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Oil price and firm profitability: evidence from Vietnamese stock market

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Abstract

Although many prior studies show that oil price affects negatively macroeconomic environment and stock prices, there are few studies on the impact of oil price on firm profitability. This paper posits that oil price tends to affect firm profitability negatively via increases in production costs and negative changes in the macroeconomic environment. As a transition economy, Vietnam has been gradually integrated into the world economy and affected by international economic shocks. Therefore, Vietnam is a potential laboratory to investigate the effect of oil price as an exogenous factor on firm profitability. Using a sample of 6,960 observations from 951 firms listed in Ho Chi Minh City Stock Exchange (HOSE) and Hanoi Stock Exchange (HNX) between 2005 and 2016, we find supporting evidence for the negative impact of oil price on firm profitability.

Keywords: Oil price, Profitability, Vietnam

1. Introduction

Oil plays an incredibly important role in global economy as it is the main source of energy for economic production and activities. Therefore, the fluctuation in oil price significantly influences the economy in terms of production cost and firm profitability. An increase in oil price leads to an escalation in production cost and thus reduce firm profit (Arouri and Nguyen, 2010). Moreover, higher production costs become a burden to consumers. If a majority of consumers cannot afford a certain product, firms' sale revenue declines. Any decrease in revenue will result in a decrease in profits of a firm. Hamilton (1988), Hamilton (1996), and Abel and Bernanke (2001) find that these inflationary pressures dampen aggregate demand

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(i.e. consumption and investment spending), reduce consumer sentiment, and thus, in turn, lead to economic downturns. The extant literature shows that an oil price shock causes economic risk regarding a country's growth and stock market (Hamilton, 1983). Macroeconomic studies explain the mechanisms by which oil price shocks are transmitted into the economy and find that oil price has a negative impact on the economy (Brown and Yücel, 2002; Jiménez-Rodríguez and Sánchez, 2004; Jones *et al.*, 2004; Kilian, 2008; Tang *et al.*, 2010). In addtion, Cunado and Gracia (2014), Schneider (2004), Caporale *et al.* (2015), and Cashin *et al.* (2012) also show a negative relationship between oil price and stock price in different countries.

Despite prior evidence for the impacts of oil price on macroeconomic variables and stock prices, there are few studies on the relationship between oil price and firm profitabity. This can be explained that oil price and stock price are changing on daily basis while accounting profit information is published quarterly, semi-annually or annually which does not catch up with oil price. However, we argue that the changes in oil price are considered as exogenous shocks which are likely to affect firms' accounting profit significantly. Poghosyan and Hesse (2009) and Darko and Kruger (2017) find that oil price have negative effects on profitability of banks in 11 oil-exporting countries and firms in energy industry. In this paper, we investigate how the world price of oil affects firm profitability in Vietnam – a transition economy.

2. Literature review

From macroecomic perspective, Brown and Yücel (2002), Jiménez-Rodríguez and Sánchez (2004), Jones *et al.* (2004), Kilian (2008), and Tang *et al.* (2010) explain the transmission channel of oil price fluctuation into economic activities by classic supply-side effect, income transfer effect, inflation effect and monetary policy. The supply side effect mechanism states that crude oil is a basic input to production. An increase in oil price leads to a rise in production costs that induces firms to lower output and depresses firms' profitability. The effect of income trasfer posits that an increase in oil price leads to income redistribution from net importers of oil to oil-exporting countries, it is plausible for the oil-importing countries to exhibit a reduction in spending, leading to reduced aggregate demand due to the decrease in total output and increase in unemployment. Moreover, an increase in oil price leads to an increase in production cost, then the general price level is higher.

In addition, there are many prior studies examinning the relationship between oil price and stock prices. Cunado and Gracia (2014) examine the impact of oil price on stock market in 12 oil importing European countries during the period 1973-2011 and find a significantly negative impact of oil price on most European stock market returns. Furthermore, they also find that stock market returns are mostly driven by oil supply shocks. Caporale *et al.* (2015) examine the time-varying impact of oil price uncertainty on stock prices in China using weekly data on 10 sectoral indices over the period January 1997–February 2014. Their research results show that sectoral stock returns are determined by oil price fluctuations. Narayan and Sharma (2011) examine the relationship between oil price and daily stock return of 560 firms in US during the period from January 2000 to 31 December 2008. Their findings reveal that as firm

size is large and medium, the relationship between oil price and firm returns becomes stronger while the relationship between oil price and small-sized firm return is significantly positive.

Park and Ratti (2008) investigate the asymmetric effect of oil price fluctuation on stock return with monthly data from January 1986 to December 2005 in the US and 13 European countries. Their research results show that the magnitude of oil price increases is smaller than that of oil price decreases and stock markets in most countries are more influenced by oil price decreases than oil price increases in the variance decomposition analysis. Ramos and Veiga (2010) analyze the effect of oil price on stock market in 43 developed and developing countries. These findings show that oil price escalation depress stock markets, but oil price decreases fail to have a positive impact on stock market return in developed countries. Nevertheless, market return is not sensitive to oil price in developing countries.

In Vietnam, Vu *et al.* (2019) examine the effects of firms' competition, wage, CEOs' characteristics on firm performance and find firm size is positively related to firm performance measured by net income per employee, return on assets (ROA) and return on equity (ROE). In addition, capital intensity and wage negatively affects firm performance. Nguyen (2014) investigates the impact of petroleum price on Vietnamese economy including 13 industries over the period from 1996 to 2007 and find that 10% increase in petroleum price causes negative results on economic activities while the 5% increase in prices shows a positive effect. These findings imply that a small change in oil price may lead to resource reallocation efficiency. Trang and Hong (2017) examine how oil price affect macroeconomic variables namely inflation, GDP growth, budget deficit and unemployment throughout the period from 2000 to 2015. Their study finds a nonlinear relationship between oil price and macroeconomic variables. If the oil price exceeds the threshold of USD 27.6/barrel, there is a positive impact of oil price on inflation rate, budget deficit and unemployment rate but GDP growth rate. Tran (2017) also studies the impact of oil price on Vietnamese stock market and macroeconomic variables. The empirical results illustrate that oil price is negatively related to stock market return and oil price shock tend to hinder the development of the market.

The extant literature shows that there are several studies on how oil price affects macroeconomic variables and stock market but research on the impact of oil price on firm profitability is rare. Poghosyan and Hesse (2009) use annual data of 145 banks in 11 oil-exporting countries including Algeria, Bahrain, Iran, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Sudan, United Arab Emirates, and Yemen for the period from 1994 to 2008 to investigate the effect of oil price on profitability. At first, when they run regression with bank-specific variables including equity to asset ratio, liquid assets to deposit ratio, loan loss reserves to total loans, cost to income ratio, logarithm of total assets, the research results indicate that oil price has a significant impact on profitability. However, when macro-variables namely inflation and fiscal stance are added, the impact of oil price becomes insignificant. This implies that the impact of oil price is transmitted through macroeconomic variables. In addition, Darko and Kruger (2017) also examine the relationship of crude oil price and firms' accounting performance in

energy industry. After leverage, size and seasonality are controlled, regression results show that crude oil price are positively related to firm profitability.

This paper argues that oil price as a exogenous variable is likely to affect firm profitability since it affects production costs directly and leads to negative changes in the macroeconomic environment. As a transition economy, Vietnam has been gradually integrated into the world economy and affected by international economic shocks. Therefore, Vietnam is a potential laboratory to investigate the effect of oil price as an exogenous factor on firm profitability.

3. Research method

3.1 Research model

To investigate the relationship between oil price and firm profitability, we develop a research model in which firm profitability is the dependent variable and oil price is the explanatory variable. In line with prior studies conducted by Pratheepan (2004), Isik and Tasgin (2017), Narayan and Sharma (2011), Darko and Kruger (2017), and Poghosyan and Hesse (2009), we use firm size, age, leverage and industry as the control variables. Moreover, industry effects are also controlled by industry dummies.

$$ROA = \beta_0 + \beta_1 op + \beta_2 age + \beta_3 size + \beta_4 lev + \beta_5 industry + u \quad (1)$$

Where ROA is firm profitability measured by net income divided by total assets; op is oil price calculated by natural logarithm of oil price; size is firm size measured by natural logarithm of total asset; age is firm age calculated by the gap between reporting year and incorporated year; lev is leverage measured by total liabilities divided by total equity.

Table 1. Variable definitions

Variable	Description	Expected sign
ROA	Current return on assets	
op	Natural logarithm of oil price	-
age	The gap between reporting year and incorporated year	+/-
size	Natural logarithm of total asset	+/-
lev	Ratio of total liabilities divided by total equity	-

Source: Author's compilation

3.2 Data collection

Our research sample includes firms listed in both Ho Chi Minh City and Hanoi stock exchanges. Annual acccounting information is provided by Stoxplus. Industry classification is in accordance with the classification of Industry Classification Benchmark (ICB). Oil price is annual world crude oil price from International Energy Agency (https://www.iea.org), measured in USD per barrel. After eliminating observations with missing and incomplete information and firms in financial sector, we obtain the final research sample with 6,960

observations from 951 listed firms between 2005 and 2016. Table 2 shows the distribution of 951 listed firms by industry and exchange and the distribution of 6,960 observations by year.

Table 2. A summary of research data

Panel A. Distribution of firms by industry and exchange					
Distribution by industry			Distribution by exchange		
Industry	N	Percent	Exchange	N	Percent
Agriculture	84	8.83	HNX	453	47.63
Energy	55	5.78	HSX	357	37.53
Construction	326	34.28	OTC	21	2.22
Industrial	107	11.25	UPCOM	120	12.62
Material	101	10.62			
Medicine	23	2.42			
Service	97	10.2			
Technology	43	4.52			
Consumer product	115	12.1			
Total	951	100	Total	951	100
Panel B. Distribution of observations by year					
Year	N	Percent	Year	N	Percent
2005	207	2.97	2011	651	9.35
2006	313	4.5	2012	626	8.99
2007	468	6.72	2013	628	9.02
2008	592	8.51	2014	632	9.08
2009	757	10.88	2015	644	9.25
2010	761	10.93	2016	681	9.78

Source: Author's calculation

4. Research results

Table 3 presents descriptive statistics of research variables which are winsorized at 1% to eliminate the impact of outliers. Return on assets of firms is 6.21% on average and its standard deviation is 7.27. The mean and the standard deviation of firm leverage are 0.51 and 0.23 respestively. Generally, mean and deviation values of research variables show no potential selection bias for further analysis.

Table 3. Descriptive statistics

Variable	Mean	Standard deviation	Min	Max
ROA (%)	6.21	7.27	-15.90	32.60
ROE (%)	12.41	15.01	-31.72	65.74
Op	4.31	0.33	3.70	4.68
Size	12.86	1.47	6.40	19.01
lev	0.51	0.23	0.00	1.00
Age	22.90	14.36	1	72

Source: Author's calculation

Table 4 reports research results from three regression models OLS, REM and FEM. We also conduct a Hausman test to specify whether fixed or random effects panel model should be used. The test indicates that the two coefficient estimates are different. This difference suggests that the random effects estimator is inconsistent and the better way to estimate the relationship is using fixed effect model, admitting the existence of fixed non-observable individual effects. For brevity, we only present and interprete results of the fixed effects model.

Table 4. Impact of oil price on firm profitability

	OLS	REM	FEM
Op	-1.68*** (0.24)	-1.74*** (0.19)	-2.50*** (0.18)
Age	0.04*** (0.00)	-0.04*** (0.01)	-0.60*** (0.03)
Size	-0.03 (0.06)	-0.67*** (0.09)	0.59*** (0.14)
Lev	-12.79*** (0.37)	-10.30*** (0.46)	-12.01*** (0.55)
Constant	21.83*** (1.81)	29.60*** (3.06)	29.31*** (1.59)
Number of observations	6,960	6,960	6,960
R^2	0.21	within = 0.0994 between = 0.1821 overall = 0.1644	within = 0.1583 between = 0.0002 overall = 0.0037
Industry dummies	Yes	Yes	No

Source: Author's calculation

In line with prior studies, regression results show that oil price has a negative impact on ROA at the significant level of 1%. This can be explained that an increase in oil price raises production cost, thus it depresses firm profit. Therefore, the negative relationship between oil price and firm profitability is consistent with the supply-side effect theory. Under the fixed effect model, control variables including age, size and leverage have significantly impact on ROA. The positive coefficient of size implies that firms with larger size tend to be more efficient since they experience economies of scale. The significantly negative relationship between firm age and ROA is consistent with life cycle theory (DeAngelo *et al.*, 2006). Older firms tend to have lower growth rate and thus they have lower profitability. Moreover, we find that firms with higher leverage ratio earn lower income. This finding is in line with transaction cost theory, firms pay excessive costs of financing debt and thus experience lower performance. As fixed effects model already control for individual effects so industry dummies are not necessary and omitted from the model.

According to the extant literature, the impact of oil price on firm profitability varies across firm size (Narayan and Sharma, 2011). Therefore, we divide the research sample in two four groups by quartiles of firm size.

Table 5. The impact of oil price on firm profitability across firm size

Quartile	FEM	No. observations	No. of firms
1st quartile	-3.95*** (0.51)	1744	412
2nd quartile	-1.76*** (0.42)	1737	749
3rd quartile	-2.86*** (0.36)	1739	469
4th quartile	-2.00*** (0.31)	1740	322

Notes: Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculation

Table 5 presents the effect of oil price on firm profitability by firm size. Hausman test also suggests fixed effect model. Profitability of firms is most affected by oil price change in the first quartile and least affected in the fourth quartile. Although the magnitude of oil price impact is small in second quartile, the cofficients of oil price in the three remainings reflect the size effect.

Table 6. The impact of oil price on firm profitability across industry

Industry	FEM	No. observations	No. of firms
Agriculture	-0.03 (0.76)	616	84
Consumer product	-2.67*** (0.63)	526	77
Energy	0.53 (0.57)	468	55
Estate & Construction	-3.56*** (0.28)	2,594	326
Industrial	-2.59*** (0.61)	855	117
Material	-1.82*** (0.65)	687	101
Medicine	-1.86* (0.97)	181	23
Service	-1.72*** (0.50)	731	97
Technology	-5.93*** (0.98)	221	30
Others	-18.63* (10.11)	81	41

Notes: Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculation

Besides, we continue to investigate the relationship between oil price and firm profitability across industry. Hausman test also suggests fixed effect model. Table 6 shows that most of the industries are negatitvely affected by increases in oil price. However, there is no significant relationship between oil price and firm profitability in agriculture and energy.

5. Additional analysis

To ensure the robustness of our findings, we also use return on equity (ROE) as the dependent variable in stead of ROA in Equation (1).

Table 7. Impact of oil price on return on equity

Variables	OLS	REM	FEM
Op	-1.73***	-1.81***	-2.33***
	(0.21)	(0.08)	(0.25)
Age	0.06***	-0.02***	-0.45***
	(0.00)	(0.00)	(0.11)
Size	-0.04	-0.73***	0.67***
	(0.03)	(0.11)	(0.07)
Lev	-12.80***	-11.04***	-11.51***
	(0.22)	(0.35)	(0.39)
Constant	22.81***	29.83***	30.34***
	(1.12)	(2.02)	(1.12)
Number of observations	6,960	6,960	6,960
R^2	0.2300	0.0892	0.1426
Industry dummies	Yes	Yes	No

Notes: Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculation

Since the global financial crisis 2007 – 2009 may affect the relationship between oil price and firm profitability, we add a crisis dummy (cri) assigned 1 for the period 2007 – 2008 and its interaction with oil price to Equation (1) to investigate the role of the finanical crisis.

$$ROA = \beta_0 + \beta_1 op + \beta_2 cri + \beta_3 op*cir + \beta_4 size + \beta_5 age + \beta_6 lev + \beta_7 industry + u \quad (2)$$

Table 8 shows regression results for both dependent variables including ROA and ROE. We find that the interation between oil price and crisis dummy is negatively related to both ROA and ROE at 1% of significance. These findings imply that the negative impact of oil price on firm profitability is stronger during the crisis period 2007 – 2008.

Table 8. The role of the financial crisis

Variables	OLS	REM	FEM
Op	-1.73***	-1.81***	-2.33***
	(0.21)	(0.08)	(0.25)
Age	0.06***	-0.02***	-0.45***
	(0.00)	(0.00)	(0.11)
Size	-0.04	-0.73***	0.67***
	(0.03)	(0.11)	(0.07)
Lev	-12.80***	-11.04***	-11.51***
	(0.22)	(0.35)	(0.39)
Constant	22.81***	29.83***	30.34***
	(1.12)	(2.02)	(1.12)
Number of observations	6,960	6,960	6,960
R^2	0.2300	0.0892	0.1426
Industry dummies	Yes	Yes	No

Notes: Standard errors are in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Author's calculation

6. Conclusion

Using a sample of 6,960 observations from 951 firms listed in HOSE and HNX between 2005 and 2016, we find supporting evidence for the negative impact of oil price on firm profitability. Our research findings are consistent with three regression approaches including pooled OLS, fixed effect and random effect. These results imply that oil price may increase firms' production costs and/or sales revenue and thus lead to lower profitability.

Vietnamese economy significantly relies on fossil fuel and thus experiences an economic downfall in response to a rise in oil price. Empirical evidence of this paper is also consistent with previous studies by Tran (2017) and Pham *et al.* (2015). In addition, the paper contributes to literature about the impact of oil price across industry, firm size and thus helps policy-makers understand how oil price volatility is transmitted in the economy. Specifically, firms in most of sectors except for energy experience a fall in ROA when oil price soars. The positive relationship between firm size and firm performance indicates that larger firm earn higher return due to economies of scale. Age has a negative association with firm profitability since older firms have fewer growth opportunities.

Based on the research findings, corporate managers should keep track of the oil prices in order to propose an appropriate plan. In addition, policy makers should have policies to support enterprises in order to avoid economic downturns when the economy experiences a shock caused by oil price.

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