Journal of
Risk and Financial Management

MDPI

Article

The Influence of Oil Prices on Equity Returns of Canadian Energy Firms

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Abstract: Using monthly data from January 2000 to August 2018, this paper examines how the Canadian oil and gas industry and individual firms' equity prices react to oil price fluctuations, which are measured by the traditional West Texas Intermediate (WTI) benchmark and the Canada-specific Western Canadian Select (WCS) benchmark. The findings provide support for the view that oil price movements are an important factor in explaining the equity returns of the overall industry and for many individual oil and gas firms in Canada. Both WTI and WCS measures provide statistically significant evidence, but the results support that WTI may still be the more relevant measure for Canadian-based firms. We also find that the spread between WTI and WCS has a minimal impact on the firms' equity returns. Additional tests for asymmetric impacts of oil price movements on Canadian oil and gas equity returns have provided little evidence, whereas time-varying impacts are found for a handful of firms. The empirical findings predicated on the holistic view of the impacts of oil price fluctuations on equity market returns will enhance investor confidence and strengthen the Canadian economy.

Keywords: oil; equity returns; Canada

JEL Classification: E44; G12; L71; Q40

Citation: Batabyal, Sourav, and Robert Killins. 2021. The Influence of Oil Prices on Equity Returns of Canadian Energy Firms. *Journal of Risk and Financial Management* 14: 226. https://doi.org/10.3390/jrfm14050226

Academic Editor: Michael Polemis

Received: 7 April 2021
Accepted: 9 May 2021
Published: 18 May 2021

1. Introduction

The impact that energy prices have on the economy has received widespread attention from academics and practitioners (e.g., Hamilton 1983; Hamilton 2003; Lee et al. 2017). Academic researchers have also focused on how energy prices impact the equity market. For example, Jones and Kaul (1996), Ramos and Veiga (2011), and Diaz et al. (2016) take a global perspective, Kilian and Park (2009) and Broadstock and Filis (2014) focus on the U.S. market, Bagirov and Mateus (2019) on the European markets, and Basher and Sadorsky (2006) and Gupta (2016) on the emerging markets. Overall, the majority of studies focusing on the impact energy prices have on the aggregate equity indices have found a negative relationship. This general finding can vary on a number of different factors. One of them is the geographic factor, specifically on whether the country is an oil-importing or oil-exporting country (Park and Ratti 2008; Filis et al. 2011). Secondly, the nature of the underlying oil shock (demand or supply) can influence the reaction that equity markets and firms have on oil fluctuations (Kilian and Park 2009). Finally, additional research has focused on individual sectors of the equity market (e.g., Elyasiani et al. 2011; Lee et al. 2012; Waheed et al. 2018). Empirical findings for industry sectors have suggested that individual industry reactions to oil shocks can vary. Generally, oil-dependent industries have a negative relationship to oil price shocks, whereas oil-producing industries can have positive reactions (Phan et al. 2015).[1]

In recent times, the oil and gas industry has received considerable recognition regarding its reaction to oil shocks. The general findings suggest that oil shocks are positively related to the energy firm's profits (e.g., Dayanandan and Donker 2011) and equity returns (e.g., Nandha and Faff 2008; Mohanty and Nandha 2011; Gupta 2016). There can be varying degrees of impact depending upon the geographic region of the sample. For example, Hall and Kenjegaliev (2017) find that while oil price changes affect stock prices of American and European oil companies as expected, the most atypical behavior is observed for equities of Chinese and Russian companies.

Canada has been one country that has attracted significant consideration from academics in regard to the impact oil has on the economy (e.g., Bashar et al. 2013). Specific assets such as housing (Killins et al. (2017)) and equity (e.g., Lee et al. 2012) have also been explored and have found that oil is a significant factor in explaining the variation of prices and returns. More focused studies on the oil and gas industry in Canada have also provided the literature with important contributions. For example, Sadorsky (2001) find that an increase in the market for oil price increases the return to Canadian oil and gas stock prices and that the oil and gas sector is less risky than the market and its moves are procyclical. Additionally, Boyer and Filion (2007) find that the return of Canadian energy stock is positively associated with the Canadian stock market return and with appreciations of crude oil and natural gas prices. Boyer and Filion (2007) extend the knowledge of how Canadian oil and gas firms react to changing energy prices by applying a panel data regression on two subsets of energy firms, producers, and integrated firms. They find that the producers are more impacted by oil price fluctuations than the integrated firms.[2]

Recently, renewed scrutiny on the oil and gas sector in Canada has focused on the impacts the Canadian oil sands (both positive and negative) bring to the Canadian economy.[3] This 'heavier' crude oil is often benchmarked by the measure called Western Canadian Select (WCS). Recent developments surrounding pipeline approvals and transportation of Canadian oil have developed uncertainty among international investors in regard to the long-term viability of the western Canadian energy market.[4] This has caused WCS to trade at a steep discount to the North American benchmark, WTI. Figure 1 provides a visual of the price of both WTI and WCS. The discounted price of WCS has prompted federal and provincial governments in Canada to take action to help bolster the energy market in western Canada.[5] To the best of our knowledge, the previous literature that has focused on the impact oil shocks have on equity markets in Canada has used only the WTI measure and not the WCS measure. Thus, this research will add to the literature focused on the impact energy prices have on the Canadian oil and gas sector by incorporating the traditional measure of oil in North America, WTI, Canada-specific measure, WCS, and the spread between WTI and WCS. Additionally, this research follows the methodological approach of Baur and Todorova (2018) and empirically tests the impacts oil fluctuations have on individual firms but also on a wide industry basis. Finally, this research tests for asymmetric impacts of energy shocks on Canadian oil and gas equity returns and for time-varying effects.

Using data spanning from January 2000 to August 2018, this research implements individual Fama and French (1993) regressions on a Canadian energy index and the major Canadian energy firms. The findings indicate that, on an industry basis, fluctuations in both WTI and WCS have statistically significant positive relationships with the Canadian energy sector equity returns. When incorporating the spread in WTI and WCS (WTI-WCS), this spread also indicates a positive and significant (at 10% level) relationship with equity returns in the Canadian energy sector. On a firm-by-firm basis, in the WTI regression, seven out of the fourteen firms show significant positive relationships. The WCS regressions provide four firms with significant positive coefficients and in the WTI-WCS regressions, only one firm (Suncor Energy) has a statistically significant coefficient. An empirical test of asymmetry indicates little evidence of asymmetric impacts of oil on the Canadian energy sector equity returns. Finally, the impact oil has on the overall energy sector equity returns

in Canada has not been altered significantly since the global financial crisis, but individual firms tend to have time-varying results.

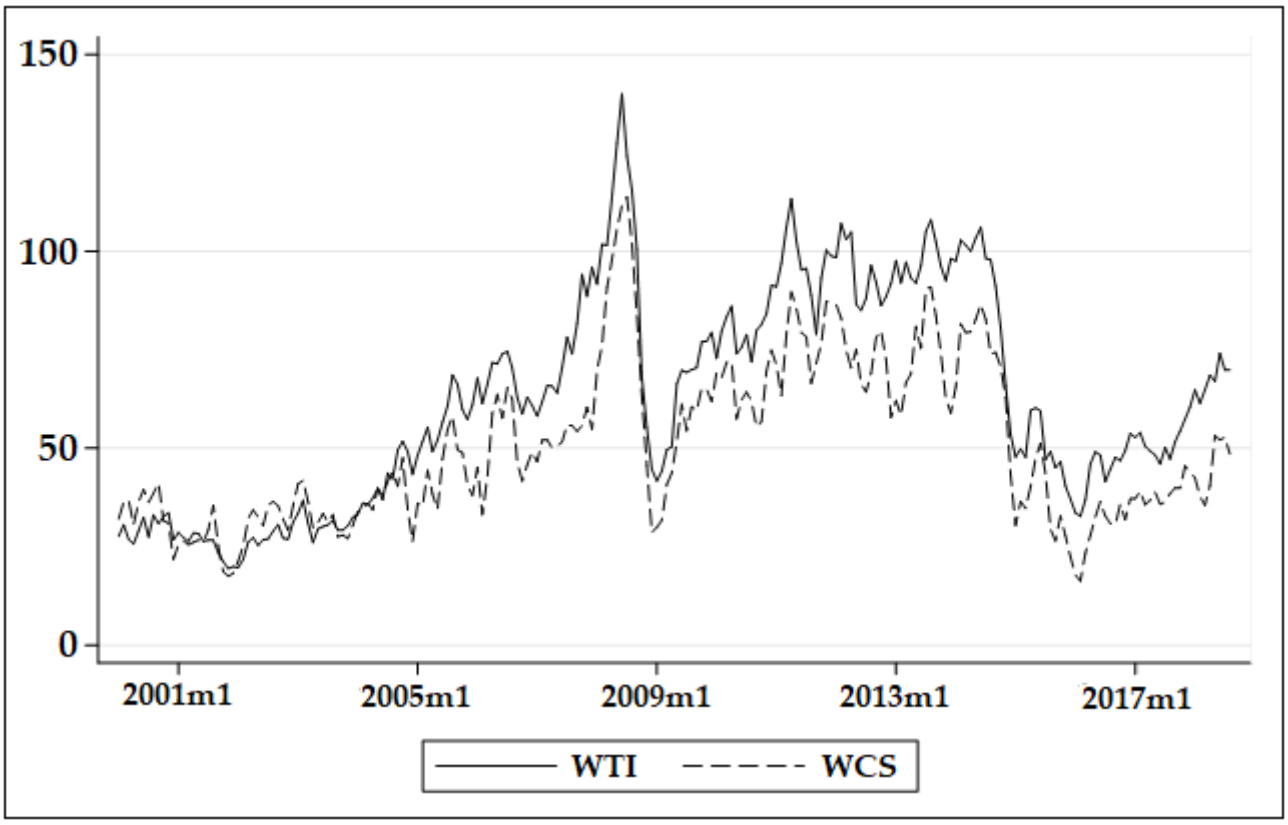

Figure 1. West Texas Intermediate (WTI) and Western Canadian Select (WCS) prices.

This research and its findings add to the existing literature in several ways. First, this research contributes to the overall energy literature by using a unique Canadian oil benchmark (WCS) that has grown in importance in the North American energy markets over the past two decades. Secondly, the general perception amongst Canadian energy media contributors is that the spread between WTI and WCS is negatively impacting the Canadian energy firms' equity returns. The empirical evidence in the study does not support that view. This is not to say that the spread between WTI and WCS does not have general economic impacts or that this spread does not impact other accounting-based measures or firm operations, but these findings call for further research on how the spread between WTI and WCS are filtered into the general Canadian economy and equity markets. Finally, using industry and firm-specific data, we are able to provide substantial evidence of how energy shocks can be unique to each individual firm, which can be lost when using portfolio or simple industry returns.

The remainder of this paper is structured as follows. Section 2 provides an understanding of the data and the methodological approach. Section 3 discusses the results. Finally, Section 4 provides the conclusion and implications.

2. Data and Methodology

This paper estimates the oil price sensitivity of Canadian oil and gas firms at the industry level as well as at the firm level. This approach is followed for several reasons. First, following the spirit of Fama and French (1997), we argue that all oil and gas industries across countries are not homogeneous. Second, the oil and gas industry plays a significant role in the Canadian economy. For example, Canada's energy sector accounts for almost 11% of the nominal Gross Domestic Product (GDP) and approximately 17% of the TSX

Composite index.[6] Third, the previous literature on the Canadian oil and gas sector does not explicitly analyze the relationship between changes in oil prices and the equity returns at the firm level. The analysis at the firm level is crucial as the aggregate or industry-level analysis may not reveal an individual firm's risk exposure to changes in oil prices.

2.1. Data

This study uses the iShares S&P/TSX Capped Energy Index ETF to capture the industry level equity returns of the oil and gas sector in Canada.[7] For the firm-level data, this study uses the fourteen oil and gas firms that are included in the primary equity index in Canada (TSX60).[8] Appendix A provides a list of the industry ETF and the fourteen energy firms used in this study. Monthly price data for these securities are obtained via the Datastream database from January 2000 to August 2018.

With regard to oil prices, our primary measure is the monthly returns on the West Texas Intermediate (WTI), expressed in USD/barrel. This paper uses the price of WTI for two reasons. First, prices of the WTI are the most widely used indices in North America. Second, when firms use hedging instruments, the vast majority of firms use futures, forward, and other over-the-counter derivatives based on the WTI. The monthly price data for WTI is obtained via the Federal Reserve Economic Database (https://fred.stlouisfed.org accessed on 9 January 2020). As previously noted, to the best of our knowledge, studies that have examined the impact oil prices have on the equity or oil and gas sector in Canada have yet to use the Canadian crude oil blend, Western Canadian Select (WCS). WCS has been of importance to the energy markets in Canada since the early 2000s, when EnCana (Cenovus), Canadian Natural Resources Limited, Petro-Canada (Suncor), and Talisman Energy Inc. joined together to create and market the new blend at the Husky Energy terminal in Hardisty, Alberta, Canada. WCS monthly price data are obtained via the Alberta Government website (https://economicdashboard.alberta.ca/OilPrice accessed on 9 January 2020).[9] Finally, the Fama–French factors specifically for Canada are obtained via the AQR website.[10] Observations are winsorized at the 1 and 99 percentiles to eliminate outliers and to avoid spurious inferences due to extreme values. Additionally, the oil variables used in the empirical estimations are tested for unit root using the Augmented Dickey–Fuller (ADF) and Philips Perron (PP) tests and are found to be stationary.[11]

Summary statistics of the variables are provided in Table 1. The average monthly return for the Canadian oil and gas industry during the sample period is approximately 0.0026 percent. In regards to the oil measures, WCS tends to have a higher monthly return at 0.0145 compared to WTI's monthly return of 0.0087. WCS also tend to be more volatile with a 0.1473 standard deviation versus WTI's standard deviation of 0.0912.

Table 1. Summary statistics of monthly log returns, Fama–French and oil variables.

Index	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
iShares S&P/TSX Energy ETF	209	0.0026	0.0630	−0.2296	0.1646	−0.5047	4.0470
Firm							
Imperial Oil Ltd.	223	0.0066	0.0616	−0.2612	0.1617	−0.1866	4.3774
Enbridge Inc.	223	0.0022	0.0786	−0.6417	0.1697	−4.9143	41.0854
TC Energy Corp.	223	0.0070	0.0443	−0.1671	0.2266	0.3712	6.0626
Encana Corp.	223	−0.0012	0.1087	−0.6160	0.3029	−1.4874	9.9876
Husky Energy	223	0.0021	0.0869	−0.7308	0.1922	−2.7026	24.4205
Fortis Inc.	223	0.0080	0.0441	−0.1017	0.1367	0.1526	3.0272
Canadian Natural Resources	223	0.0013	0.1165	−0.7420	0.2472	−2.5403	16.9563
Suncor Energy	223	−0.0006	0.1093	−0.7083	0.2419	−2.8018	17.3664
Emera Inc.	223	0.0050	0.0394	−0.1070	0.1217	−0.1432	3.2658
Inter Pipeline Inc.	223	0.0076	0.0507	−0.1720	0.1263	−0.3885	3.3662
ARC Resources	223	0.0019	0.0694	−0.2683	0.1535	−0.5137	3.9763
Pembina Pipeline Corp.	223	0.0087	0.0463	−0.1825	0.1128	−0.7567	4.5170
Crescent Point Energy Corp.	200	0.0079	0.0948	−0.2576	0.4321	0.3009	4.8090
Cenovus Energy	104	−0.0075	0.0754	−0.2315	0.2472	0.0825	4.3676

Table 1. *Cont.*

Index	Obs	Mean	Std. Dev.	Min	Max	Skewness	Kurtosis
Fama—French and Oil Variables:							
MRK	224	0.0061	0.0563	0.2802	0.2039	−0.6516	5.8591
SMB	224	0.0008	0.0299	−0.0972	0.1458	0.5554	6.2599
HML	224	0.0070	0.0413	−0.1849	0.2194	0.2536	8.0827
ΔWTI	223	0.0087	0.0912	−0.3237	0.3170	−0.1552	3.7197
ΔWCS	223	0.0145	0.1473	−0.3680	0.4393	0.0218	3.2558

Note: Monthly log returns are from January 2000 to August 2018. The iShares S&P/TSX Energy ETF data are available from March 2001, Crescent Point Energy from October 2002 and Cenovus Energy data from November 2009. MRK is the excess market return, small minus big (SMB) is the size factor, and high minus low (HML) is the value factor. MRK, SMB, and HML are all obtained via the AQR website for Canada. ΔWTI is the monthly return for West Texas Intermediate. ΔWCS is the monthly return of Western Canadian Select.

2.2. Regression Models

This research follows the regression approach of Baur and Todorova (2018) and estimates the following four-factor regression model of the excess returns R_t of the overall oil and gas industry and each Canadian oil firm as:

$$R_t = \alpha_0 + \beta_1\left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 OIL_t + \varepsilon_t \quad (1)$$

The excess return on a Canadian oil firm is regressed on the three Fama–French factors (the market risk premium, $R_m - R_f$; a capitalization factor of small to big firms, *SMB*; a stock valuation factor of high to low book value stocks, *HML*; and changes in the oil price). The OIL factor measures the change in WTI, WCS, or the spread between WTI and WCS. The regression coefficients β_1 through β_4 measure the sensitivity of the dependent variable to each of the four factors, respectively.

Additionally, as in Baur and Todorova's work (2018), which is motivated by the previous literature regarding significant asymmetric effects of oil price shocks on financial markets (e.g., Arouri 2011; Broadstock et al. 2016), we adapt Equation (1) to test for the potential of asymmetric effects by means of a threshold model as:

$$R_t = \alpha_0 + \beta_1\left(R_{m,t} - R_{f,t}\right) + \beta_2 SMB_t + \beta_3 HML_t + \beta_4 OIL_t + \beta_{\blacklozenge} OIL_t D_t + \varepsilon_t \quad (2)$$

where the dummy variable D_t is equal to one if the price of oil is above a certain threshold and zero if otherwise. This paper considers different thresholds to analyze this effect, such as the average WTI price over the whole sample period (USD 63.26), the median price (USD 60.85), as well as the 1-year and 5-year moving averages. Equation (2) statistically tests for asymmetry based on the coefficient $\beta_{\blacklozenge}$.

Finally, the previous literature suggests the existence of structural breaks in the relationship between stock and oil markets (e.g., Apergis and Miller 2009). Research by Salisu and Fasanya (2013), Mollick and Assefa (2013), Baur and Todorova (2018), and Yun and Yoon (2019) indicate that the impacts that oil prices have on financial markets may have been altered during the time of the global financial crisis. Since the sample of this study covers the period of January 2000 to August 2018, we split the sample period to capture two time-frames: (1) from January 2000 to December 2008 and (2) from January 2009 to August 2018. We re-estimated Equation (1) to identify if Canadian oil firms' reactions to oil price fluctuations have been altered in the post-global financial crisis period.[12]

3. Results

3.1. Main Estimation Results

Table 2 provides the results of Equation (1), with WTI as the measure for the oil price. The market beta (MRK) is 0.60 for the industry-wide regression (iShares ETF). Thirteen of the fourteen individual firm regressions indicate that the market beta is significant, in which

values range from 0.1176 to 0.6744. These results align with Sadorsky's (2001) findings of an estimated market beta of 0.78 for the Canadian oil and gas industry, suggesting it has been less risky than the market. The size factor (SMB) indicates little statistically significant evidence. The value factor (HML) is generally positive and is significant in eight of the fourteen firm-specific regressions. There is empirical evidence that oil (WTI) does positively impact the equity returns of the oil and gas sector in Canada. Specifically, the coefficient for the industry-wide regression is 0.29 and the OIL coefficient is positive and significant for seven of the fourteen firms, ranging from 0.1267 to 0.3437. These results support the findings of Sadorsky (2001) and Boyer and Filion (2007), who find positive associations between Canadian energy firms and oil prices. The last and second-last columns of Table 2 present the adjusted R^2 values of the full model (Equation (1)) and a constrained model (with only the OIL factor). It is clear that oil price changes make a significant contribution to explaining the monthly returns at an industry and firm levels.

Table 2. Regression results—with WTI.

	C	MRK	SMB	HML	OIL	R^2	R^2(OIL)
iShares S&P/TSX Energy ETF	−0.0063 **	0.6046 ***	−0.0716	0.0898	0.2947 ***	0.6863	0.4969
	(0.0025)	(0.0595)	(0.0990)	(0.0719)	(0.0352)		
Imperial Oil	0.0004	0.3591 ***	−0.4539 ***	0.1371	0.2023 ***	0.2668	0.1628
	(0.0037)	(0.0919)	(0.1305)	(0.1069)	(0.0428)		
Enbridge Inc.	−0.0026	0.1716 **	−0.1458	0.2962 ***	0.0116	0.0329	0.0040
	(0.0053)	(0.0753)	(0.1416)	(0.0970)	(0.0605)		
TC Energy Corp.	0.0016	0.2462 ***	−0.1561	0.3585 ***	−0.0230	0.1518	0.0079
	(0.0029)	(0.0553)	(0.1308)	(0.0976)	(0.0446)		
Encana Corp.	−0.0127 *	0.5099 ***	−0.5052 **	0.5998 ***	0.3437 ***	0.2386	0.1498
	(0.0065)	(0.1256)	(0.2175)	(0.1535)	(0.0749)		
Husky Energy Inc.	−0.0069	0.6491 ***	−0.1808	0.4105 ***	0.0600	0.2014	0.0707
	(0.0054)	(0.1102)	(0.1700)	(0.1296)	(0.0909)		
Fortis Inc.	0.0056 *	0.1151	−0.0110	0.0551	−0.0358	0.0151	0.0000
	(0.0031)	(0.0704)	(0.0995)	(0.0715)	(0.0406)		
Canadian Natural Resources	−0.0103	0.7643 ***	−0.0148	0.4173 ***	0.2784 ***	0.2677	0.1698
	(0.0072)	(0.1144)	(0.2488)	(0.1434)	(0.0802)		
Suncor Energy Inc.	−0.0086	0.6744 ***	−0.4975	0.0803	0.2381 *	0.2048	0.1134
	(0.0061)	(0.1724)	(0.3690)	(0.2587)	(0.1347)		
Emera Inc.	0.0027	0.1176 *	−0.0741	0.0537	−0.0542	0.0238	0.0030
	(0.0028)	(0.0618)	(0.0964)	(0.0703)	(0.0366)		
Inter Pipeline Ltd.	0.0024	0.3422 ***	0.0805	0.1687 **	0.0210	0.1710	0.0639
	(0.0033)	(0.0566)	(0.1354)	(0.0842)	(0.0454)		
ARC Resources Ltd.	−0.0067 *	0.5873 ***	−0.3158 *	0.3645 ***	0.1267 **	0.3143	0.1411
	(0.0041)	(0.0909)	(0.1689)	(0.0839)	(0.0495)		
Pembina Pipeline Corp.	0.0038	0.2167 ***	−0.1070	0.2018 ***	0.0612	0.1216	0.0575
	(0.0032)	(0.0675)	(0.1074)	(0.0722)	(0.0453)		
Crescent Point Energy Corp.	−0.0027	0.5376 ***	0.1080	0.3736 **	0.2806 ***	0.3004	0.2189
	(0.0058)	(0.1251)	(0.2561)	(0.1835)	(0.0947)		
Cenovus Energy Inc.	−0.0106	0.4913 ***	−0.4078	0.0178	0.2856 ***	0.2627	0.2030
	(0.0065)	(0.1773)	(0.2703)	(0.1777)	(0.1000)		

Note: The table presents the Fama–French factor estimates and an oil price factor as per model (1) with robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R^2 present the goodness of fit for the full model. R^2(OIL) denotes the fit of a model with the oil price factor only.

Table 3 provides the results of Equation (1) with WCS as the measure for the price of oil. In regard to the Fama–French factors, there is not much difference in the reported values from Table 2, only that the market beta (MRK) is slightly higher in Table 3. The OIL coefficient is still positive and significant for the overall industry and for four of the fourteen firm regressions. The OIL coefficient of note is much smaller when using WCS than WTI (e.g., 0.0613 versus 0.2947 for the industry-wide regression). Evidence from the R^2 metrics also suggests that the models with WTI better explained the monthly returns of

the Canadian oil and gas industry. Note that, in the constrained model (with only the OIL factor), the R^2 has dropped from 0.4969 with WTI to 0.1093 with WCS. Similar evidence is found in the R^2 metrics for individual firm regressions.

Table 3. Regression results—with WCS.

	C	MRK	SMB	HML	OIL	R^2	R^2(OIL)
iShares S&P/TSX Energy ETF	−0.0068 **	0.8163 ***	0.0148	0.1682 **	0.0613 ***	0.5892	0.1093
	(0.0029)	(0.0600)	(0.1245)	(0.0806)	(0.0226)		
Imperial Oil	0.0002	0.4970 ***	−0.3861 ***	0.1839 *	0.0445	0.2153	0.0300
	(0.0038)	(0.0892)	(0.1326)	(0.1028)	(0.0282)		
Enbridge Inc.	−0.0026	0.1824 **	−0.1361	0.3004 ***	−0.0029	0.0328	0.0003
	(0.0055)	(0.0773)	(0.1346)	(0.0983)	(0.0297)		
TC Energy Corp.	0.0017	0.2370 ***	−0.1509	0.3564 ***	−0.0171	0.1532	0.0000
	(0.0029)	(0.0534)	(0.1258)	(0.0960)	(0.0185)		
Encana Corp.	−0.0136 **	0.7088 ***	−0.4601 **	0.6623 ***	0.1410 ***	0.2141	0.0651
	(0.0069)	(0.1182)	(0.2138)	(0.1601)	(0.0464)		
Husky Energy Inc.	−0.0063	0.7290 ***	−0.0833	0.4433 ***	−0.0591	0.2076	0.0002
	(0.0053)	(0.0794)	(0.1665)	(0.1232)	(0.0372)		
Fortis Inc.	0.0056 *	0.0943	−0.0158	0.0486	−0.0146	0.0134	0.0004
	(0.0031)	(0.0660)	(0.1004)	(0.0712)	(0.0243)		
Canadian Natural Resources	−0.0109	0.9341 ***	0.0389	0.4721 ***	0.0981 *	0.2489	0.0596
	(0.0073)	(0.1197)	(0.2647)	(0.1415)	(0.0517)		
Suncor Energy Inc.	−0.0088	0.8375 ***	−0.4160	0.1359	0.0507	0.1819	0.0216
	(0.0062)	(0.1381)	(0.3517)	(0.2496)	(0.0490)		
Emera Inc.	0.0030	0.0964 *	−0.0612	0.0488	−0.0409 **	0.0339	0.0169
	(0.0028)	(0.0557)	(0.0957)	(0.0715)	(0.0190)		
Inter Pipeline Ltd.	0.0024	0.3537 ***	0.0821	0.1723 **	0.0097	0.1707	0.0205
	(0.0033)	(0.0504)	(0.1303)	(0.0826)	(0.0239)		
ARC Resources Ltd.	−0.0067	0.6806 ***	−0.2594	0.3972 ***	0.0148	0.2962	0.0211
	(0.0041)	(0.0850)	(0.1721)	(0.0844)	(0.0307)		
Pembina Pipeline Corp.	0.0039	0.2670 ***	−0.0693	0.2201 ***	−0.0025	0.1116	0.0043
	(0.0032)	(0.0579)	(0.1094)	(0.0722)	(0.0226)		
Crescent Point Energy Corp.	−0.0032	0.7294 ***	0.1564	0.4408 **	0.0837 *	0.2687	0.0687
	(0.0061)	(0.1028)	(0.2470)	(0.1873)	(0.0457)		
Cenovus Energy Inc.	−0.0114 *	0.7594 ***	−0.2768	0.1314	0.0175	0.2072	0.0264
	(0.0066)	(0.1353)	(0.2848)	(0.1977)	(0.0484)		

Note: The table presents the Fama–French factor estimates and an oil price factor as per model (1) with robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R^2 present the goodness of fit for the full model. R^2(OIL) denotes the fit of a model with the oil price factor only.

Table 4 provides the results for Equation (1) with the spread between WTI and WCS as the oil measure. Again, the Fama–French factors are not altered significantly. In the industry regression, the OIL coefficient is similar to Table 3 results, with a coefficient of 0.0705 and now only significant at the 10% level. The model fit statistics have diminished even further, with the R^2(OIL) measure at 0.0416 for the industry making a negligible contribution to explaining the return of Canadian oil and gas firms in most cases compared to the traditional asset pricing model.

Table 4. Regression results—with WTI-WCS.

	C	MRK	SMB	HML	OIL	R^2	R^2(OIL)
iShares S&P/TSX Energy ETF	−0.0247 ***	0.8371 ***	0.0522	0.1818 **	0.0705 *	0.5822	0.0416
	(0.0093)	(0.0598)	(0.1229)	(0.0844)	(0.0368)		
Imperial Oil	−0.0103	0.5159 ***	−0.3547 ***	0.1813 *	0.0415	0.2095	0.0088
	(0.0108)	(0.0884)	(0.1312)	(0.1050)	(0.0412)		
Enbridge Inc.	0.0131	0.1882 **	−0.1158	0.3202 ***	−0.0601	0.0383	0.0026
	(0.0191)	(0.0726)	(0.1401)	(0.0953)	(0.0762)		
TC Energy Corp.	0.0000	0.2271 ***	−0.1715	0.3499 ***	0.0058	0.1504	0.0035
	(0.0077)	(0.0552)	(0.1273)	(0.0962)	(0.0283)		
Encana Corp.	−0.0227	0.7800 ***	−0.3246	0.6856 ***	0.0396	0.1828	0.0074
	(0.0225)	(0.1205)	(0.2108)	(0.1687)	(0.0919)		
Husky Energy Inc.	−0.0215 *	0.6902 ***	−0.1685	0.4086 ***	0.0563	0.2027	0.0128
	(0.0117)	(0.0810)	(0.1640)	(0.1292)	(0.0494)		
Fortis Inc.	0.0071	0.0872	−0.0291	0.0468	−0.0059	0.0115	0.0000
	(0.0089)	(0.0662)	(0.0918)	(0.0704)	(0.0334)		
Canadian Natural Resources	−0.0052	0.9894 ***	0.1513	0.5041 ***	−0.0185	0.2354	0.0021
	(0.0192)	(0.1252)	(0.2493)	(0.1434)	(0.0757)		
Suncor Energy Inc.	−0.0551 **	0.8429 ***	−0.4314	0.0878	0.1790 **	0.2033	0.0335
	(0.0249)	(0.1372)	(0.3418)	(0.2570)	(0.0824)		
Emera Inc.	0.0056	0.0757	−0.1007	0.0419	−0.0111	0.0138	0.0006
	(0.0080)	(0.0547)	(0.0927)	(0.0717)	(0.0284)		
Inter Pipeline Ltd.	0.0120	0.3635 ***	0.1067	0.1873 **	−0.0365	0.1750	0.0002
	(0.0091)	(0.0506)	(0.1325)	(0.0861)	(0.0340)		
ARC Resources Ltd.	−0.0127	0.6858 ***	−0.2527	0.3931 ***	0.0234	0.2964	0.0078
	(0.0113)	(0.0804)	(0.1732)	(0.0871)	(0.0422)		
Pembina Pipeline Corp.	−0.0025	0.2626 ***	−0.0816	0.2110 ***	0.0245	0.1143	0.0085
	(0.0100)	(0.0586)	(0.1056)	(0.0745)	(0.0357)		
Crescent Point Energy Corp.	−0.0114	0.7661 ***	0.2371	0.4621 **	0.0354	0.2549	0.0113
	(0.0168)	(0.1030)	(0.2296)	(0.1877)	(0.0607)		
Cenovus Energy Inc.	−0.0178	0.7699 ***	−0.2650	0.1247	0.0263	0.2075	0.0059
	(0.0181)	(0.1402)	(0.2640)	(0.1886)	(0.0796)		

Note: The table presents the Fama–French factor estimates and an oil price factor as per model (1) with robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R^2 present the goodness of fit for the full model. R^2(OIL) denotes the fit of a model with the oil price factor only.

Table 5 presents the results of Equation (2), which tests for potential asymmetric impacts that oil may have on Canadian oil and gas equity returns. The chosen thresholds (with WTI) do not appear to yield any strong evidence for regime-specific differences and asymmetries in the industry-wide regressions. From examining the firm-specific regression, the empirical evidence suggests that some firms may be more sensitive to changes in oil prices when prices are higher. For example, the regressions with Imperial Oil provide positive and statistically significant coefficients for $\beta_{\blacklozenge}$ across all four thresholds. Additionally, $\beta_{\blacklozenge}$ is significant in at least one threshold regression for Enbridge, Cenovus Energy, and Crescent Point Energy. These results suggest that individual firms address fluctuations in oil prices in varying risk management (hedging) strategies. Due to the weak to moderate evidence of asymmetric impacts with the initial thresholds described, we extend the threshold levels to the 75 percentile and 90 percentile. With these higher thresholds, stronger evidence of an asymmetric impact is evident, but results are still moderate. This supports the findings of Narayan and Narayan (2014), who suggest there may be a psychological barrier in equity markets when oil prices reach a certain level, around USD 100 per barrel, and that higher crude oil price may generate inflationary pressures (leading to changing of, as well as negative impacts on, equity returns. Finally, this study also substitutes WCS for WTI in the asymmetric regressions and similar empirical findings are found.[13]

Table 5. Regression results—asymmetric model with WTI.

Threshold	Mean			Median			1-Year Moving Average			5-Year Moving Average		
	OIL	$\beta_{\blacklozenge}$	R^2	OIL	$\beta_{\blacklozenge}$	R^2	OIL	$\beta_{\blacklozenge}$	R^2	OIL	$\beta_{\blacklozenge}$	R^2
iShares S&P/TSX Energy ETF	0.2936 ***	0.0025	0.6863	0.3079 ***	−0.0276	0.6866	0.2691 ***	0.0485	0.6873	0.2611 ***	0.0570	0.6877
	(0.0447)	(0.0607)		(0.0461)	(0.0605)		(0.0495)	(0.0595)		(0.0570)	(0.0614)	
Imperial Oil	0.1395 ***	0.1644 *	0.2805	0.1369 **	0.1589 *	0.2796	0.1518 **	0.0932	0.2709	0.0655	0.2148 **	0.2887
	(0.0525)	(0.0897)		(0.0541)	(0.0880)		(0.0633)	(0.0978)		(0.0699)	(0.0867)	
Enbridge Inc.	−0.0708	0.2155 *	0.0472	−0.0945	0.2576 **	0.0534	−0.0729	0.1559	0.0399	−0.0201	0.0496	0.0336
	(0.0680)	(0.1206)		(0.0692)	(0.1172)		(0.0705)	(0.1327)		(0.0734)	(0.1098)	
TC Energy Corp.	−0.0399	0.0442	0.1537	−0.0644	0.1005	0.1617	−0.0621	0.0722	0.1566	−0.0456	0.0355	0.1530
	(0.0643)	(0.0829)		(0.0646)	(0.0825)		(0.0521)	(0.0780)		(0.0593)	(0.0769)	
Encana Corp.	0.3760 ***	−0.0847	0.2397	0.3881 ***	−0.1079	0.2405	0.3161 ***	0.0508	0.2390	0.5053 ***	−0.2537 *	0.2484
	(0.1026)	(0.1333)		(0.1069)	(0.1349)		(0.1063)	(0.1283)		(0.1349)	(0.1525)	
Husky Energy Inc.	−0.0081	0.1783	0.2095	−0.0387	0.2399	0.2160	0.0632	−0.0058	0.2014	0.0306	0.0462	0.2019
	(0.0843)	(0.1612)		(0.0851)	(0.1568)		(0.0880)	(0.1234)		(0.0954)	(0.1220)	
Fortis Inc.	−0.0240	−0.0308	0.0160	−0.0221	−0.0332	0.0162	−0.0234	−0.0227	0.0156	−0.0577	0.0344	0.0162
	(0.0478)	(0.0744)		(0.0490)	(0.0739)		(0.0651)	(0.0761)		(0.0763)	(0.0857)	
Canadian Natural Resources	0.1939 *	0.2210	0.2745	0.1799	0.2393	0.2757	0.2697 **	0.0161	0.2677	0.2446 *	0.0531	0.2680
	(0.1060)	(0.1690)		(0.1091)	(0.1634)		(0.1096)	(0.1452)		(0.1430)	(0.1727)	
Suncor Energy Inc.	0.1619	0.1995	0.2111	0.1512	0.2109	0.2118	0.3191 ***	−0.1496	0.2081	0.2060	0.0504	0.2051
	(0.1592)	(0.1480)		(0.1620)	(0.1471)		(0.1209)	(0.1660)		(0.1288)	(0.1664)	
Emera Inc.	−0.0776	0.0612	0.0284	−0.0845 *	0.0737	0.0305	−0.1160 **	0.1140 *	0.0388	−0.1853 ***	0.2057 ***	0.0728
	(0.0470)	(0.0640)		(0.0488)	(0.0641)		(0.0497)	(0.0633)		(0.0489)	(0.0597)	
Inter Pipeline Ltd.	0.0476	−0.0696	0.1746	0.0306	−0.0233	0.1714	0.0763	−0.1019	0.1782	0.0463	−0.0397	0.1721
	(0.0570)	(0.0818)		(0.0567)	(0.0822)		(0.0692)	(0.0812)		(0.0759)	(0.0842)	
ARC Resources Ltd.	0.1444 ***	−0.0462	0.3151	0.1844 ***	−0.1401 *	0.3221	0.1203 *	0.0119	0.3143	0.0600	0.1046	0.3184
	(0.0527)	(0.0836)		(0.0489)	(0.0806)		(0.0728)	(0.0844)		(0.0770)	(0.0828)	
Pembina Pipeline Corp.	0.0576	0.0094	0.1216	0.0514	0.0239	0.1221	0.0644	−0.0059	0.1216	0.1169	−0.0874	0.1280
	(0.0459)	(0.0798)		(0.0456)	(0.0781)		(0.0706)	(0.0754)		(0.0781)	(0.0825)	
Crescent Point Energy Corp.	0.3687 ***	−0.1960	0.3080	0.4181 ***	−0.2832 **	0.3157	0.2591 *	0.0400	0.3007	0.3774 ***	−0.1633	0.3059
	(0.1183)	(0.1357)		(0.1191)	(0.1340)		(0.1341)	(0.1388)		(0.1202)	(0.1467)	
Cenovus Energy Inc.	0.3482 **	−0.1154	0.2662	0.3750 **	−0.1568	0.2689	0.0962	0.4447 ***	0.3084	0.3395 ***	−0.1721	0.2696
	(0.1608)	(0.1660)		(0.1683)	(0.1715)		(0.1036)	(0.1415)		(0.1237)	(0.1440)	

Note: The table presents the Fama–French factor estimates and an oil price factor as per Equation (2) with robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R^2 present the goodness of fit for the full model. R^2(OIL) denotes the fit of a model with the oil price factor only. Fama–French factors are not shown but are available from the authors upon request.

Tables 6 and 7 provide results for the two different time-frames: 2000–2008 and 2009–2018, respectively. The Fama–French factors tend to be relatively stable across the two subsamples. For example, the market beta (MRK) in the 2000–2008 period is 0.6046 compared to 0.6304 in the 2009–2018 period. The coefficient measuring the impact of changes in WTI (OIL) on equity returns is still positive and significant in both subsamples. The 2000–2009 subsample has a moderately higher OIL coefficient of 0.3417 compared to the 2009–2018 subsample OIL coefficient of 0.2437. Additional evidence of a moderately higher impact of oil in the 2000–2008 period is found in the constrained model (with OIL only) with the R^2(OIL) measure in the 2000–2008 period being 0.5334 versus 0.4606 in the 2009–2018 period. The individual firm regression suggests that Imperial Oil, Enicana, and Canadian Natural Resources equity returns are impacted positively by oil price changes and relatively so in the same magnitude in both subsamples. The results in the 2009–2018 sample suggest that individual firms' equity returns are impacted by the price of oil. Specifically, seven of the fourteen firms indicate a positive influence of oil prices on their equity returns in the 2009–2018 period versus only four in the 2000–2008 period. Overall, the results suggest that oil price exposures of firms in the Canadian oil and gas sector vary across firms and over time. The varying effects of oil shocks on equity returns may be attributed to several factors, such as differences in a firm's revenue structure, cost management, diversification activities, hedging strategies, etc.

Table 6. Regression results for the 2000–2008 period.

	C	MRK	SMB	HML	OIL	R^2	R^2(OIL)
iShares S&P/TSX Energy ETF	−0.0053	0.6046 ***	−0.0041	0.2165	0.3417 ***	0.7101	0.5334
	(0.0049)	(0.0945)	(0.1858)	(0.1576)	(0.0509)		
Imperial Oil	0.0001	0.5356 ***	−0.6194 ***	0.4701 ***	0.2406 ***	0.3579	0.1691
	(0.0066)	(0.1533)	(0.1949)	(0.1545)	(0.0583)		
Enbridge Inc.	−0.0039	0.1640	−0.0667	0.3599 **	−0.0528	0.0335	0.0020
	(0.0077)	(0.1260)	(0.2086)	(0.1525)	(0.0675)		
TC Energy Corp.	−0.0006	0.2918 ***	−0.1869	0.5071 ***	0.0104	0.1879	0.0061
	(0.0046)	(0.0805)	(0.2005)	(0.1382)	(0.0670)		
Encana Corp.	−0.0072	0.5111 ***	−0.2950	0.6840 ***	0.2732 ***	0.1985	0.1071
	(0.0092)	(0.1612)	(0.2561)	(0.1931)	(0.0924)		
Husky Energy Inc.	−0.0080	0.7906 ***	−0.1303	0.7678 ***	0.0414	0.1896	0.0371
	(0.0095)	(0.1656)	(0.2321)	(0.1806)	(0.1354)		
Fortis Inc.	0.0076	0.0871	−0.0510	0.0587	−0.0022	0.0086	0.0008
	(0.0054)	(0.1205)	(0.1445)	(0.1073)	(0.0550)		
Canadian Natural Resources	0.0140	0.7643 ***	0.0997	0.7407 ***	0.3170 ***	0.2345	0.1397
	(0.0110)	(0.1935)	(0.4032)	(0.1954)	(0.1119)		
Suncor Energy Inc.	−0.0252 **	0.8639 ***	−0.9995 *	0.4777	0.3039	0.1922	0.0813
	(0.0105)	(0.2701)	(0.5983)	(0.4323)	(0.2159)		
Emera Inc.	0.0002	0.1264	−0.0831	0.1038	−0.0313	0.0264	0.0007
	(0.0041)	(0.0868)	(0.1271)	(0.0959)	(0.0494)		
Inter Pipeline Ltd.	−0.0031	0.3917 ***	0.1744	0.2905 **	−0.0064	0.2016	0.0414
	(0.0050)	(0.0779)	(0.1902)	(0.1360)	(0.0563)		
ARC Resources Ltd.	−0.0033	0.5453 ***	−0.0220	0.3672 ***	0.1519 **	0.3169	0.1659
	(0.0063)	(0.1252)	(0.2012)	(0.1265)	(0.0583)		
Pembina Pipeline Corp.	0.0013	0.3280 ***	0.0268	0.2508 **	−0.0344	0.1490	0.0112
	(0.0047)	(0.1049)	(0.1451)	(0.1216)	(0.0486)		
Crescent Point Energy Corp.	0.0231 *	0.5795 ***	0.6456	0.0221	0.1866	0.2932	0.1653
	(0.0124)	(0.2106)	(0.5264)	(0.4852)	(0.1506)		

Note: The table presents the Fama–French factor estimates and an oil price factor as per model (1) with robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R^2 present the goodness of fit for the full model. R^2(OIL) denotes the fit of a model with the oil price factor only.

Table 7. Regression results for the 2009–2018 period.

	C	MRK	SMB	HML	OIL	R^2	R^2(OIL)
iShares S&P/TSX Energy ETF	−0.0078 **	0.6304 ***	−0.1535	0.0473	0.2437 ***	0.6795	0.4606
	(0.0031)	(0.0774)	(0.1163)	(0.0848)	(0.0483)		
Imperial Oil	−0.0033	0.3081 **	−0.2714 **	−0.1698	0.1755 ***	0.2533	0.1580
	(0.0041)	(0.1203)	(0.1362)	(0.1243)	(0.0575)		
Enbridge Inc.	−0.0017	0.1803 **	−0.2259	0.1467	0.1073	0.0539	0.0343
	(0.0076)	(0.0884)	(0.2056)	(0.1665)	(0.1104)		
TC Energy Corp.	0.0019	0.2660 ***	−0.1344	0.2283 **	−0.0587	0.1458	0.0107
	(0.0035)	(0.0874)	(0.1167)	(0.0908)	(0.0506)		
Encana Corp.	−0.0176 *	0.5176 ***	−0.7158 *	0.4042 *	0.4424 ***	0.2788	0.2031
	(0.0091)	(0.1939)	(0.4121)	(0.2275)	(0.1246)		
Husky Energy Inc.	−0.0089 *	0.6170 ***	−0.2513	0.0167	0.1129	0.3186	0.1576
	(0.0053)	(0.1184)	(0.2030)	(0.1570)	(0.0819)		
Fortis Inc.	0.0031	0.1737 **	0.0537	0.0403	−0.0864	0.0382	0.0012
	(0.0037)	(0.0849)	(0.1387)	(0.1194)	(0.0621)		
Canadian Natural Resources	−0.0102	0.9163 ***	−0.1507	0.0280	0.2417 **	0.3658	0.2179
	(0.0089)	(0.1345)	(0.2406)	(0.1533)	(0.1000)		
Suncor Energy Inc.	0.0005	0.6409 ***	0.0258	−0.2401	0.1934 **	0.4320	0.2489
	(0.0050)	(0.1369)	(0.1775)	(0.1480)	(0.0815)		
Emera Inc.	0.0044	0.1338	−0.0793	0.0274	−0.0819	0.0310	0.0073
	(0.0037)	(0.1006)	(0.1456)	(0.1058)	(0.0559)		
Inter Pipeline Ltd.	0.0070	0.3055 ***	−0.0663	0.0577	0.0728	0.1686	0.0978
	(0.0043)	(0.0861)	(0.2026)	(0.1052)	(0.0752)		
ARC Resources Ltd.	−0.0088 *	0.6370 ***	−0.6686 ***	0.3805 ***	0.0823	0.3514	0.1196
	(0.0053)	(0.1275)	(0.2262)	(0.1410)	(0.0833)		
Pembina Pipeline Corp.	0.0071 *	0.0407	−0.3019 **	0.1702 *	0.2071 ***	0.1845	0.1406
	(0.0042)	(0.0963)	(0.1396)	(0.1012)	(0.0775)		
Crescent Point Energy Corp.	−0.0167 ***	0.4047 ***	−0.1310	0.3851 **	0.3532 ***	0.3597	0.2899
	(0.0063)	(0.1334)	(0.2624)	(0.1842)	(0.1042)		
Cenovus Energy Inc.	−0.0106	0.4913 ***	−0.4078	0.0178	0.2856 ***	0.2627	0.2030
	(0.0065)	(0.1773)	(0.2703)	(0.1777)	(0.1000)		

Note: The table presents the Fama–French factor estimates and an oil price factor as per model (1) with robust standard errors (in parentheses). *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. R^2 present the goodness of fit for the full model. R^2(OIL) denotes the fit of a model with the oil price factor only.

3.2. Additional Estimations for Time-Varying Oil Sensitivities

To enable a better understanding of the time-varying and dynamic relevance of the oil factors on the oil firms' equity returns, time-varying oil price sensitivities are presented graphically for a restricted model. Figures 2 and 3 present the time-varying betas based on a monthly return frequency for ΔWTI and ΔWCS, respectively, based on a 3-year forward rolling window. All charts in Figure 3 coincide with a downward movement for changes in WTI in 2009, as the global financial crisis recession ended in June 2009. Less clear are the time-varying WCS sensitivities.

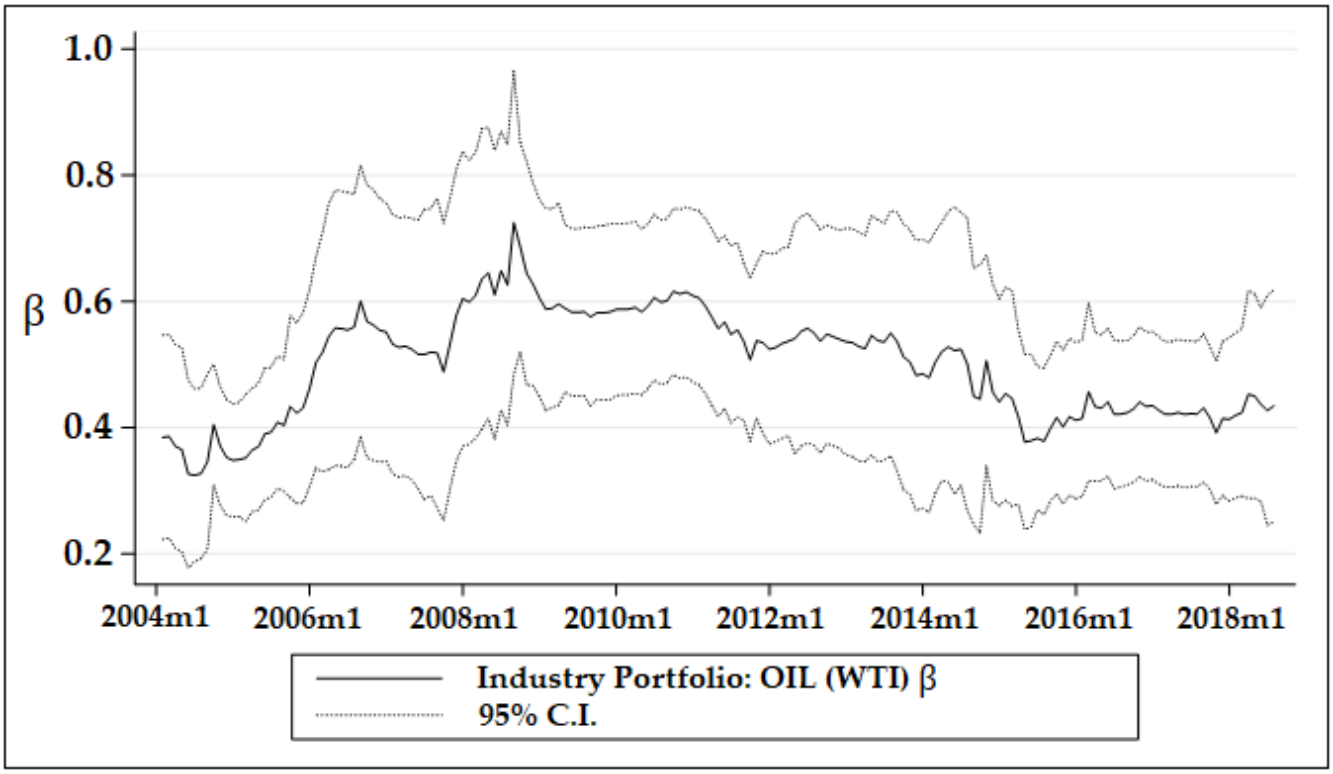

Figure 2. Time varying oil price beta (36-month average (ΔWTI)).

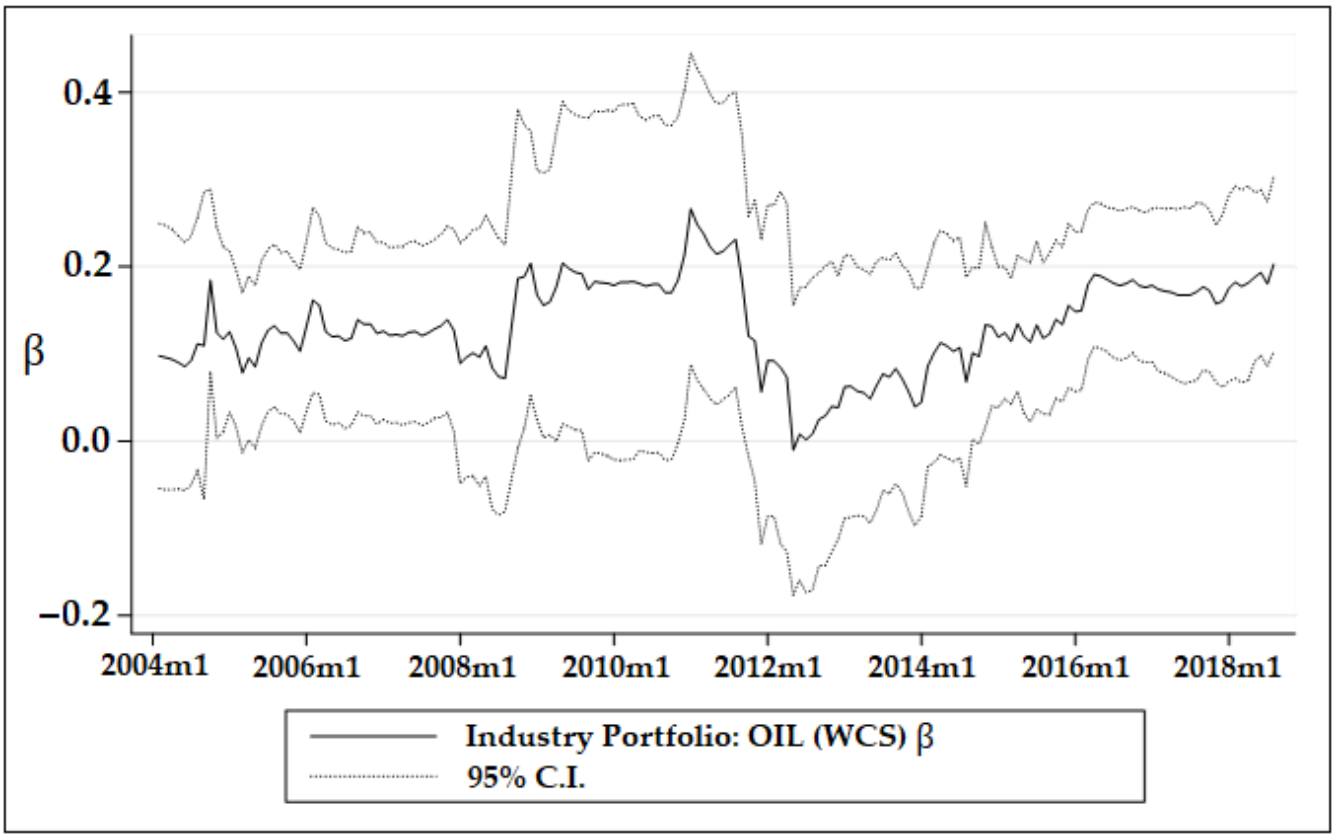

Figure 3. Time varying oil price beta (36-month average (ΔWCS)).

4. Conclusions and Implications

This study addresses how oil prices impact the equity returns of the Canadian oil and gas industry. Although this research question has been explored in previous work by Sadorsky (2001) and Boyer and Filion (2007), this paper extends the previous work in several important ways. First, this study uses both the traditional North American oil benchmark, WTI, but also the specific Western Canadian Select (WCS) oil measure that has become important in the Canadian oil market since the development of the oil sands in the early 2000s. Secondly, this study implements a methodological approach that evaluates the impact of oil prices on equity returns at both the industry and firm-specific levels. Although Boyer and Filion (2007) separate their sample into producers and integrated oil and gas firms in a panel data format, this paper separates the pooling or portfolio approach and applies firm-specific regressions. Finally, updating the previous literature with data from the post-global financial crisis period and commodity supercycle period provides further evidence in regard to the potential of time-sensitive impacts.

The empirical evidence in this paper confirms the previous findings of Sadorsky (2001) and Boyer and Filion (2007), who find that oil prices positively influence the equity returns of the Canadian oil and gas industry. When evaluating the impact of oil prices with the WCS measure, positive statistically significant results are still found, but at a moderately lower level when compared to the WTI results. Since WCS has historically traded with a discount to WTI, further empirical regressions are conducted to determine if this spread impacts equity returns of the oil and gas industry in Canada. The results suggest a minimal impact at an industry level and little to no evidence at the firm level. Little evidence of the asymmetric impact of oil on equity returns in the Canadian oil and gas sector is found. Finally, in the subsample analysis (pre-/post-2009) evidence from firm-specific regressions suggest that some Canadian oil and gas firms have become more sensitive to oil price changes. The varying effects of oil shocks on individual equity returns may be attributed to factors such as differences among firms' revenue structures or hedging strategies (Boyer and Filion 2007) and draw attention to the importance of methodological approaches that provide analysis at the firm level, as aggregate or industry-level analysis may not reveal an individual firm's risk exposure to changes in oil prices.

This research will provide researchers, investors, policymakers, and regulators with additional insight into how energy prices influence equity returns of Canadian oil and gas firms. First, the findings of this study suggest that an increase in oil prices has a statistically significant positive effect on the equity returns of Canadian energy firms, but the sensitivity of each firm varies with oil price fluctuations and can change over time. Secondly, this study indicates that WCS is a relevant alternative measure of oil when assessing the impacts energy prices have on equity returns in Canada. Further research should address how WCS impacts other sectors of the financial markets in Canada (e.g., currency, uncertainty, etc.) and firm-specific decisions (e.g., capital structure, payout policy, etc.). Finally, the empirical findings will guide investors about the effect of oil price changes (both WTI and WCS) on Canadian oil and gas stock returns within the industry, as well as for the managers of these firms who require deeper insight into the effectiveness of hedging policies, which are affected by oil price changes. The results highlighting the flow of firm-specific risks through one of the most critical equity sectors of the Toronto Stock Exchange will ameliorate some aspects of investor uncertainty and provide policymakers with a holistic view of the impact of oil price fluctuations.

Author Contributions: All authors equally contributed to this paper. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The iShares S&P/TSX Capped Energy Index ETF and the fourteen energy firm-level monthly price data are downloaded from the Datastream International accessed on 9 January 2020. The monthly price data for WTI is downloaded from the Federal Reserve Economic Database, https://fred.stlouisfed.org, accessed on 9 January 2020. The WCS monthly price data are downloaded from the Alberta Government website, https://economicdashboard.alberta.ca/OilPrice, accessed on 9 January 2020. Finally, the Fama–French factors for Canada are downloaded from the AQR website, https://www.aqr.com/Insights/Datasets/Betting-Against-Beta-Equity-Factors-Monthly, accessed on 13 January 2020.

Acknowledgments: The authors would like to gratefully acknowledge many useful comments from the Editor and two anonymous reviewers.

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

Appendix A

Table A1. List of Canadian Energy Index and Firms.

	Index	GVKEY
1	iShares S&P/TSX Capped Energy ETF	142830
	Firm	
2	Imperial Oil Ltd.	005903
3	Enbridge Inc.	006135
4	TC Energy Corp.	010671
5	Encana Corp.	011781
6	Husky Energy	013994
7	Fortis Inc.	014390
8	Canadian Natural Resources	015055
9	Suncor Energy	015070
10	Emera Inc.	025792
11	Inter Pipeline Inc.	066319
12	ARC Resources	105239
13	Pembina Pipeline Corp.	130618
14	Crescent Point Energy Corp.	145812
15	Cenovus Energy	183791

Note: This study uses the iShares S&P/TSX Capped Energy Index ETF to capture the industry level equity returns of the oil and gas sector in Canada. For the firm level data, this study uses the fourteen oil and gas firms that are included in the primary equity index in Canada (TSX60).

Notes

1 For example, Alfadli and Rjoub (2020) and Esmaeil et al. (2020) find that oil prices are one of the most significant macroeconomic factors of profitability for banks in the Gulf Cooperation Council (GCC). Its positive and significant elasticity is explained via the PCSE interpretation. Hesami et al. (2020) identify a relationship between tourism and oil prices in MENA countries.

2 Additional sectors in Canada have also been examined (e.g., banking (Killins and Mollick 2020) and the transportation sector (Killins 2020)).

3 See https://www.nrcan.gc.ca/energy/publications/18756 (accessed on 19 June 2020) for a discussion on the economic benefits of the oil sands in Canada.

4 The Trans Mountain Pipeline is a pipeline that carries crude and refined oil from Alberta to the coast of British Columbia, Canada. In 2013, the Canadian National Energy Board has approved a proposal by Kinder Morgan to expand the pipeline. The proposal has attracted controversy due to its potential environmental impact, faced legal challenges, as well as protests from environmentalists and First Nations groups. The disputes have intensified in early 2018 when the provinces of Alberta and B.C. engaged in a trade war over the expansion project. In May 2018, the federal government has announced its intent to buy the pipeline from Kinder Morgan for $4.5 billion, and seek outside investors to complete the expansion.

[5] See https://www.bnnbloomberg.ca/ottawa-gives-green-light-to-trans-mountain-pipeline-expansion-1.1275007 (accessed on 12 July 2020) & https://www.bnnbloomberg.ca/senate-passes-bill-c-69-c-48-in-blow-to-canada-s-energy-industry-1.1276452 (accessed on 12 July 2020).

[6] See https://www.nrcan.gc.ca/science-and-data/data-and-analysis/energy-data-and-analysis/energy-facts/20061 (accessed on 19 June 2020) and https://us.spindices.com/indices/equity/sp-tsx-composite-index (accessed on 19 June 2020).

[7] See https://www.blackrock.com/ca/individual/en/products/239839/ish-ares-sptsx-capped-energy-index-etf (accessed on 12 July 2020) for details of the iShares index. Please note the inception of this index was March 2001 and thus the data for the industry analysis is from March 2001 to August 2018.

[8] See https://ca.spindices.com/indices/equity/sp-tsx-60-index (accessed on 13 January 2020) for details and breakdown of the TSX60 index. These fourteen firms are the largest and most actively traded energy firms in Canada.

[9] WCS is the reference price for heavy crude oil from the oil sands delivered at Hardisty, Alberta, Canada. It is Canada's largest commercial heavy oil stream, comprised of bitumen, conventional oil, synthetic crude, and diluent. For further details about WCS please see https://www.oilsandsmagazine.com/technical/western-canadian-select-wcs (accessed on 13 January 2020). Data for the WCS series before 2004 is supplement with the oil price at Hardisty and is obtained via the Petroleum Services Association of Canada https://www.psac.ca/ (accessed on 13 January 2020).

[10] See https://www.aqr.com/Insights/Datasets/Betting-Against-Beta-Equity-Factors-Monthly (accessed on 13 January 2020). This paper uses the AQR dataset due to the fact that Kenneth French's website does not have a specific factor for Canada (only North America).

[11] Please note the unit root results are not included but available from the authors upon request.

[12] Further, several articles have focused on oil prices empirically suggest a breakpoint in and around 2010 (e.g., Chen et al. 2015 and Scheitrum et al. 2018).

[13] Results with alternative thresholds and with the WCS oil price are not reported but are available from the authors upon request.

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