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Oil Price Shocks and the Canadian Stock Market

Ruiqi Tan [1] and Wei Dai [2,*]

[1] Faculty of Economics, University of Cambridge, Cambridge CB3 9DD, UK; rt606@cam.ac.uk
[2] Department of Economics, Philosophy and Political Science, University of British Columbia Okanagan, Kelowna, BC V1V 1V7, Canada
* Correspondence: wei.dai@ubc.ca

Abstract: In this paper, we use monthly data from 1992 to 2022 and a structural VAR model to investigate the effects of oil supply shocks, aggregate demand shocks, and oil-specific demand shocks in the global crude oil market on the Canadian stock market. Our analysis reveals that these shocks affect the S&P/TSX Composite Index and various sector-specific indices in different ways. Specifically, the response of the Canadian market to oil-specific demand shocks diverges notably from the U.S. market, highlighting Canada's unique position as an oil-exporting country. In the long run, oil price shocks account for over 10% of the variation in the composite index and as much as 35% in the Energy sector index.

Keywords: oil price shocks; Canada; stock market; structural VAR; sectorial indices

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1. Introduction

Crude oil is an essential input for industrial modernization and the economic sustainability of nations. The volatility of crude oil prices affects the profitability of enterprises and, consequently, the performance of stock markets, particularly in energy-dependent countries (Lee et al. 2012). Given Canada's status as a major oil exporter, fluctuations in the oil market are likely to have profound implications for its stock market (Basher et al. 2018). Prior studies have predominantly focused on the impact of oil price changes on composite stock indices and differentiated between oil-exporting and oil-importing countries. However, these studies often overlook the sector-specific effects of oil price fluctuations, which can vary significantly across different industries. For example, while rising oil prices might bolster the valuations of oil-centric companies, they could adversely affect industries burdened by increased operational costs.

This study proposes a nuanced exploration of the Canadian stock market by employing a sectorial approach to better understand the differential impacts of oil price shocks. By utilizing a structural vector autoregression (SVAR) model, this research aims to decompose the changes in real oil prices into demand and supply shocks, thereby elucidating their distinct effects on the performance of both composite and sector-specific stock indices in Canada. Using a structural VAR framework with monthly data from 1992 to 2022, we find that oil supply shocks, aggregate demand shocks, and oil-specific demand shocks in the global crude oil market affect the S&P/TSX Composite Index and various sectorial indices in different ways. Specifically, the Canadian market's response to oil-specific demand shocks diverges notably from that of the U.S. market, highlighting Canada's unique position as an oil-exporting economy. In the long run, oil price shocks account for over 10% of the variation in the composite index and up to 35% in the Energy sector index. These varying sector sensitivities underscore the importance of tailored investment strategies and policy measures to mitigate financial volatility.

This paper is organized as follows: Section 2 reviews the relevant literature, Section 3 outlines the empirical methodology, Section 4 describes the data sources, Section 5 discusses the empirical findings, and Section 6 provides a conclusion.

2. Literature Review

The relationship between oil price fluctuations and stock market performance has been a focal point of economic research for decades. One of the seminal studies in this field was conducted by Hamilton (1983), who linked spikes in crude oil prices to all seven U.S. recessions between 1948 and 1980, underscoring a robust negative correlation between oil prices and economic activity. This correlation suggests that increases in oil prices—often tied to labor strikes in key industries—could precipitate broader economic downturns, subsequently impacting stock valuations negatively.

Contrasting viewpoints emerge in the literature concerning the direct impact of oil price changes on stock prices. Chen et al. (1986) contended that oil price variations do not significantly affect stock prices, a position challenged by Jones and Kaul (1996), who documented a negative impact of oil price increases on stock markets across the United States, Canada, Japan, and the United Kingdom. Meanwhile, Huang et al. (2006) found no correlation between oil futures returns and stock market performance during the 1980s, suggesting a more complex interaction or potential market-specific factors at play. Park and Ratti (2008) utilized a vector autoregression (VAR) model to demonstrate the immediate and short-term impacts of oil price innovations on real stock returns in the United States and several European countries. These early studies, however, generally treated oil prices as a singular exogenous variable without distinguishing between the underlying sources of oil price changes.

The methodology used to analyze these effects has also evolved. A significant advancement in this area was achieved by Kilian (2009) and Kilian and Park (2009), who treated crude oil prices as endogenous and differentiated among three distinct sources of oil price changes: supply shock, aggregate demand shock, and oil-specific demand shock. They found that the source of the shock critically determines its economic and stock market impacts, with supply and demand shocks exerting divergent effects. Their work highlights the importance of considering the origins of oil price shocks to avoid biased estimates and obscured relationships due to reverse causality.

Building on Kilian (2009)'s structural vector autoregression (SVAR) framework, subsequent studies (Abhyankar et al. 2013; Apergis and Miller 2009; Basher et al. 2018; Güntner 2014; Kilian and Park 2009; Rahmana and Serletis 2019; Wang et al. 2013) have consistently shown that while supply shocks have minimal impact on stock returns, demand shocks can significantly influence market outcomes. This body of research spans various analyses, from country-level comparisons between oil-exporting and oil-importing nations (Jiang and Yoon 2020) to industry-specific investigations (Hammoudeh and Li 2005; Nandha and Faff 2008; Sadorsky 2001). For example, the U.S. transportation industry typically suffers negative returns in response to rising oil prices, whereas oil and gas-linked industries frequently benefit. Degiannakis et al. (2018) found that the causal effects between oil prices and stock markets vary significantly based on the level of analysis—whether it is conducted using aggregate stock market indices, sectorial indices, or firm-level data—and the status of the stock markets as operating in net oil-importing or net oil-exporting countries.

Despite the extensive research conducted, there remains a notable gap in sector-specific analysis within the Canadian context—a country whose economic health is significantly influenced by its status as a major oil exporter. The Canadian case presents a compelling context for studying the effects of oil price shocks due to Canada's unique status as a major oil-exporting developed economy. According to the Canada Energy Regulator, Canada's crude oil exports reached approximately 4.84 million barrels per day in 2023, marking the highest level on record and underscoring crude oil's substantial role in the Canadian economy. These exports, valued at CAD 124 billion, comprised around 16% of Canada's total export value, highlighting the economy's sensitivity to fluctuations in global oil markets. Such dependence on oil as a primary export renders the Canadian economy and its financial markets particularly vulnerable to price shocks in the global crude oil market. This study's focus on the Canadian S&P/TSX Composite Index and sector-specific indices provides critical insights into how crude oil supply and demand shocks impact different industries within an oil-exporting economy. Moreover, examining Canada's response to these shocks contributes to the broader literature by offering a comparison with oil-importing economies, where market responses to oil price dynamics are likely to diverge significantly. This study seeks to address the above-mentioned gap by employing an SVAR model to dissect the interactions between oil price shocks and the performance of both composite and sector-specific stock indices in Canada. This approach aims to contribute a novel perspective to the existing literature, providing insights into the differentiated impacts of oil price shocks across various sectors of the Canadian economy. As we discuss in the next section, Figure 1 illustrates that no consistent linear relationship exists between oil prices and stock prices at either the composite or sectoral levels, suggesting that conventional linear time series models may not adequately capture the underlying dynamics. The SVAR model, however, is particularly well suited to this analysis, as it enables the structural decomposition of oil price fluctuations into distinct types of shocks: oil supply shocks, aggregate demand shocks, and oil-specific demand shocks. By imposing structural restrictions based on characteristics of the crude oil market, the SVAR model isolates these shocks and allows us to trace their effects on Canadian stock prices. This decomposition is crucial for understanding the heterogeneous responses across sectors, which reflect Canada's unique position as an oil-exporting economy and the varied sensitivity of its industries to oil market disturbances.

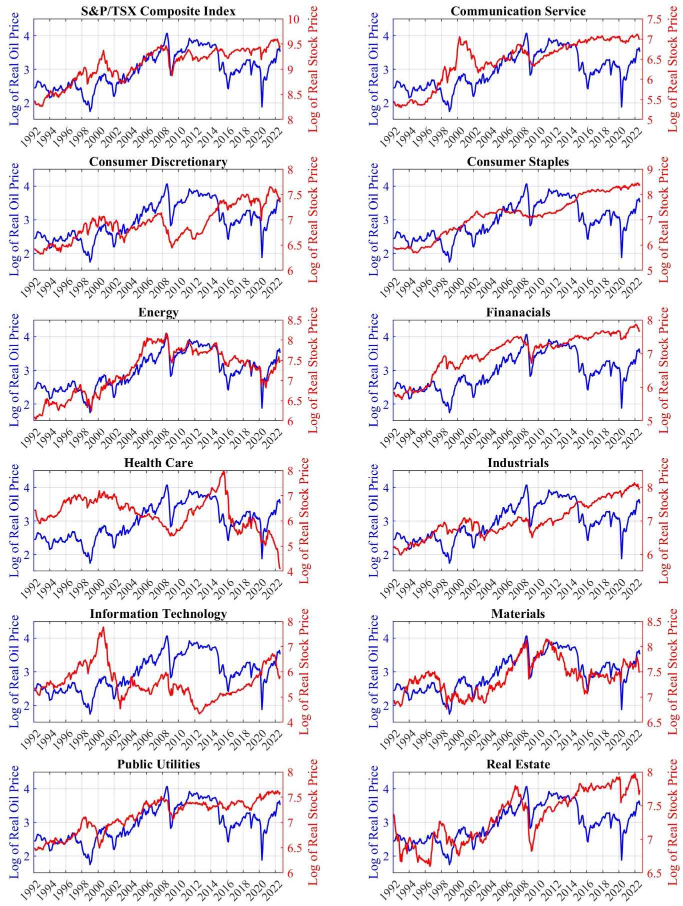

Figure 1. Oil Price and the Canadian stock market indices.

3. Data

This study analyzes monthly data spanning from January 1992 to July 2022, including the percentage change in world crude oil production, $\Delta prod$; an index of global real economic activity, rea, the real price of crude oil, rpo; and real Canadian stock market indices, rps.

World crude oil production changes are calculated from data sourced from the U.S. Energy Information Administration (EIA), including crude oil and lease condensate. We compute these changes using the log differences in monthly world crude oil production data in thousands of barrels per day. Global real economic activity is measured using an index constructed from representative single-voyage freight rates, as developed by Kilian (2009). This index is adjusted by removing fixed effects and deflating it with the U.S. Consumer Price Index (CPI) from the Bureau of Labor Statistics, then linearly detrended to exclude long-run trends that might be influenced by technological advancements or changing demands for sea transport, thus better representing the global business cycle. The real price of crude oil, expressed in logs, is calculated by deflating the U.S. refiner acquisition cost of crude oil with the U.S. CPI, as the U.S. is the biggest importer of Canadian oil, which accounts for about 98% of total production.

Comprehensive data on the Canadian stock market indices, including the S&P/TSX Composite Index and sector-specific indices as defined by the Global Industry Classification Standard (GICS), were collected from Yahoo Finance and Bloomberg. These indices span eleven sectors, including Communication Service, Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Public Utilities, and Real Estate. All indices are deflated by the Canadian CPI and expressed in logs.

Given that global oil production is modeled as percentage changes and real economic activity as percentage deviations from the trend, there appears to be a logical basis for using the first difference of the natural logs for real crude oil and stock prices to maintain consistency within the VAR system. However, Kilian and Zhou (2020) argue that since 1974, there has been no clear trend in the log real price of oil, which supports the conventional approach of expressing real oil prices in log levels. This method ensures that standard frequentist inference about the estimates of impulse responses remains asymptotically valid under weak conditions, even when the underlying processes contain unit roots or are potentially cointegrated with other variables, as noted by Inoue and Kilian (2019). Furthermore, Lütkepohl and Netšunajev (2014) highlight the risks associated with over-differencing, suggesting that it may be more detrimental than including a unit root series at levels. Following these insights and established econometric practices by Kilian (2009), Kilian and Park (2009), and Jadidzadeh and Serletis (2017), we opt to use the log levels of real crude oil and stock prices in our model.[1]

The interplay between real oil prices and stock market indices in Canada, as depicted in Figure 1, shows the complex dynamics across various sectors from January 1992 to July 2022. The S&P/TSX Composite Index typically shows a moderate positive correlation with oil prices. However, the relationship is much more varied across different sectors due to their different dependencies on oil. For example, the Energy sector shows a strong positive correlation with oil prices, mirroring major oil-related economic events such as the oil price crash in 1998 during the Asian financial crisis and the sharp increases during the mid-2000s driven by rising global demand, especially from emerging markets like China.

In contrast, sectors such as technology and health care demonstrate a weaker correlation with oil prices, indicating a degree of insulation from direct oil price impacts due to their lesser reliance on raw material costs and greater reliance on technological advancements and demographic trends. The finance and real estate sectors respond more subtly to oil price fluctuations, influenced by the broader economic implications of oil prices which affect economic growth, inflation, and interest rates, especially evident during the 2008 financial crisis when oil prices plummeted alongside a sharp decline in these sectors. Meanwhile, consumer staples and utilities, known for their stability, exhibit less sensitivity to oil price changes and often perform as defensive stocks, maintaining consistent performance regardless of broader economic conditions.

This variance across sectors underlines the complexity of the relationship between oil prices and stock performance, highlighting the limitations of analyzing these relationships in isolation. The divergent impacts observed necessitate a detailed examination of how oil market shocks, whether supply- or demand-driven, influence each sector uniquely. To address this, the study employs a structural vector autoregression (SVAR) model that identifies the sources of unpredictable changes in real oil prices and investigates their interactions with the Canadian stock market, offering a more accurate assessment of sector-specific dynamics.

4. Methodology

The structural representation of the VAR model in this model is

$$\boldsymbol{A}_0 \boldsymbol{z}_t = \boldsymbol{\alpha} + \sum_{i=1}^{24} \boldsymbol{A}_i z_{t-i} + \boldsymbol{\varepsilon}_t \tag{1}$$

where $\boldsymbol{z}_t = (\Delta prod_t, rea_t, rpo_t, rps_t)'$ and $\boldsymbol{\varepsilon}_t$ denotes the vector of serially and mutually uncorrelated structural innovations. Following Kilian (2009) and Kilian and Park (2009), we use a lag length of two years (24 months). They suggest that a lag length of about 24 months is adequate to capture the dynamics effects in the crude oil market. The reduced-form representation of Equation (1) is

$$\boldsymbol{z}_t = \boldsymbol{\gamma} + \sum_{i=1}^{24} \boldsymbol{B}_i z_{t-i} + \boldsymbol{e}_t \tag{2}$$

where $\boldsymbol{B}_i = \boldsymbol{A}_0^{-1}\boldsymbol{A}_i$ and $\boldsymbol{e}_t = \boldsymbol{A}_0^{-1}\boldsymbol{\varepsilon}_t$. The structural shocks $\boldsymbol{\varepsilon}_t$ and the structural parameters can be recovered by using the reduced-form estimation after imposing exclusion restrictions on $\boldsymbol{A}_0^{-1}$.

As suggested by Kilian and Park (2009), $\boldsymbol{A}_0^{-1}$ has a block-recursive structure as follows

$$\boldsymbol{A}_0^{-1} = \begin{pmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix} \tag{3}$$

so the reduced-form innovations $\boldsymbol{e}_t$ can be decomposed as

$$\boldsymbol{e}_t \equiv \begin{pmatrix} e_t^{\Delta prod} \\ e_t^{rea} \\ e_t^{rpo} \\ e_t^{rps} \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix} \begin{pmatrix} \varepsilon_t^{\text{oil supply shock}} \\ \varepsilon_t^{\text{aggregate demand shock}} \\ \varepsilon_t^{\text{oil-specific demand shock}} \\ \varepsilon_t^{\text{other shocks to stock prices}} \end{pmatrix}. \tag{4}$$

This study adopts the framework proposed by Kilian (2009) to analyze the dynamics of the real price of crude oil in the global market through three distinct structural shocks: (1) *oil supply shocks*, which are unforeseen changes in global oil production; (2) *aggregate demand shocks*, influenced by the business cycle and overall levels of global economic activity, including demand for industrial commodities such as crude oil; and (3) *oil-specific demand shocks*, often driven by precautionary motives due to uncertainties about future oil supply. These shocks collectively explain the variability in the real price of crude oil, addressing fluctuations that are not solely attributable to traditional supply and demand factors. Alquist and Kilian (2010) note that oil-specific demand shocks, in particular, arise from concerns over potential oil supply deficits, leading to immediate increases in the real spot price of crude oil.

The last row in Equation (4) captures shocks to the Canadian stock market that are independent of crude oil supply or demand fluctuations. This part of the model isolates the influence of non-oil-related shocks on stock prices, reflecting broader market variabilities. The focus here is on understanding how oil market shocks specifically affect stock prices, without delving into the myriad other factors that might drive market fluctuations outside the scope of this study. This approach ensures a clear analysis of the direct impacts of oil-related economic disturbances on the financial markets.

The exclusion restrictions on A_0^{-1} in the first three rows support the model's assumption that crude oil supply does not instantaneously respond to changes in demand. This is consistent with a market characterized by a vertical short-run supply curve and a downward-sloping demand curve. Specifically, the zero restrictions in the first row ($a_{12} = a_{13} = a_{14} = 0$) imply that neither aggregate demand shocks for industrial commodities nor precautionary demand shocks for crude oil, nor other stock market shocks, affect the supply of crude oil contemporaneously, reflecting the real-world logistical and technical constraints that delay adjustments in oil production. The conditions in the second row ($a_{23} = a_{24} = 0$) ensure that shocks to crude oil production and broader economic activities are immediately interconnected. The third row's restriction ($a_{34} = 0$) dictates that the real price of crude oil is reactive to supply shocks and shifts in demand with a temporal lag, thus acknowledging the time-sensitive nature of market responses.

Lastly, the fourth row of A_0^{-1}, with all elements nonzero, treats world crude oil production, global economic activity, and the real price of crude oil as predetermined factors with respect to stock prices. This configuration suggests that changes in these variables directly and instantaneously impact stock markets, indicating a high sensitivity of stock prices to shifts in key economic indicators related to the Energy sector and broader economic conditions.

5. Empirical Results

The reduced-form VAR model (2) was estimated using the least-squares method, enabling us to recover the structural VAR representation of the model. We computed impulse response functions to one-standard-error shocks, utilizing the recursive-design wild bootstrap with 2000 replications as proposed by Gonçalves and Kilian (2002).[2] The primary objective of this study is to examine the effects of structural shocks in the crude oil market on Canadian stock indices. Figures 2–13 show the responses of the composite and sectorial stock indices to each of the three structural shocks in the crude oil market—the oil supply shock, the aggregate demand shock, and the oil-specific demand shock. Point estimates are indicated by solid lines and one-standard-error and two-standard-error bands are indicated by dashed and dotted lines, respectively.

The impulse responses, illustrated in Figure 2, depict the timing and magnitude of the responses of the real stock price of the S&P/TSX Composite Index to one-time structural shocks in the crude oil market. We normalized the oil supply shock to represent a negative one-standard deviation shock (shifting the short-run supply curve leftward) and normalized the aggregate demand and oil-specific demand shocks to represent positive shocks (shifting the demand curve rightward), so that all three shocks would increase the real price of crude oil. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines, respectively.

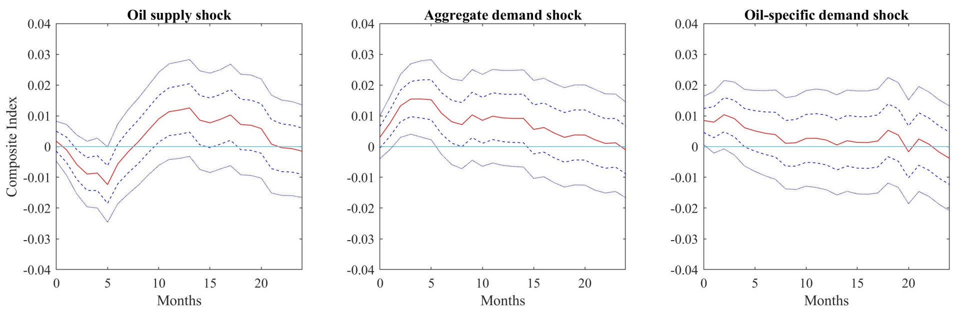

Figure 2. Responses of the S&P/TSX Composite Index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

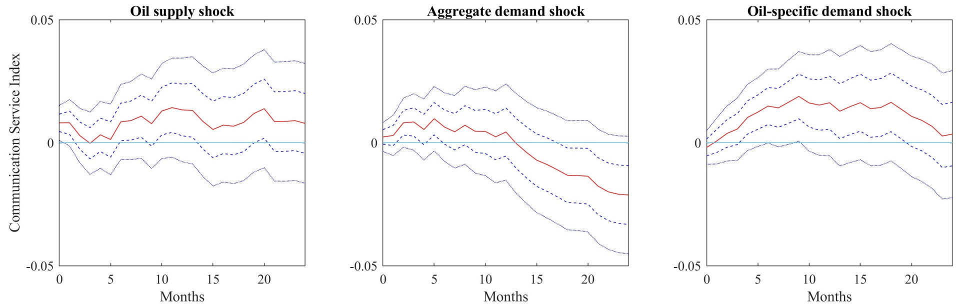

Figure 3. Responses of the Communication Service index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

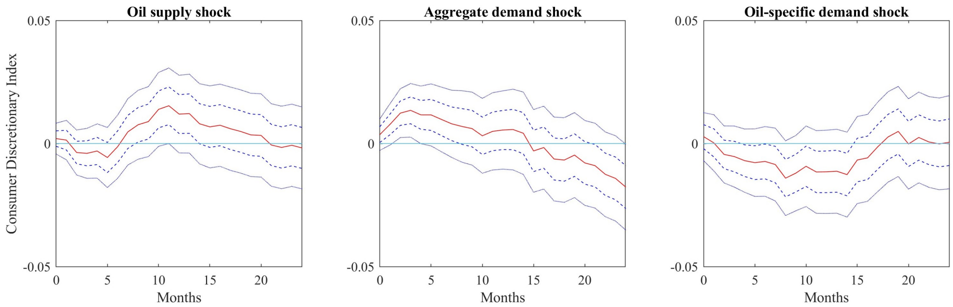

Figure 4. Responses of the Consumer Discretionary index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

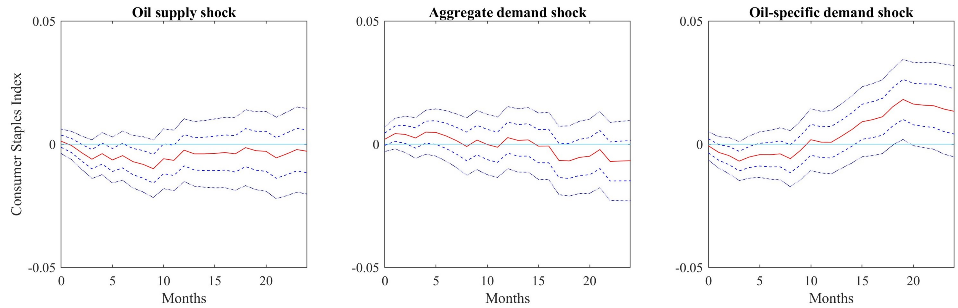

Figure 5. Responses of the Consumer Staples index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

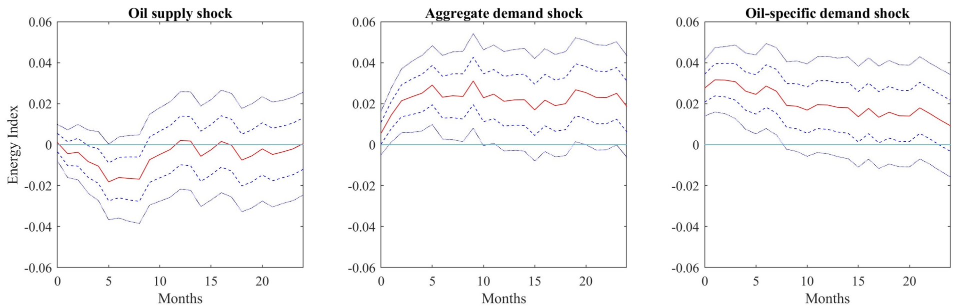

Figure 6. Responses of the Energy index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

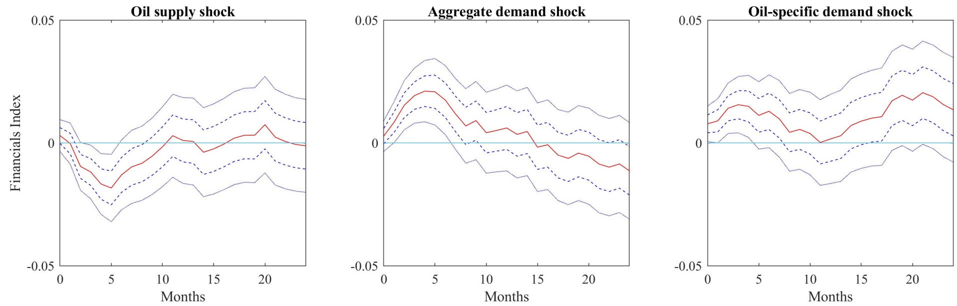

Figure 7. Responses of the Financials index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

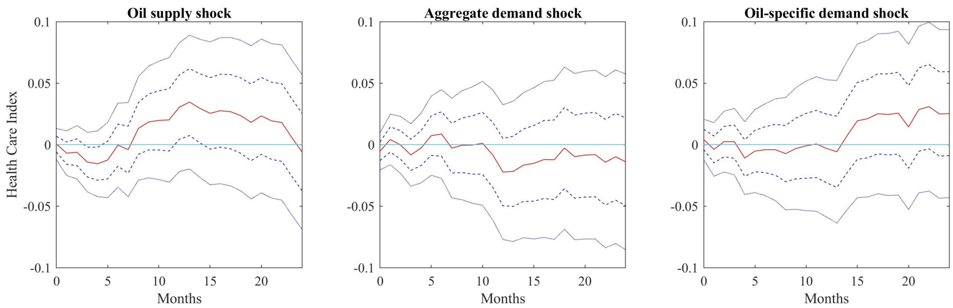

Figure 8. Responses of the Health Care index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

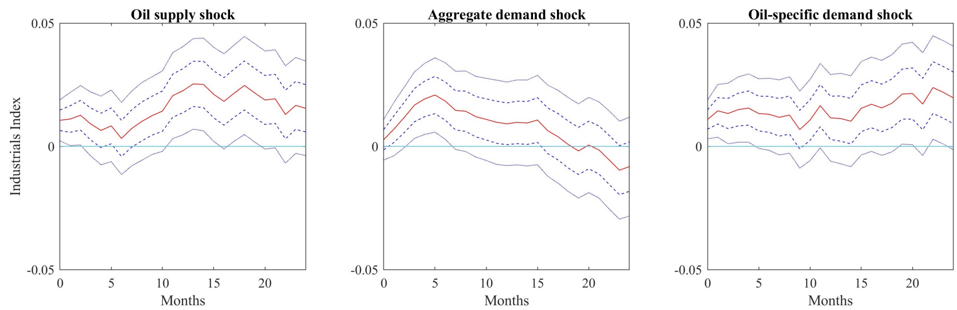

Figure 9. Responses of the Industrials index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

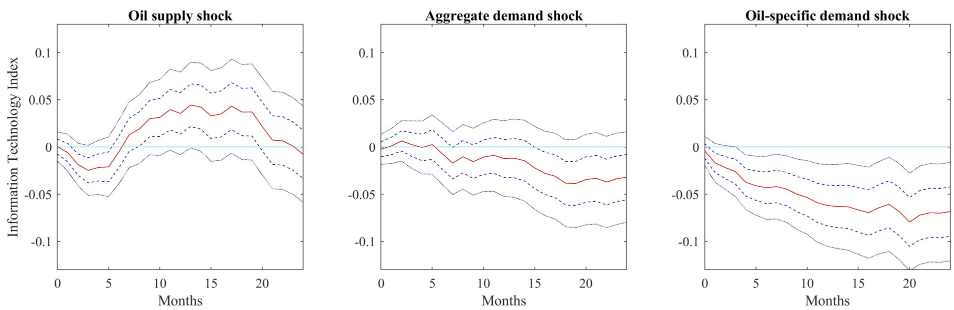

Figure 10. Responses of the Information Technology index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

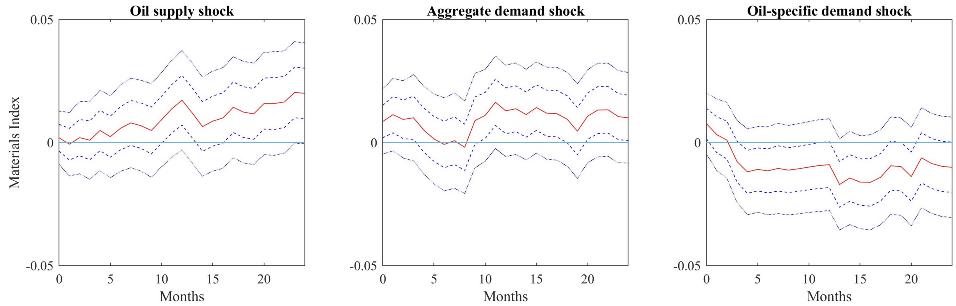

Figure 11. Responses of the Materials index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

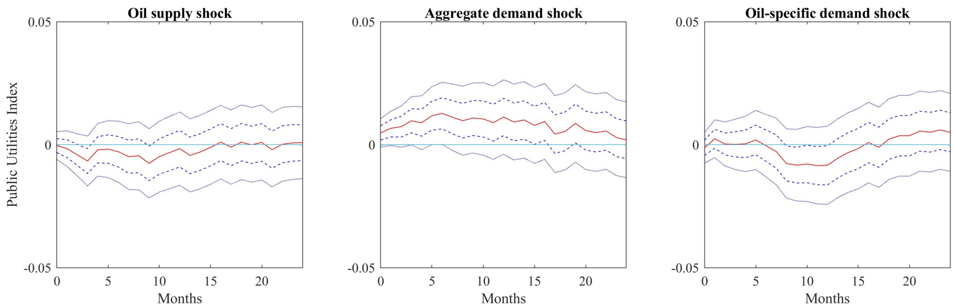

Figure 12. Responses of the Public Utilities index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

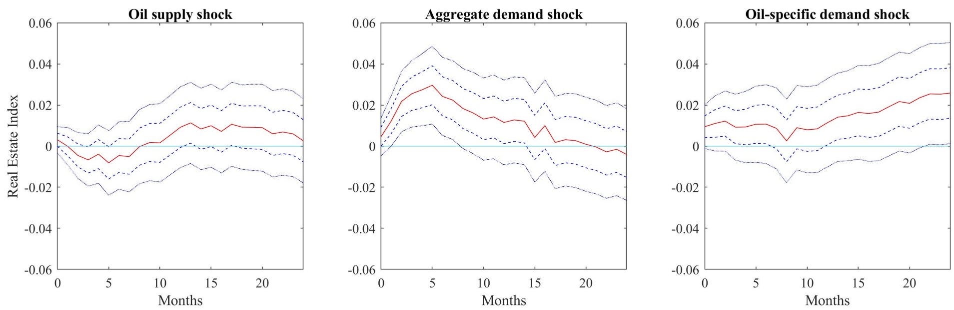

Figure 13. Responses of the Real Estate index to three structural shocks. Point estimates are indicated by solid red lines, with one-standard-error and two-standard-error bands represented by dashed and dotted lines.

Although all three shocks result in an increase in the real price of crude oil, the responses of the Composite Index vary significantly based on the underlying cause of the oil price increase. An unexpected decline in the supply of crude oil has a negative effect on the Composite Index for the first five months, reflecting rapid market adjustments to potential supply shortages. This negative effect gradually diminishes after eight months, leading to a sustained positive effect lasting about one year. An aggregate demand shock generates a sustained positive effect on the Composite Index, though this effect gradually tapers off and becomes insignificant after fifteen months. An unexpected increase in the precautionary demand for oil causes an immediate increase in the Composite Index, but the effect disappears after about eight months. Contrasting with Kilian and Park (2009), who found a negative effect of oil-specific demand shocks on US stock performance, we observe a positive effect in Canada. This finding aligns with Güntner (2014), who highlighted the difference in stock market performance between oil-importing and oil-exporting countries, as Canada is an oil exporter while the U.S. is an importer.

The forecast error variance decomposition in Table 1 quantifies the effects of the structural shocks on real stock prices. For each index, five rows show the percentage contribution of oil supply shock, aggregate demand shock, oil-specific demand shock, and other shocks to the variation in the index for 1, 2, 3, and 12 months, and the long-run contribution (∞), respectively. For the Composite Index, although the short-run effects of the three structural shocks in the crude oil market are negligible, the explanatory power increases over the forecast horizon. In the long run, the oil supply shock, aggregate demand shock, and oil-specific demand shock together account for over 10% of the variability in the Composite Index. This suggests that the Canadian stock market is significantly influenced by structural shocks in the global crude oil market. The aggregate demand shock is the primary contributor, accounting for 4.46% of the long-term variation in the Composite Index, followed by oil-specific demand shocks (2.89%) and oil supply shocks (2.72%).

Table 1. Percent contribution of supply and demand shocks in the crude oil market to the overall variability in the real stock price.

		Shock			
Stock	**Horizon**	**Oil Supply**	**Aggregate Demand**	**Oil-Specific Demand**	**Other**
Composite Index	1	0.16	0.51	3.85	95.48
	2	0.10	1.73	3.35	94.81
	3	0.61	3.88	3.84	91.67
	12	2.54	5.99	1.80	89.67
	∞	2.72	4.46	2.89	89.93
Communication Service	1	2.81	0.24	0.16	96.79
	2	2.43	0.26	0.08	97.23
	3	1.61	0.93	0.22	97.25
	12	2.21	1.13	4.48	91.82
	∞	4.17	5.72	12.79	77.31
Consumer Discretionary	1	0.19	0.64	0.38	98.80
	2	0.13	1.67	0.18	98.02
	3	0.29	3.47	0.42	95.82
	12	2.65	3.81	3.39	90.15
	∞	5.80	15.43	26.15	52.61
Consumer Staples	1	0.10	0.30	0.04	99.53
	2	0.06	0.87	0.46	98.60
	3	0.36	0.99	0.87	97.78
	12	2.55	0.65	1.23	95.58
	∞	5.28	4.34	41.84	48.54
Energy	1	0.03	0.78	19.08	80.12
	2	0.25	2.86	21.02	75.88
	3	0.27	5.45	21.49	72.80
	12	2.71	12.19	14.79	70.31
	∞	6.81	19.81	6.56	66.81
Finanacials	1	0.47	0.41	3.18	95.93
	2	0.22	1.90	3.41	94.48
	3	1.54	4.81	5.20	88.46
	12	4.13	7.29	4.20	84.38
	∞	2.02	4.76	17.67	75.54
Health Care	1	0.00	0.28	0.17	99.55
	2	0.20	0.19	0.14	99.47
	3	0.24	0.13	0.11	99.53
	12	0.80	0.13	0.12	98.95
	∞	3.08	2.54	2.43	91.95

Table 1. *Cont.*

Stock	Horizon	Shock			
		Oil Supply	Aggregate Demand	Oil-Specific Demand	Other
Industrials	1	4.42	0.30	4.69	90.59
	2	4.08	0.99	5.67	89.26
	3	4.48	2.22	5.73	87.57
	12	5.12	7.97	6.81	80.10
	∞	16.12	2.87	41.87	39.14
Information Technology	1	0.00	0.05	0.14	99.82
	2	0.14	0.03	1.19	98.65
	3	1.01	0.13	2.05	96.82
	12	3.52	0.57	11.34	84.57
	∞	22.28	12.44	20.93	44.34
Materials	1	0.07	1.34	1.09	97.50
	2	0.04	1.99	0.69	97.28
	3	0.06	2.04	0.50	97.41
	12	1.27	2.37	2.85	93.52
	∞	24.79	21.51	10.28	43.38
Public Utilities	1	0.01	1.58	0.11	98.30
	2	0.10	2.31	0.25	97.34
	3	0.43	2.59	0.16	96.82
	12	1.00	5.16	1.30	92.54
	∞	0.75	5.46	1.29	92.50
Real Estate	1	0.43	0.95	3.98	94.65
	2	0.18	3.20	3.89	92.73
	3	0.34	7.22	4.00	88.45
	12	0.61	12.67	2.68	84.05
	∞	4.53	6.50	31.39	57.58

The Energy sector (Figure 6) exhibits the most significant reaction to oil market shocks, mirroring the general market trend but with heightened sensitivity. As shown in Figure 6, an unexpected decline in the supply of crude oil negatively affects the real stock price, with this effect diminishing to nearly zero after one year, similar to the impact on the Composite Index. However, the two demand shocks—unexpected increases in global demand and precautionary demand—cause significant and persistent increases in the real stock price in the Energy sector. In the long run, the combined effect of oil supply, aggregate demand, and oil-specific demand shocks accounts for about 35% of the variability in the real stock price of the Energy sector.

Other sectors display varied responses based on their economic characteristics and dependence on crude oil. Generally, the effect is positive for the Communication Services (Figure 3), Consumer Discretionary (Figure 4), Health Care (Figure 8), Industrials (Figure 9), Information Technology (Figure 10), and Materials (Figure 11) sectors. Resource-intensive sectors like Materials (Figure 11) and Industrials (Figure 9) show a sustained positive response to oil supply shocks, aligning with their reliance on global commodity prices and trade flows. Public Utilities (Figure 12), Real Estate (Figure 13), and Consumer Staples (Figure 5) sectors exhibit stability and minimal fluctuations in response to oil shocks, reinforcing their role as defensive sectors during economic uncertainties. For most sectors, the aggregate demand shock generally produces a positive effect, except in the Information Technology sector (Figure 10), with differences in magnitude and timing. Finally, an unexpected oil-specific demand shock has significant and positive effects on the Communication Services (Figure 3), Industrials (Figure 9), and Real Estate (Figure 13) sectors, while the effects on other sectors are either negative or insignificant. The Information Technology (Figure 10) and Materials (Figure 11) sector indices experience significant and sustained declines following the shock.

In the long run, the Materials and Information Technology sectors are more influenced by supply shocks, accounting for over 20% of their variability. The Consumer Discretionary and Materials sectors are more influenced by aggregate demand shocks, at 15% and 22%, respectively. The Consumer Discretionary, Consumer Staples, Industrials, Information Technology, and Real Estate sectors are more influenced by oil-specific demand shocks, with contributions exceeding 20% and reaching as high as 42%. Overall, oil market shocks account for over 50% of the variability in the Consumer Staples, Industrials, Information Technology, and Materials sectors.

6. Conclusions

This study employs a structural vector autoregression (SVAR) model to explore the impact of three types of shocks in the crude oil market on the Canadian stock market. By decomposing real oil price changes into oil supply shocks, aggregate demand shocks, and oil-specific demand shocks, we discern their distinct effects on both the S&P/TSX Composite Index and various sector-specific indices.

The analysis reveals that despite all shocks being normalized to increase the real price of crude oil, they manifest differently across the stock market. Oil supply shocks initially exert a negative influence on the Composite Index, which transitions to a positive effect over time. In contrast, aggregate demand shocks consistently foster a sustained positive impact on the index. Oil-specific demand shocks, while initially boosting the index, exhibit a transient influence that diminishes after eight months. This pattern of response in the Canadian market, particularly the positive initial impact of oil-specific demand shocks, stands in stark contrast to the negative effects observed in the U.S. market, underscoring the differential economic dynamics between an oil-exporting nation like Canada and oil-importing countries.

The Energy sector's pronounced sensitivity to oil market shocks highlights its vulnerability, with these shocks accounting for a significant proportion of the sector's stock price variability. Conversely, other sectors display varied sensitivities: resource-intensive sectors such as Materials and Industrials benefit from supply shocks, reflecting their reliance on global commodity flows and pricing dynamics. Defensive sectors, including Consumer Staples and Public Utilities, exhibit robustness, showing minimal sensitivity to these shocks. Interestingly, the Information Technology sector experiences notable declines following oil-specific demand shocks, indicating its unique exposure to these market dynamics.

This study makes several contributions to the literature on oil price shocks and stock market dynamics, particularly through its sector-specific analysis within the context of an oil-exporting economy. Whereas previous research has primarily focused on aggregate stock indices or examined oil-importing economies, our analysis underscores the varied sectorial responses within Canada's market, reflecting the country's distinctive sensitivity to global oil market fluctuations. By employing the SVAR model to disentangle oil price shocks into supply, aggregate demand, and oil-specific demand components, we uncover substantial variation in sectorial responses, yielding insights of direct relevance to policymakers and investors seeking to manage exposure to oil price volatility. This study broadens the field's understanding of the complex interactions between global commodity markets and domestic financial markets. The empirical framework established here can also serve as a foundation for future research examining the linkages between financial markets and other commodity markets.

The findings of this study emphasize the critical importance of conducting sector-specific analyses to fully understand the implications of oil price shocks. The differential impacts of structural shocks in the crude oil market on various segments of the Canadian stock market provide deep insights that are vital for investors and policymakers. This study enriches the existing literature by detailing the complex interactions between oil price fluctuations and stock market performance, offering insightful perspectives that can inform economic strategies and investment decisions in the context of global energy markets.

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Conflicts of Interest: The authors declare no conflicts of interest.

Notes

1 Kilian and Murphy (2014) argue that using a level specification has the advantage that impulse response estimates remain asymptotically valid, not only under the assumption of stationarity but also in cases of departure from that assumption. By contrast, incorrectly differencing the real price of oil would render these estimates inconsistent. A potential drawback of not imposing unit roots is a loss in asymptotic efficiency, reflected in wider error bands. It is important to note, however, that historical decompositions for the real price of oil assume covariance stationarity, which would not hold in the presence of unit roots.

2 For detailed guidance on estimating the specified SVAR model, readers are encouraged to consult Kilian (2009) and Kilian and Park (2009), along with their associated online resources.

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