails the TMX by a healthy margin. In terms of market capitalization, the energy sector is the second largest (27.44%) within the TMX trailing the financial sector (29.19%) by a small amount. The total market capitalization of the oil and gas sector in TMX during 2009 saw a 36% rise compared to the year before. In 2009, 24 new oil and gas listings raised about $8.2 billion of equity capital demonstrating the increasing importance of this sector. With this development in the background, it is only natural that oil price fluctuations will profoundly impact the Canadian stock market through its influence on the oil and gas corporations. Since the majority of Canadian oil exports goes to the south of the border, a related factor to inspect would be the exchange rate between the US and Canada. It is expected that with rising oil prices, the US dollar should depreciate against its Canadian counterpart. The organization of this paper is as follows. In the first section, we start with a review of existing literature. In the next section, a description of the data and methodology employed in the paper will be explained. Then, we will present the outcomes of the tests and estimated models, followed by conclusions.

LITERATURE REVIEW

There seems to be a dearth of research in the area of oil price and stock market relationship. Very few empirical works are available that looks specifically at the oil price to stock market causality in Canada. Boyer and Didier (2007) found that Canadian energy stocks are positively associated to the overall markets return and the appreciations of crude oil and natural gas prices. Our paper addresses the influence of oil prices on the overall stock market and not just the energy stocks in Canada. The only study that investigated the difference between the effects of oil price shocks in two time periods, was done by Blanchard and Gali (2007). However, they tested the effects of oil price changes on macroeconomic performances of a set of industrialized economies rather than that of a single stock market.

Miller and Ratti (2009) analyzed the long run relationship between the world price of crude oil and international stock markets. One of the six markets that made up the international stock market for their study was Canada. Their study was focused on the overall impact of all these 6 countries' markets rather than single countries themselves. They found that stock market indices responded negatively to increases in the oil price in the long run. However, this pattern appeared to disintegrate from the beginning of 2000. Lescaroux and Mignon (2008) found a strong Granger causality running from oil to share prices, especially for oil exporting countries. They demonstrated that oil prices lead share prices counter-cyclically for almost every countries included in their study.

On the subject of oil price shocks and their effects on the stock market, Kilian and Park (2009) found that the reaction of U.S. real stock returns to an oil price shock differs greatly depending on whether the change in the price of oil is driven by demand or supply shocks in the oil market. Nandha and Faff (2008) demonstrated that oil price rises have negative impacts on equity returns for all sectors except mining and oil and gas industries. Chen (2010) suggested that an increase in oil prices leads to a higher probability of a bear market emerging. Bhar and Nikolova (2010) found that global oil price returns have significant impact on Russian equity returns and volatility. Arouri and Rault (2010) investigated the case of net oil exporting countries and found that oil price shocks Granger cause stock price changes. Jawadi, Arouri and Bellalah (2010) identified different regimes for stock-oil price deviations and show a nonlinear mean-reverting mechanism that is activated by regime with an adjustment speed that increases according to price deviations toward the equilibrium. Seshaiah and Behera (2009) found that Indian stock price indices are co integrated with crude oil prices and exchange rates – oil price and exchange rates influence the stock market prices at lag 50 and by exchange rates alone at lag 25.

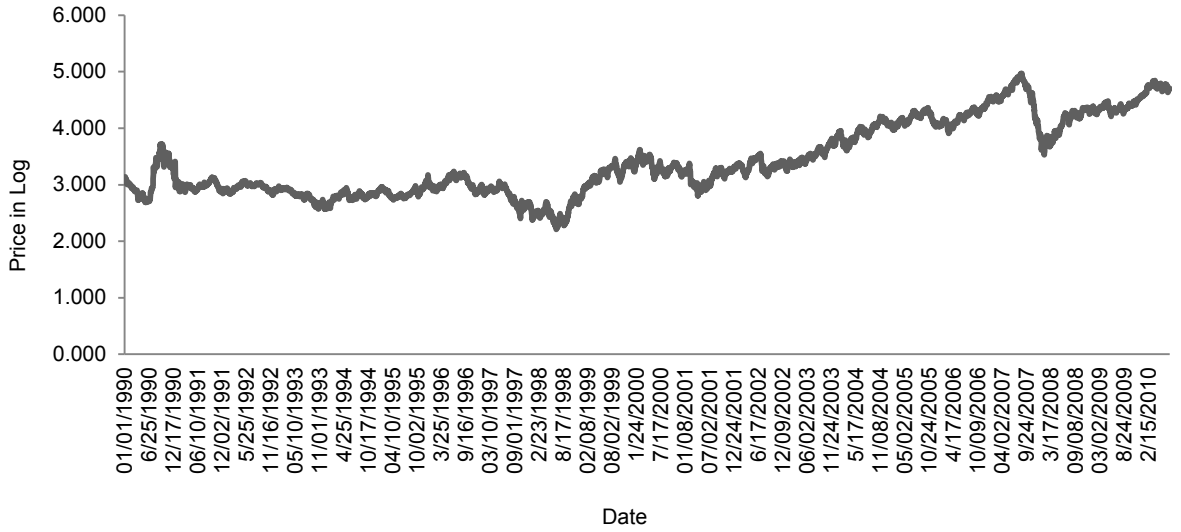
Regarding the relationship between the oil price and exchange rates, there is a diverse group of literature as to how they are related. Amano and Norden (1993, 1996, 1998) developed an equation to determine the relationship between energy prices and the Canadian dollar. They found evidence of a negative relationship between these two variables, such that higher real energy prices led to a depreciation of the Canadian dollar. Issa, Lafrance and Murray (2008) used the equation developed by Amano and van Norden on a structural break test and found a break point in the sign of this relationship, which changes from negative to positive in the early 1990s. The relationship between oil price shocks and its reaction on individual or groups of stocks were demonstrated by Bjornland (2009), Gogineni (2007), Huang et. al (1996), Jones and Kaul (1996), Jones, Leiby and Paik (2004) and Sadorsky (1999). None of these studies, however, investigated the difference in the impact of oil price shocks between two periods for the entire stock market in question.

DATA & METHODOLOGY

This paper uses daily data on light sweet crude oil prices, S&P/TSX indices and the Canadian Dollar exchange rates against US Dollars during the January 1990 to August 2011 period. We collected the daily oil prices, index values and the exchange rates from the US Energy Administration web site

(www.eia.gov), TSX Datalinx and OANDA web site (www.oanda.com) consecutively. Figures 1a, 1b and 1c show the data in logarithmic form.

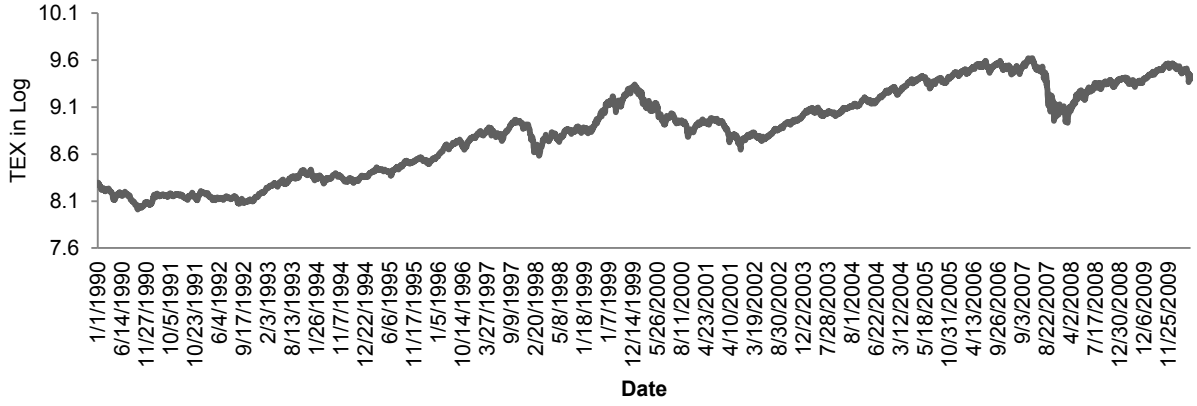
Figure 1a: Daily Light Sweet Crude Oil Price in Logarithm Form



Source: U.S. Energy Information Administration, website: www.eia.gov. As can be seen here, there seems to be a structural break some time in late 2008. After a sharp decline, the price seems have gone back to its previous course of upward movement.

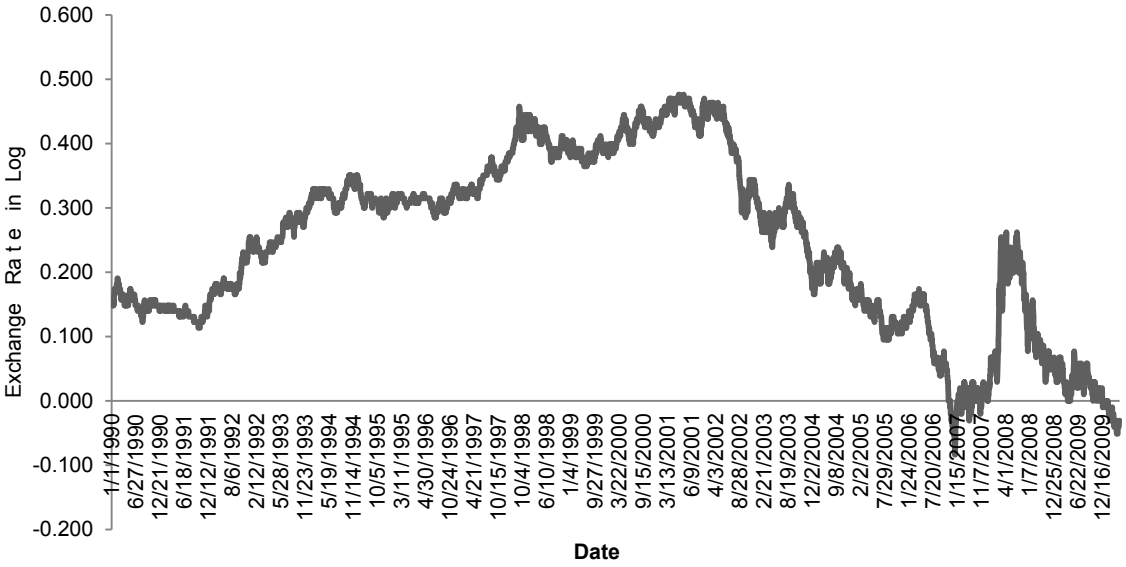
Consistent with the trend of the Canadian leading business indicators depicted in Figure-2, the data were divided into two periods: January 1990 to November 20, 2008 and November 21, 2008 to August 19, 2011. Additionally, a casual observation of the time series plot indicated that during the second period, there was a much more visible correlation between oil prices and the other two variables. This allows us to test our hypothesis that it is only recently that the oil price has become a dominant factor in the Canadian equities market.

Figure 1b: Daily Toronto Stock Price Index in Logarithm Form



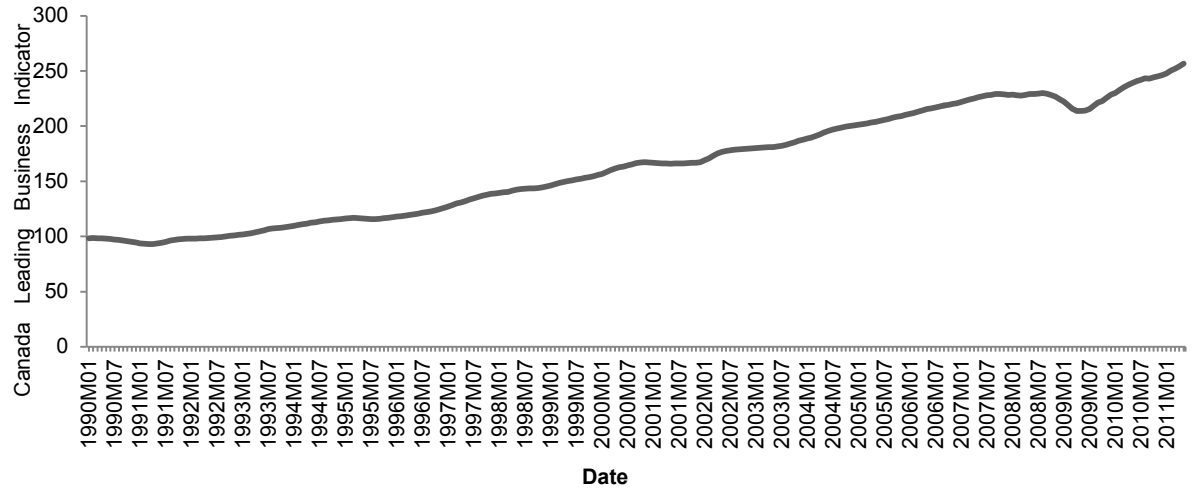
Source: Datalinx Corporation. As can be seen here, there seems to be a structural break some time in late 2008. After a sharp decline, the indexe seems have gone back to its previous course of upward movement.

Figure 1c: Daily US over Canadian Dollars in Logarithm Form



Source: OANDA Data Services; Website: www.oanda.com. Unlike the oil price and the TSX index, exchange rates seem to have had two more structural breaks before the November 2008 period; one in late 2001 and the next in late 2006.

Figure 2: Trend of Canadian Business Leading Indicators from Jan 1990 to May 2011



Source: Statisitcs Canada(www.statscan.ca). Notice that unlike figures 1a, 1b and 1c, data for the Leading Indicators were only available in monthly format. However, the structural break pattern that was evident in the other three graphs, is also visible here as the indicators seem to have changed course in late 2008.

In this paper we employ three alternative ways to examine the influence of oil prices on Canadian stock market. These include Granger causality test, the Lag Augmented VAR- the so-called LA-VAR testing procedure proposed by Toda and Yamamoto (1995), and the use of generalized impulse response functions by Pesaran and Shin (1998) and the associated variance decomposition analysis. Granger (1969) simplified the definition of causality between x and y and if it presents the fact that y can be predicted with better accuracy by using past values of x. The standard Granger causality specifications among x and y can be define as:

$$Y_t = a + \sum_{i=1}^{n} \beta_1 X_{t-1} + \sum_{i=1}^{n} \beta_{2i} Y_{t-1} + \in_t \quad 1$$

$$X_t = a' + \sum_{i=1}^{n} \beta_1' X_{t-1} + \sum_{i=1}^{n} \beta_{2i}' Y_{t-1} + \in_t' \quad 2$$

The null hypothesis for equation (1) is that "x does not Granger cause y." This hypothesis would be rejected if the coefficients of the lagged x's were jointly significant (different from zero). The null hypothesis for equation (2) is that "y does not Granger cause x." This hypothesis would be rejected if the coefficients of the lagged y's were jointly significant. If both of these null hypotheses are rejected, then these exists a feedback between the two variables.

While the Wald exogeneity test can be applied to see if one variable Granger cause the other, it cannot be used with all possible pre-test biases within the variables. Toda and Yamamoto (1995) introduced the modified Wald test. They proposed a lag augmented VAR-also known as LA-VAR- testing procedure. This robust test avoids the integration and co integration order (*d*) of the data and other possible biases. The only condition must be satisfied is that the order of the data integration does not exceed the true lag length of the model. Usual lag length selection criteria can be used to select the appropriate lag length (*k*). We applied the LA-VAR testing procedure to see if the influence of oil price on Canadian stock market has been increasing over the recent years, especially after the current turmoil in the North American markets. The LA-VAR testing procedure also allows for testing coefficient restrictions in a level VAR when the variables are of unknown integration or cointegration order.

The last evidence to demonstrate the growing impact of oil prices on the Canadian stock market is the variance decomposition analysis from the estimated VAR model. The impulse response functions (IRF) and variance decomposition analyses are two standard tools of VAR model. As stated by Hill *et al* (2010) a VAR model tells us whether the underlying variables are significantly related to each other. While we estimate the IRFs to show how the variables react dynamically to shocks, the variance decomposition analysis informs us about the source of the volatility. Further, we also analyzed the impact of exchange rate and oil market on TSX using the generalized impulse response functions introduced by Pesaran and Shin (1998). The shocks of one standard deviation of oil and exchange rate on the Toronto Exchange Stock market were estimated. Before estimating the unrestricted VAR model, all variables are subject to unit root tests. The two common unit root tests are Augmented Dickey–Fuller test (ADF) and Phillips–Perron (PP) tests.

EMPIRICAL RESULTS

In order to determine the extent of the relationship in each of the distinct periods, the Granger (1969), and Tado-Yamamoto (1995) causality tests were applied. The unit root tests were also performed to determine the credibility of the Granger tests. Lastly, we estimated the generalized impulse response functions and perform the variance decomposition analysis for both exchange rates and oil prices to determine their impacts of a shock in these variables on the stock market. This allowed us to be more certain about the importance of the influence of oil prices in the stock market. Table-1 shows the descriptive statistics for the two periods. Tables-2 reports the test statistic obtained, together with the estimated Chi-Square values and the results for the multivariate and bi-variate causality tests. At the 5% level of significance and within the first period of our analysis (from January 2, 1990 to November 20, 2008), our results using Wald exogeneity test indicate that the hypothesis of oil price does not Granger cause the TSX is not rejected. On the other hand, the null hypothesis of the oil price does not Granger cause the TSX was rejected in the second period of analysis. This simply indicates that the influence of oil price using the Granger causality test on the Canadian stock market has been statistically increased. Table-2 also presents

the outcome of the same test for the exchange rate. During the first period, exchange rate does Granger cause and therefore did have contribution in predicting fluctuations in oil market while such conclusion may not be drawn for the second period. In fact, within this period, while the hypothesis of exchange rate does not Granger cause the TSX was rejected at 5% and 1% levels of significance, the same hypothesis could not be rejected at 10%.

Table 1: Descriptive Statistics for all Variables

Time Period	**January 2, 1990 to November 20, 2008**			**November 21, 2008 to August 19, 2011**		
Descriptive Statistics	**TSX Index**	**Oil Price**	**Exchange Rate**	**TSX Index**	**Oil Price**	**Exchange Rate**
Mean	7,206.19	32.56	1.32	11,557.27	78.88	1.07
Median	6,804.06	22.70	1.35	11,707.32	76.65	1.04
Maximum	1,5073.13	143.95	1.61	14,270.53	126.59	1.30
Minimum	3,009.91	9.10	0.92	7,566.94	34.16	0.94
Std. Dev.	3,186.55	23.93	0.16	1,633.54	22.06	0.09
Skewness	0.63	1.97	-0.15	-0.52	0.24	1.01
Kurtosis	2.44	6.80	2.08	2.56	2.52	2.96
Sum	33,422,31	151,000.7	6,117.29	7,662,470	52,293.09	706.80
Observations	4,638	4,638	4,638	663	663	663

Source: Authors' own calculations. The mean, median and standard deviations of the three variables in both the periods are presented here to demonstrate the shift in the regime. The means and the medians of both the TSX index and that of oil price increased significantly during the recent three years compared to the previous 20 years. While the variability of oil price increased during the recent years, that of the TSX index have actually gone down recently.

Table 2: VAR Granger Causality/Block Exogeneity Wald Tests

Time Period	**January 2, 1990 to November 20, 2008**			**November 21, 2008 to August 19, 2011**		
Excluded Variables	**Chi-sq**	**df**	**Prob.**	**Chi-sq**	**df**	**Prob.**
Oil Price	12.09	13	0.519	32.51	8	0.000*
Exchange Rate	48.87	13	0.000*	15.75	8	0.046**

Source: Authors' own calculations. (*) and (**) indicate significance at 1% and 5% levels respectively. Oil price was not useful and contributing in forecasting the TSX in the first period. However this result was reversed during the second period. Exchange rates on the other hand, showed importance in the first period, but the level of significance went up in the second period.

Table-3 shows the results of the two common unit root tests of Augmented Dickey–Fuller test (ADF) and Phillips–Perron (PP) test. The results indicate that all three variables are stationary at first difference. In order to analyze the impact of each of the three variables on the other two, one may estimate a Vector Auto regression (VAR) model. In doing so, we first estimate the lag order of the equations in the model. Table-4 and Table-5 show the optimum lag order of the VAR model using all three variables. Based on Hannan-Quinn-HQ, and Schwarz-SC- information criteria, the optimum lags for the set of the three variables are twelve and seven lags respectively. In most applied cases, however, Akaike Information Criterion, AIC, is used as the evidence of lag. Therefore, the unrestricted VAR model will be estimated using 12 lags, k=12 for the first period, and k =7 as the best lag orders for the second period.

Table 3: Group Unit Root Test: Summary

Time Period	**January 2, 1990 to November 20, 2008**			**November 21, 2008 to August 19, 2011**		
Method	Statistic	Prob.**	Cross-sections	Statistic	Prob.**	Cross-sections
Null: Unit root (assumes common unit root process)						
Levin, Lin & Chu t*	-0.147	0.441	3	-2.026	0.021	3
Null: Unit root (assumes individual unit root process)						
Im, Pesaran and Shin W-stat	0.526	0.701	3	-0.619	0.268	3
ADF - Fisher Chi-square	2.701	0.845	3	6.968	0.324	3
PP - Fisher Chi-square	3.012	0.807	3	7.001	0.321	3

*** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.Source: Authors' Own Calculations. The summary of the unit root tests of all variables for the two periods. After first difference all variables became stationary.*

Table 4: The Lag Order Selection Criteria, Jan 2, 1990 to Nov 20, 2008

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	5,181.859	NA	0	-2.9525	-2.942	-2.948
1	3,3363.34	56,282.58	0	-19.023	-18.997	-19.014
2	3,3406.26	85.637	0	-19.042	-19.000*	-19.027*
3	3,3412.76	12.968	0	-19.041	-18.983	-19.020
4	3,3437.01	48.296	0	-19.050	-18.976	-19.023
5	3,3442.04	10.016	0	-19.047	-18.958	-19.015
6	3,3456.65	29.059	0	-19.051	-18.945	-19.013
7	3,3462.91	12.438	0	-19.049	-18.928	-19.00
8	3,3471.99	18.025	0	-19.049	-18.912	-19.00
9	3,3476.82	9.577	0	-19.047	-18.894	-18.99
10	3,3484.12	14.469	0	-19.046	-18.877	-18.99
11	3,3487.23	6.1586	0	-19.042	-18.858	-18.978
12	3,3522.05	68.886	0	-19.057*	-18.857	-18.986
13	3,3522.80	1.4682	0	-19.052	-18.836	-18.975

Source: Authors' own calculations. (*) 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 *According to the Akaike information criterion, the 12th lag is the significant one. Although the other criteria yielded different lag lengths, we went with the common practice of giving the AIC the priority in selecting lag lengths.*

Table 5: Lag Order Selection Criteria, Nov 21, 2008 to Aug 19, 2011

Lag	**LogL****	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	3,069.838	NA	0	-10.161	-10.118	-10.144
1	5,345.960	4,514.496	0	-17.681	-17.571*	-17.638
2	5,371.416	50.238	0	-17.736	-17.560	-17.667*
3	5,375.997	8.994	0	-17.721	-17.480	-17.627
4	5,394.840	36.810	0	-17.754	-17.447	-17.635
5	5,403.355	16.549	0	-17.752	-17.380	-17.607
6	5,410.445	13.710	0	-17.746	-17.308	-17.575
7	5,423.435	24.988*	0	-17.759*	-17.255	-17.563
8	5,428.744	10.161	0	-17.747	-17.177	-17.525
9	5,434.953	11.820	0	-17.737	-17.102	-17.490
10	5,441.517	12.429	0	-17.729	-17.028	-17.456

Source: Authors' own calculations. (*) indicates lag order selected by the criterion, (**)All acronyms are the same as in Table-4.*According to the Sequential Modified LR and the Akaike information criterion, the 7th lag is the significant one. Although the other criteria yielded different lag lengths, we went with the common practice of giving the AIC the priority in selecting lag lengths.*

Table-6 shows the outcomes of Tado-Yamamoto Causality Modified Wald test for the two time periods. With a maximum integration order of the data, *d*=1, the LA-VAR test can be estimated. The hypothesis is that the exchange rate or the oil price does not Granger cause the TSX. This robust test verifies the outcome of the traditional Wald test in testing if there exists Granger cause between exchange rate and

TSX. The results show that while exchange rate between January 1990 to Nov 20, 2008 does Granger cause the TSX, oil price does not Granger cause the TSX. The results of Granger causality test from Nov 21, 2008 to August 2011 indicate that although the casual relationship from exchange rate to the TSX is not very strong, such causal relationship from the oil price to the TSX appears to have strengthened in the second period compared to the previous period.

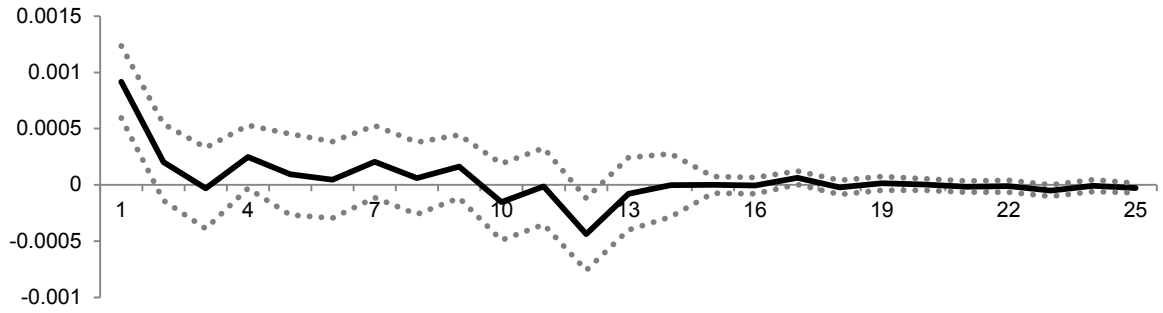
Table 6: Granger Causality Test Based on LA-VAR Model

Dependent Variable: TSX Index	**Time Periods**					
	January 2, 1990 to November 20, 2008			November 21, 2008 to August 19, 2011		
Excluded Variables	Chi-square	Lag	p-value	Chi-square	Lag	p-value
Oil Price	11.787	13	0.545	28.271	8	0.0004*
Exchange Rate	45.103	13	0.000 *	16.811	8	0.0321**

Source: Authors' Own Calculation . (*) and (**) indicate significance at 1% and *5% levels respectively. Oil price was not useful and contributing in forecasting the TSX in the first period. However this result was reversed during the second period. Exchange rates on the other hand, showed importance in the first period, it was not significant at 1% in the second period.*

The third evidence of an existence upward influence of oil price on the Canadian stock market is to estimate generalized impulse response functions introduced by Pesaran and Shin (1998). This can be done within an estimated Vector Auto regression (VAR) model. We use the optimum lag length shown on Table-4 and Table-5. Before estimating the unrestricted VAR model, all variables are subject to unit root tests. The results of the two common unit root tests of the Augmented Dickey–Fuller test (ADF) and Phillips–Perron (PP) for both periods are shown in Table-5. The results indicate that all three variables are stationary at first difference.The generalized impulse response functions out of one S.D. shock (innovation) of oil price and exchange rate on the TSX index were estimated. Figure-3a and Figure-3b show these functions for the period of January 2, 1990 to November 20, 2008. The results indicate that TSX index is more volatile after a one S.D. shock in exchange rate compared to oil price. The graphs in Figure-3a and Figure-3b show impacts of such innovations in exchange rate and oil price on TSX for the two different periods. The graph depicted in Figure-3a is the response of TSX to one shock in Oil price from January 1990 to November 20, 2008. The impact of one shock in exchange rate with the same period on TSX index shown in Figure-3b.

Figure 3a: Generalized One S.D. Innovations of TSX Index to Shock in oil price with ± 2 S.E. During January 2, 1990 to November 20, 2008

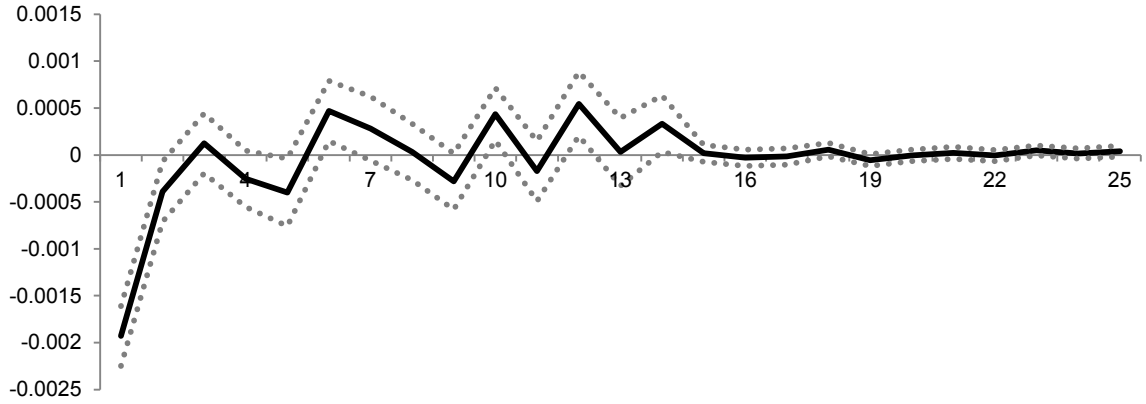


Source: Authors' own calculations The results indicate that TSX index is more volatile after a one S.D. shock in exchange rate compared to oil price

During the second period from November 21, 2008 to August 2011, the same impacts were estimated. The results as shown in Figure-4a and Figure-4b indicate that although both oil price and exchange rate shocks have had major influences on TSX, the impact of oil price shock on TSX in particular is

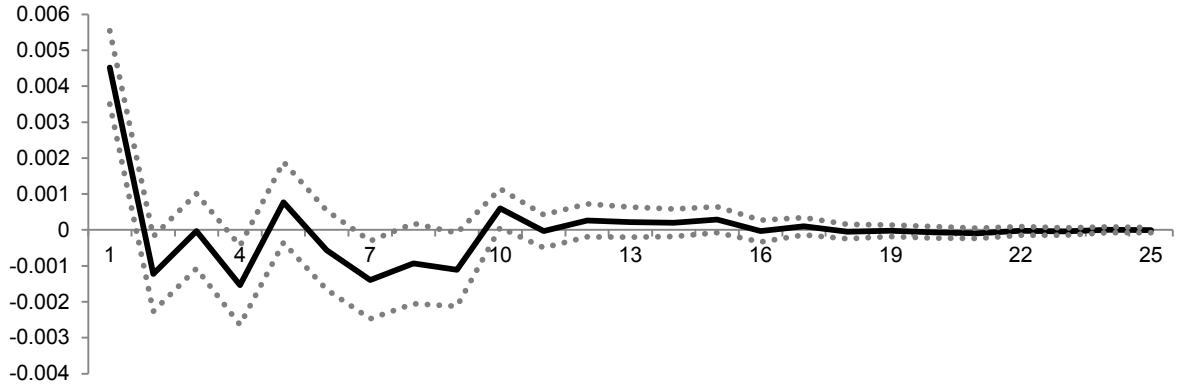
significant during the second period. Therefore, this volatility reversed during the second period. In other words, after the recent downturn in the financial markets, TSX index reveals more fluctuations to one standard deviation shock in oil price compared to the previous period, and it takes more time for the market to absorb such shock. As shown in Figures-4a and 4b, this volatility reversed during the second period. In other words, after the recent downturn in the financial markets, TSX index reveals more fluctuations to one standard deviation shock in oil price compared to the first period, and it takes more time for the market to absorb such shock.

Figure 3b: Generalized One S.D. Innovations of TSX Index to Shock in Exchange Rate with ± 2 S.E. During January 2, 1990 to November 20, 2008



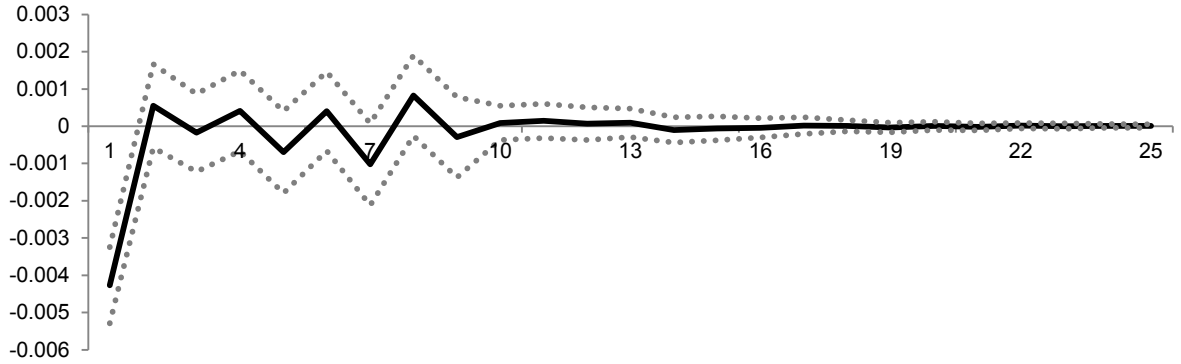
Source: Authors' own calculations

Figure 4 a: Generalized One S.D. Innovations of TSX Index to Shock in Oil Price with ± 2 S.E. During November 21, 2007 to Aug 19, 2011



Source: Authors' own calculations TSX index reveals more fluctuations to one standard deviation shock in oil price compared to the first period, and it takes more time for the market to absorb such shock.

Figure 4 b: Generalized One S.D. Innovations of TSX Index to Shock in Exchange Rate with ± 2 S.E. During November 21, 2007 to Aug 19, 2011



Source: Authors' own calculations

Finally, Table-7 shows the variance decomposition analysis out of the estimated VAR model for the two periods. It indicates that within the first period of analysis 99.92% of the two-step forecast error variance of the Canadian stock exchange market is due to the volatility in this market. Only 0.00027% and 0.076% are due to oil prices and exchange rate respectively. In the second period of the analysis, however, these sources of volatilities were estimated at significantly higher levels with 0.57% for oil prices, and at 0.29% for exchange rate. Consequently, during the recent years' chaotic situation in the North American financial markets, it is evident that the sharp jump in source of the volatility of the Canadian stock market is more due to fluctuations in oil market than to instability in exchange rate market.

Table 7: Variance Decompositions of TSX Index

	January 2, 1990 to November 20, 2008				**November 21, 2008 to August 19, 2011**			
Period	S.E.	TSX	OIL	Exchange Rate	S.E.	TSX	OIL	Exchange Rate
1	0.008	100.000	0.000	0.000	0.021	100.000	0.000	0.000
2	0.008	99.924	0.000	0.075	0.021	99.139	0.571	0.289
3	0.008	99.923	0.000	0.076	0.021	98.948	0.566	0.484
4	0.008	99.876	0.035	0.087	0.022	98.638	0.883	0.478
5	0.008	99.869	0.042	0.088	0.022	96.404	1.771	1.824
6	0.008	99.840	0.042	0.117	0.022	96.068	1.738	2.192
7	0.008	99.830	0.045	0.123	0.022	95.885	1.749	2.364
8	0.008	99.815	0.049	0.135	0.022	94.712	2.906	2.381
9	0.008	99.813	0.050	0.136	0.022	94.709	2.914	2.376
10	0.008	99.813	0.050	0.136	0.022	94.638	2.918	2.442
11	0.008	99.813	0.050	0.136	0.022	94.612	2.937	2.449
12	0.008	99.813	0.050	0.136	0.022	94.613	2.936	2.449
13	0.008	99.813	0.050	0.136	0.022	94.610	2.939	2.450
14	0.008	99.812	0.050	0.136	0.022	94.580	2.963	2.456
15	0.008	99.812	0.050	0.136	0.022	94.570	2.970	2.458
16	0.008	99.812	0.050	0.136	0.022	94.569	2.971	2.459
17	0.008	99.812	0.050	0.136	0.022	94.568	2.971	2.460
18	0.008	99.812	0.050	0.136	0.022	94.568	2.971	2.460
19	0.008	99.812	0.050	0.136	0.022	94.567	2.971	2.461
20	0.008	99.812	0.050	0.136	0.022	94.566	2.972	2.461

Source: Authors' Own Calculations. In the first period, 99.924% of the two-step forecast error variance of the TSX market is due to the volatility in this market. Only 0.075% is due to exchange rate. Oil price was not influential in predicting the TSX. In the second period, these effects were estimated at significantly higher levels with 0.57% for oil prices, and at 0.289% for exchange rate .

CONCLUSIONS

The main objective of this paper was to demonstrate the increasing influence of the oil price changes on the Canadian stock market. Daily data between January 1990 and August 2011 were used for all variables. Consistent with the Canadian leading business indicators, the whole time period was divided into two time segments. We employed alternative causality tests and procedures to identify the influence of oil price and exchange rate in driving the TSX index. This has been shown using the Wald test, the LA-VAR model, and the use of generalized impulse response functions and the variance decomposition analysis. The results of the Wald test, the LA-VAR models, and the generalized impulse response functions for shocks in oil price and exchange rate during the two time segments were estimated and analyzed. Additionally, for the same two distinct time periods, we ran the variance decomposition analysis for oil price and exchange rate. The results for all these tests indicate that the impact of oil price on the Canadian stock market has been robustly increasing during the second period of time while the causality from exchange rates to TSX index was also identified for the same period, albeit at a lesser degree. Furthermore, the generalized impulse response functions and variance decomposition analysis demonstrated that during the first time period, oil price innovations (shocks) have had significant impact on the Canadian stock market. Such impact, however, became much more visible and pronounced in the second period of our analysis, i.e. after the recent slump in the financial markets. The results were also consistent with what we predicted from the casual observation of the raw data.

One of the limitations of this study is that we have only tried to ascertain fluctuations in the Canadian stock market related to two major variables, i.e. exchange rate and oil price. However, the behaviour of financial markets is more complex and stock prices react to many different variables that have not included in this study. As a result, it might be interesting to include additional relevant variables that might directly or indirectly influence the securities market. One possible direction of future research of this study is that the methodology may be expanded beyond the Canadian stock market. Due to the integration of Canadian, US, and the rest of the world financial markets, it is possible to extend the scale of the current research to the global level. The hypothesis may then be tested to see if in fact oil price has become more influential on the world stock market in the recent years. The intensified dependency of the Canadian stock market on oil price demonstrated in this paper has significant policy and business implications that are beyond the scope of this paper. However, individual investors in the Canadian stock market may be better off tracking oil price changes in order to discern their returns from holding the market portfolios.

REFERENCES

Amano, R. A. and S. V. Norden (1993) "A Forecasting Equation for the Canada-U.S. Dollar Exchange Rate", *The exchange Rate and the Economy* (Ottawa,: Bank of Canada).

------(1996) "Exchange Rates and Oil Prices", *Review of International Economics,* vol. 6(4) p. 683–694.

----- (1998) "Oil Prices and the Rise and Fall of the U.S. Real Exchange Rate", *Bank of Canada Working Paper Series*.

Arouri, M. and C. Rault (2010) "Oil Prices and Stock Markets: What Drives What in the Gulf Cooperation Council Countries", *CESifo Working Paper Series*, No. 2934.

Bhar, R. and B. Nikolova (2010) "Global Oil Prices, Oil Industry and Equity Returns: Russian Experience", *Scottish Journal of Political Economy*, May 2010, vol. 57(2), p. 169-186.

Bjornland, H. C., (2009) "Oil Price Shocks and Stock Market Booms in an Oil Exporting Country", *Scottish Journal of Political Economy*, May 2009, vol. 56(2), p. 232-254.

Blanchard, O. J. and J. Gali (2007) "The Macroeconomic Effects of Oil Price Shocks: Why are 2000's so Different from the 1970's?" *NBER Working Papers*, no. 13368.

Boyer, M. and F. Didier (2007) "Common and Fundamental Factors in Stock Returns of Canadian Oil and Gas Companies", *Energy Economics*, vol. 29(3), p. 428-453.

Chen, S. S. (2010), "Do Higher Oil Prices Push the Stock Market in to Bear Territory?", *Energy Economics*, vol. 32(2), p. 490-495.

Granger, C.W.J (1969) "Investigating Causal Relations by Econometric Models and Cross-spectral Methods" *Econometrica*, vol. 37(3), p. 424-438.

Gogineni, S. (2008) "The Stock Market Reaction to Oil Price Changes", *University of Oklahoma Working Papers*. March 13, 2008.

Huang, R. D., Masulis, R. W. and H. Stoll (1996) "Energy Shocks and Financial Markets", *Journal of Futures Markets*, vol. 16, p. 1-27.

Issa, R., Lafrance, R and J. Murray (2008) "The Turning Black Tide: Energy Prices and the Canadian Dollar" *Canadian Journal of Economics,* vol. 41(3), p. 737–759.

Jawadi, F., Arouri, M and M. Bellalah (2010) "Nonlinear Linkages between Oil and Stock Markets in Developed and Emerging Countries", *International Journal of Business*, vol. 15(1), p. 19-31.

Hill, R. C., Griffiths, W. E. and G. Lim (2010) Principles of Econometrics, 4th ed., New York: John Wiley and Sons, Inc.
Jones, C. and G. Kaul (1996) "Oil and the Stock Market", *Journal of Finance*, vol. 51(2), p. 463-491.

Jones, D., Leiby, P. and I. Paik (2004) "Oil Price Shocks and the Macro-economy: What has been learned Since 1996", *The Energy Journal*, vol. 25(2), 1-32.

Kilian, L and C.Park (2009) "The Impact of Oil Price Shocks on the U.S. Stock Market", *International Economic Review*, vol. 50(4), p. 1267-1287.

Lescaroux, F. and V. Mignon (2008) "On the Influence of Oil Prices on Economic Activity and other Macroeconomic and Financial Variables", *OPEC Energy Review,* vol. 32(4), p. 343–380.

Miller, J. and R. Ratti (2009) "Crude Oil and Stock Markets: Stability, Instability and Bubbles", *Energy Economics*, vol. 31(4), p. 559-568.

Nandha, M. and R. Faff (2008) "Does Oil Move Equity Prices? A Global View", *Energy Economics*, vol. 30(3), p. 986-997.

Pesaran, H. and Y. Shin (1998) "Generalized Impulse Response Analysis in Linear Multivariate Models", *Economics Letters*, vol. 58(1), p. 17-29.

Park, J. and R. Ratti (2008) "Oil Price Shocks and Stock Markets in the U.S. and 13 European Countries", *Energy Economics*, vol. 30(5), p. 2587-2608.

Sadorsky, P. (1999) "Oil Price Shocks and Stock Market Activity", *Energy Economics*, vol. 21(5), p. 449-469.

Seshaiah, S. and C. Behera (2009) "Stock Prices and its Relation with Crude Oil Prices and Exchange Rates", *Applied Econometrics and International Development*, vol. 9(1), p. 149-156.

Statistics Canada. *Table 377-0003 - Business leading indicators for Canada, monthly*, *CANSIM*. Retrieved November 27, 2011 from the Statistics Canada Web site: http://estat.statcan.gc.ca.ezproxy.tru.ca/cgi-win/cnsmcgi.exe?Lang=E&EST-Fi=EStat/English/CII_1-eng.htm.

Toda, H. Y and T. Yamamoto (1995) "Statistical Inference in Vector Autoregressions with Possibly Integrated Processes" *Journal of Econometrics*, vol. 66(1-2, March) p. 225-250.

Van Norden, S. and R. Amano (1998) "Exchange Rates and Oil Prices", *Review of International Economics*, vol. 6(4), p. 683-694.

BIOGRAPHY

Shahriar Hasan, Ph.D, is an assistant professor of finance in the department of Accounting and Finance in Thompson Rivers University. Real exchange rate stability is his main area of research. Lately, he has been working around the energy prices, gold prices and their influence on real exchange rates in the OECD countries. He has also been active in the area of foreign aid and development.
Contact information: 900 McGill Road, Kamloops, BC V2C 0C8. E-mail: shasan@tru.ca

Mohammad Mahbobi, Ph.D, is a faculty in the Department of Economics at Thompson Rivers University. His main area of expertise is in Intermediate and Advanced Econometrics, Forecasting in Business and Economics, and Applied Statistical Methods in Business and Economics. His recent research focuses are on alternative scenarios in the structure of OPEC, and the possibility of dumping under mixed duopoly setting in international trade. Contact information: 900 McGill Road, Kamloops, BC V2C 0C8. E-mail: mmahbobi@tru.ca