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The relationship between global oil prices and the profitability of Dutch public companies

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Aim: This study honors the pioneering work by André Dorsman on energy finance, especially on oil prices and company performance. The objective is to investigate the relationship between the global oil price and the profitability of Dutch companies.

Design / Research methods: In our research, a model is formed which evaluates the relationship between a global oil price index and the profitability of Dutch public companies. Publicly available data from 143 Dutch listed firms during the period 2010 till 2023 has been used to conduct this research. Besides the independent variable (the oil price) and the dependent variables (return on assets and return on equity), a firm's leverage, market capitalization and degree of internationalization are used as control variables in the conceptual model. The model is evaluated via multiple panel regression analyses.

Conclusions / findings: We reveal a positive relationship between the oil price and the return on assets as well as the return on equity. However, this relationship is dependent upon the presence of oil and energy related companies in the sample. When oil and energy related companies are removed from the sample, no relationship is found between the global oil price and profitability. The control variable market capitalization is found to be significant and positively related to return on equity and return on assets. Contrary, the control variable leverage is found to be negatively related to return on assets. The variable for degree of internationalization of Dutch firms is insignificant for all the regression models, indicating that there is no linear relationship between the degree of internationalization and profitability.

Originality / value of the article: The study confirms a complicated relationship between oil prices and company profitability.

Keywords: oil price, profitability, Dutch companies
JEL Codes: G10, L95

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1. Introduction

This study honors the pioneering work of André Dorsman in the practice and scholarly field of energy economics and finance, both in in the Netherlands and way beyond, as the long-term President of the Center for Energy Economics and Value Issues (CEVI).

Our research paper investigates the relationship between the global oil price and the profitability of Dutch companies. Oil, also known as crude oil or petroleum is a liquid naturally formed in certain geographical locations. The product is used for many applications such as transportation, heating, food production and cosmetics. The versatility and frequency of use of the product causes oil to be a determinant of economic growth (Hanabusa 2009).

Oil is sold in the form of barrels in the global commodity market. The price per barrel is determined by supply and demand conditions. The supply of oil is mostly controlled by a small number of countries, these countries are participating in, or aligning with, the so-called OPEC(+) cartel. The Organization for Petroleum Exporting Countries controls around 40% of the global oil supply. These countries organize meetings to determine the cumulative oil supply. The supply decisions made in the OPEC(+) meetings change the price per barrel. The demand for oil is more fluent and can move due to changes in factors such as: economic growth, energy consumption and geopolitical.

Since oil is used for such a variety of applications, the price of oil influences the costs companies make. Most frequent expenses include transportation costs and manufacturing costs, but oil also changes other business expenses. Therefore, it is expected that oil prices change the profitability of companies.

Research has indicated that a higher oil price results in more profit for companies in the oil & gas industry (Dayanandan, Donker 2011). Despite the lack of oil exports in the Netherlands—the Netherlands imported 98 million tons of oil in 2020 and during the same year there were no exports, there are still 12 companies included in the sample of this research paper, which are in the oil and/or energy sector.

Given the fact that The Netherlands has no oil exports, it is expected that Dutch business are negatively affected by higher oil prices since their business expenses will

increase. Nevertheless, it should be noted that a high oil price is the effect of a high demand, supply, or both. Moreover, generally, a high oil demand is associated with much economic activity.

Considering that there is no dominant paradigm on the effect of the oil price on the Dutch economy, this paper seeks to provide answers to the question: *'How does the global oil price relate to the profitability of Dutch public companies?'.* Company managers can use the results provided to support their profitability forecasts, and ultimately to be better informed about the effects of the oil price on the Dutch economy.

With the aim of answering the research question, a conceptual model was formed. The model relates the effects of oil prices (independent variable), firm size (control variable), leverage (control variable), and degree of internationalization (control variable) to the profitability (dependent variable) of Dutch companies.

The sample used includes 143 public companies with their headquarters located in the Netherlands. Yearly data from the period 2010–2022 is used. The company specific data (firm size, leverage, degree of internationalization and profitability) is sourced via Eikon Refinitiv. The oil price is sourced from the OPEC reference basket, ORB (https://www.opec.org/opec_web/en/data_graphs/40.htm). This index is made up of the Saharan Blend (Algeria), Djeno (Congo), Zafiro (Equatorial Guinea), Rabi Light (Gabon), Iran Heavy (Islamic Republic of Iran), Basra Medium (Iraq), Kuwait Export (Kuwait), Es Sider (Libya), Bonny Light (Nigeria), Arab Light (Saudi Arabia), Murban (UAE) and Merey (Venezuela).

Since the data is likely affected by heteroscedasticity and autocorrelation problems, the conceptual model is tested via a GLS (generalized least squares) estimator instead of the OLS (ordinary least squares) method. A fixed effects and random effects model are performed, whereafter a Hausman test is performed to evaluate which model can best evaluate the data. Thereafter, the effect of the oil price on the return of equity is measured. Finally, two fixed effects regressions are performed. The regressions are on a sample excluding the oil and energy companies while the second sample excludes all companies except those in the oil and energy sector.

A detailed description of the available literature can be found in the literature review in section 2. The descriptive statistics and research design are explained in the methodology section (3). The regression results can be found in the findings (section 4). The discussion of the findings is provided in section 5. The conclusion of the research follows in section 6. Finally, limitations and recommendations are given (section 7).

2. Literature review

The literature review is based upon peer-reviewed articles published by renowned journals. In total, 11 major articles have helped to develop this research. A summary of these articles is available upon request. In this literature review, a selection of three main articles has been made. The articles helped to define and select the independent variables. Additionally, the articles provided a base for forming the tested hypotheses.

The available literature on the topic can be categorized in two broad categories: oil, and profitability. Naturally, academic articles combining the two topics are most relevant. Despite their relevance, there seems to be a lack of articles combining oil and profitability. More commonly, the relationship between oil and economic factors such as growth and inflation are studied.

2.1. Oil price

The independent variable (the oil price) is often measured as the WTI (West Texas Intermediate) oil price or the Brent Crude oil price. Selecting one of the two, or the wrong price indicator, can lead to decreased reliability of the research. The wrong price indicator can be selected, or more commonly, the price indicator selected does not (completely) represent the variable.

The paper *The oil price does not exist* (Original title in Dutch: *'De' olieprijs bestaat niet*) written by André Dorsman, Jerry de Leeuw and Ranjit Nelissen (2008) helps to define the variable 'oil price'. The authors of the paper note that there is not a single oil price. There are different oil prices based upon different qualities of oil and geographic areas. The authors recommend using an index, combining different

oil prices, to correctly measure the variable. We pick up this notion by using the OPEC-index ORB.

2.2. Hypothesis formation

Understanding the relationship between the oil price and economic factors can help to develop a hypothesis regarding the nature of the effect. Does a higher oil price cause profitability to grow or to decline?

In the paper *The Impact of International Oil Price Fluctuation on China's Economy* written by Zhang Qianqian (2011), the author studies the effect of oil price fluctuations on China's economy. The research establishes that the oil price is negatively correlated with net exports and real output. Additionally, the author finds evidence for a positive link between oil prices and inflation.

Concluding from the findings in the study by Qianqian (2011), it is expected that a higher oil price is bad for the real output and net exports of the Netherlands. Moreover, a higher oil price would cause inflation to be higher. All three causations found have bad implications for the profitability of companies.

The findings from *Oil prices and profitability performance: sector analysis*, written by Woraphon Wattanatorn and Termkiat Kanchanapoom (2012), illustrate an opposing view. In this paper, the authors have used data from the Thailand stock exchange. The findings suggest that during the period between 2001 and 2010 the oil price has had a positive impact on the profitability of companies in the energy and food sectors. The study focusses on other sectors to, but no significant effects were found.

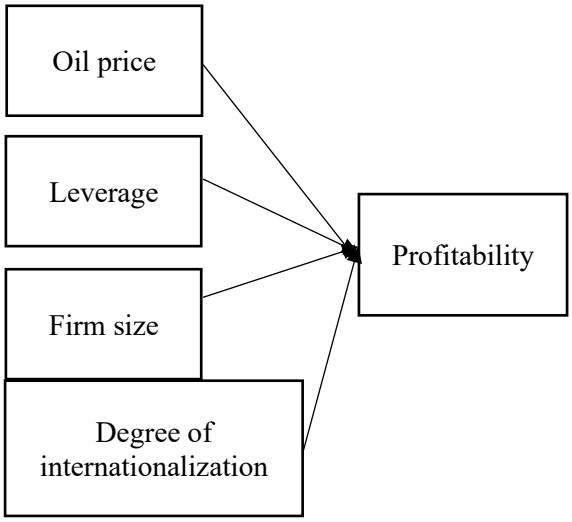
The two papers illustrate conflicting effects of oil prices. While in the paper authored by Qianqian (2011) negative effects of a high oil price are shown, the paper by Wattanatorn and Kanchanapoom (2012) finds that a high oil price has a significant positive effect on the profitability of some industry sectors.

The opposing effects have helped with forming the following set of hypotheses:
H0: There is no relationship between oil prices and profitability.
H1: There is a relationship between oil prices and profitability for companies in the oil & energy sector.
H2: There is a relationship between oil prices and profitability.

3. Methodology

Based on the literature review, a conceptual model (see Figure 1) was made to investigate the relationship between oil prices and profitability in the sample.

Figure 1. Conceptual model



Source: own elaborations.

3.1. The data

The variable specifications are given in Table 1 below. Control variables help to define the relationship between the oil price and profitability. Leverage, size and degree of internationalization are chosen as control variables.

In total, four regressions are performed on the whole sample and two regressions are performed on a subset. The whole sample includes all (143) public companies headquartered in the Netherlands. The two regressions on the partial dataset divide the sample into two groups. One regression includes all oil and energy related companies (12) and the other one excludes these (131). The sample data excludes funds and is solely focused on companies with ordinary shares. Yearly datapoints during the period 2010–2022 are used as the regression input. The firm specific data (leverage, firm size, degree of internationalization and profitability) is sourced via

Refinitiv Eikon. The oil price is sourced via the ORB (OPEC Reference Basket), an index combined of different oil prices denoted in dollars per barrel. Since the dataset covers multiple variables over a 12-year period, the data is categorized as panel / longitudinal. Panel data is likely to have heteroscedasticity and autocorrelation problems. Therefore, the GLS (generalized least squares) estimator is used here.

Table 1. Specification of variables

Independent variables	**Measurement form**	**Formula**
Profitability	Return on assets is used as the main measure for profitability.	$ROA = \frac{Net\ income + interest\ expense}{Total\ assets}$
	Return on equity is used to confirm the main measurement for profitability.	$ROE = \frac{Net\ income}{Shareholders\ equity}$
Dependent variable:		
Oil price	The OPEC basket price is used. The OPEC basket price is an index composed of different oil prices denoted in dollars per barrel of oil.	
Control variables:		
Firm size	Market capitalization is used as the measure for firm size. Market capitalization is measured in dollars.	$Market\ capitalization = Total\ shares * shareprice$
Degree of internationalization	Total foreign sales in relation to total sales is used as the measure for the degree of internationalization.	$\%\ of\ foreign\ sales = \frac{Foreign\ sales}{Total\ sales}$
Leverage	The debt to equity equation is used to measure leverage.	$Leverage = \frac{Total\ debt}{Total\ equity}$

Source: own elaborations.

3.2. Outliers

Boxplots were made to examine the raw data distribution. The boxplots illustrated that the raw data contained many outliers. The outliers in the dataset generated from Refinitiv Eikon were compared to reported data in the income statements and annual reports of the companies and if needed replaced by the latter.

The descriptive statistics in Table 2 below indicate that the data on: return on assets, return on equity, market capitalization and leverage do not follow a normal

distribution. Nevertheless, data on the oil price and percent of foreign sales nearly follow a normal distribution.

To decrease the skewness and kurtosis of the market capitalization and leverage variables, the natural logarithm of the variables is used in the regressions. For the independent variables (return on assets and return on equity), no adjustments were made. The skewness and kurtosis cannot be decreased by forming a natural logarithms of the variables since the datapoints of the variables are dual-signed (negative and positive).

Table 2. Descriptive statistics

Variable	Number of observations	Skewness	Kurtosis	Median	Min	Max
Return on assets	1,327	-4.7	33.07	2.11	-254.57	64.23
Return on equity	962	-2.61	73.71	0.10	-22.35	19.53
Oil price	13	0.03	1.52	69.89	40.76	109.45
Market capitalization	1,338	7.99	93.42	547 million	10.53	327 million
Ln (market capitalization)	**1,338**	**-0.74**	**4.25**	**20.12**	**2.35**	**26.51**
Leverage	1,190	4.36	29.47	59.98	0	1397.99
Ln (leverage)	**1,190**	**-1.73**	**8.43**	**4.14**	**-3.91**	**7.24**
Percent foreign sales	805	-0.56	2.43	66.76	0.08	100
Bold variables represent the normal variables transformed to a natural logarithm.						

Source: own elaborations.

A correlation matrix was made to understand the correlations between the variables. The matrix shows that there is no correlation greater than |0.3| indicating that there is no severe multicollinearity between the dependent variables. Furthermore, the matrix indicates that most correlations are not apparent, while some are weak.

3.4. Research design

To test the hypotheses according to the conceptual model, six regression models are formed.

3.4.1. Abbreviations used in the model equations:

$\beta =$ the coefficient for the variables.
$\alpha_1 =$ represents the intercept.
$v_i =$ represents the firms random effects.
$i =$ reprensents the different firms.
$t =$ reprensents the different years.

3.4.2. Model 1

Model 1 measures the effect of the oil price on the return on assets. The model used is a fixed effects model:

$$Return\ on\ assets_{it} = \alpha_{1i} + \beta_1 * Oil\ price_{it} + \beta_2 * \ln(Market\ capitalization_{it}) + \beta_3 * \ln\left(\frac{Debt}{Equity}_{it}\right) + \beta_4 * \frac{Foreign\ sales}{Total\ sales}_{it} + \varepsilon_{it}$$

3.4.3. Model 2

Model 2 measures the effect of the oil price on the return on assets: The model used is a random effects model:

$$Return\ on\ assets_{it} = \alpha_1 + \beta_1 * Oil\ price_t + \beta_2 * \ln(Market\ capitalization_t) + \beta_3 * \ln\left(\frac{Debt}{Equity}_t\right) + \beta_4 * \frac{Foreign\ sales}{Total\ sales}_t + v_i + \varepsilon_{it}$$

3.4.4. Hausman test

To test whether the fixed or random effects model is more representative for the sample, a Hausman test is performed.

3.4.5. Model 3

In model three, the internationalization variable is included as a dummy. The dummy variable is constructed so that:

$Dummy\ is\ 0\ when$:
$$\frac{Foreign\ sales}{Total\ sales} \leq 0.5$$

$Dummy\ is\ 1\ when$:
$$\frac{Foreign\ sales}{Total\ sales} > 0.5$$

The regression equation used is similar to the fixed effects model:

$$Return\ on\ assets_{it} = \alpha_{1i} + \beta_1 * Oil\ price_{it} + \beta_2 * \ln(Market\ capitalization_{it}) + \beta_3 * \ln\left(\frac{Debt}{Equity}_{it}\right) + \beta_4 * Dummy_{it} + \varepsilon_{it}$$

3.4.6. Model 4

Model 4 uses the same independent and control variables as the other models. However, model 4 includes a different independent variable. In model 4 the effect of the oil price on the return on equity is measured. Testing the independent and control variables on a diffferent measure for profitability increases the external validity of the research. Additionally, this will help to verify and define the relations found in the models using the independent variable return on assets. Model 4 uses a fixed effects regression:

$$Return\ on\ equity_{it} = \alpha_{1i} + \beta_1 * Oil\ price_{it} + \beta_2 * \ln(Market\ capitalization_{it}) + \beta_3 * \ln\left(\frac{Debt}{Equity}_{it}\right) + \beta_4 * \frac{Foreign\ sales}{Total\ sales}_{it} + \varepsilon_{it}$$

3.4.7. Model 5 & 6

Models 5 and 6 use the same regression model and equation as model 1. However, model 5 excludes oil and energy companies in its sample and model 6 only includes oil and energy companies in its sample. The purpose of these regressions is to evaluate the influence oil and energy companies have on the regression results.

Table 3. Regression results

Dependent variable	Return on assets			Return on equity	Return on assets	
Variables	Model 1***:	Model 2***:	Model 3***:	Model 4*:	Model 5***:	Model 6***:
Constant	-71.0908*** (10.25234)	-37.098*** (6.6411)	-71.106*** (10.2320)	-1.053* (0.5447)	-65.44*** (11.089)	-73.9138** (30.7747)
Oil price	0.0285*** (0.0107)	0.0205** (0.0106)	0.0282*** (0.0107)	0.0014** (0.0006)	0.0140 (0.1105)	0.11284** (1.5481)
Ln market capitali-zation	3.4979*** (0.4719)	1.8593*** (0.3092)	3.4938*** (0.4645)	0.0501** (0.0249)	3.2476*** (0.5066)	3.994** (1.5481)
Ln leverage	-0.75978*** (0.3595)	-0.70014** (0.3144)	-0.75434** (0.35933)	0.00146 (0.0206)	-0.4481 (0.3579)	-4.5188* (1.7168)
Percentage of foreign sales	0.00757 (0.0207)	0.01576 (0.0185)		-0.00044 (0.0011)	-0.0008 (0.0215)	0.0393 (0.065)
Internatio-nalization			0.79441 (1.0110)			
R-squared:	0.0283	0.0304	0.0284	0.0838	0.0230	0.0431
R-squared within	0.1029	0.0986	0.1036	0.0160	0.0838	0.3226
R-squared between	0.0422	0.0419	0.0423	0.2959	0.0399	0.0864
Number of observations:	680	680	680	599	613	67
P-value:	0.000	0.000	0.000	0.0778	0.000	0.0018
Significance levels: *=90%, **=95%, ***=99%.						

Source: own elaborations.

4. Results

4.1. Model 1: fixed effects model

The regression results in Table 3 show that the p-value for the F-statistic is 0.000. Therefore, it can be said with more than the 99% confidence level that the model has explanatory power. However, the model can only explain 2.83% of the change in return on assets.

The data on the individual estimators for return on assets reveal that the effect of oil price on ROA is significant at the 99% level. There seems to be a positive relation between the variables where a 1 dollar increase in oil price increases ROA by 0.0285 percentage points, ceteris paribus.

The control variables for firm size (the natural logarithm of market capitalization) and leverage are significant at the 99% and 95% level, respectively. When the natural logarithm of market capitalization increases by 1%, the ROA increases by 0.0349 percentage points, ceteris paribus. The natural logarithm of leverage has a negative relation to ROA. When the natural logarithm of leverage increases by 1%, the ROA decreases by 0.0075978 percentage points, ceteris paribus.

The control variable measuring the degree of internationalization has shown to be insignificant.

4.2 Model 2: random effects model

The regression results of the random effects model show that the p-value for the chi-squared test statistic is 0.000. Therefore, it can be said with more than the 99% confidence level that the model has explanatory power. However, the model can only explain 3.04% of the change in return on assets.

The data on the individual estimators for return on assets reveal that the effect of oil price on ROA is significant at the 90% level.

The control variables for firm size and leverage have shown to be significant at the 99% and 95% level, respectively. When the natural logarithm of market capitalization increases by 1, the ROA increases by 0.0186 percentage points, ceteris paribus. The natural logarithm of leverage has a negative relation to ROA. When the

natural logarithm of leverage increases by 1, the ROA decreases by 0.0070 percentage points, ceteris paribus.

The control variable measuring the degree of internationalization has shown to be insignificant (again).

4.3. Hausman test

Models 1 and 2 indicate similar results. To test whether the fixed or random effects model is better, a Hausman test was performed.

The datapoints used are likely to be affected by individual (firm) characteristics. Therefore, the fixed effects model is expected to be the most appropriate regression model.

The results of the Hausman test confirm this hypothesis. The results show that with the 99% confidence level, the fixed effects model is more appropriate for this sample compared to the random effects model.

4.4. Model 3: fixed effects model, including dummy variable

Model 1 and 2 results show that internationalization (measured in foreign sales divided by total sales) has no significant impact on return on assets.

To confirm the finding that internationalization indeed has no statistically significant effect on the return of Dutch companies, regression model 3 was performed. It includes the percent of foreign sales variable as a dummy. The regression shows comparable results to that of model 1. In both models, the internationalization variable is insignificant. The addition of a dummy variable has not changed the significance of the internationalization variable.

4.5. Model 4: return on equity

The regression results on model 4 show that the p-value for the F-statistic is 0.0778. The model can explain 8.38% of the variation in return on equity at the 90% significance level. This coefficient of determination is notably higher than the coefficients of determination of the models measuring the variation of return on assets.

The data on the individual estimators for return on equity reveal that the effect of oil price on ROE is significant at the 95% level. There appears to be a positive relation

between the variables where a 1 dollar increase in oil price increases ROE by 0.13571 percentage points, ceteris paribus.

The control variable for firm size is significant at the 95% level, while the other control variables are not significant. When the natural logarithm of market capitalization increases by 1%, the ROA increases by 0.00050055 percentage points, ceteris paribus.

4.6. Model 5: fixed effects model excluding oil and energy companies

The sample of model 5 excludes oil and energy companies. Therefore, model 5 can help to evaluate the relationship between the oil price and the profitability of non-oil and non-energy companies.

The findings show that the model is significant at the 99% level. Nevertheless, the oil price is found to be insignificant. This indicates that for non-oil and non-energy companies there is no relationship between the oil price and profitability.

There appears to be a highly significant and positive relation between the natural logarithm of market capitalization and return on assets. When the natural logarithm of market capitalization increases by 1% return on assets increases by 0.0324763 percentage points, ceteris paribus.

The control variables leverage, and percent of foreign sales are insignificant for this model.

The r-squared value of this model is 0.0230. This is the lowest coefficient of determination of all the tested models.

4.7. Model 6: fixed effects model, only oil and energy companies

Model 6 is a fixed effects model used on a sample only including oil and energy companies. The regression results show that the model is significant at the 99% level. Additionally, the model can explain 4.31% of the variation in the return on assets of the companies in the sample.

The coefficients of the individual estimators for return on assets reveal that the oil price variable is significant at the 90% level. A 1 dollar increase in the oil price increases the return on assets by 0.1128384 percentage points, ceteris paribus.

The control variables for market capitalization and leverage are significant at the 90% level and indicate that a 1% increase in the natural logarithm of market capitalization causes the return on assets to increase by 0.03994251 percentage points, ceteris paribus. A 1% increase in the natural logarithm of leverage causes the dependent variable to decrease by 0.04518809 percentage points ceteris paribus.

5. Discussion

The findings show that the oil price has a positive effect on the profitability of Dutch public companies. However, the findings also show that this relationship is based upon the presence of oil and energy related companies in the sample.

The finding establishing the positive and significant effect of the global oil price on the profitability of oil and energy related companies confirms previous studies such as the ones by Dayanandan & Donker (2011) and Wattanatorn & Kanchanapoom (2012). Both papers acknowledge the positive relationship the oil price has on the profitability of oil and energy related companies.

Existing literature evaluating the relationship between global oil prices and the profitability of companies, provides divergent results regarding the nature of the effect of oil prices on profitability. The literature is known to be focused on single countries in its analysis. This is causing the presence of country dependent factors such as the type of companies in the country, the countries' dependence on oil, the number of oil related companies in the sample, etcetera, to determine the nature of the relationship between global oil prices and profitability.

The findings have shown that the presence of oil and energy related companies in the sample cause the overall relationship between oil prices and the profitability to be positive. The strong presence of oil and energy related companies in the sample helps to explain this finding. From the 143 currently operating public companies in The Netherlands, 12 operate directly in the oil and/or energy sector. Historically, The Netherlands always had a strong energy sector including names such as Royal Dutch Shell (till 2022). Additionally, it should be considered that the Netherlands was a major exporter of natural gas during the sample period. The well-established co-

movement of the oil and gas price could have caused the Dutch economy to indirectly profit from higher oil prices.

The findings have also shown a positive and highly significant effect of company size on profitability. This effect is a long-established phenomenon. Bigger companies can benefit from economies of scale, have more buying power and are known to operate in industries with high barriers to entry. Additionally, bigger companies have more and better access to (scarce) resources.

The control variable for leverage was significant in four of the six models. In the models where leverage was significant, leverage negatively influenced return on assets. The negative effects of leverage on profitability contradicts the general view on the risk-return relationship. Many studies have supported the Capital Asset Pricing Model, which establishes a positive relationship between risk (leverage) and return (profitability).

Lastly, the results have indicated that the degree of internationalization measured by foreign sales as a percentage of total sales has no significant impact on profitability. The benefits and drawbacks of internationalization may have similar strengths. The downsides of internationalization include cultural differences, political risk, exchange rate risks, etcetera. The benefits of internationalization include economies of scale and scope, access to new resources, diversification etcetera. The finding regarding the internationalization variable is similar to that of other papers. The literature suggests that there is a relationship between internationalization and return on assets. However, this relationship is not linear. Riahi-Belkaoui (1998) found that when the level of internationalization increases, there is a fluctuation in the rate of return on assets, initially decreasing, then increasing, and eventually experiencing a slight decrease. Since the regressions models used are based upon linear relationships, it seems logical that the internationalization variable is not significant in the tested models.

6. Conclusion

Five fixed effects regressions and one random effect regression have been performed. The Hausman test has confirmed that the fixed effects regressions are more representative for this sample data. Therefore, models 1, 2, 3, 5 and 6 are the most relevant models for answering the research question.

All models on the whole sample (model 1, 2, 3 & 4) confirm that there is a significant and positive relationship between the oil price and profitability. Models 1, 2 and 3 show a positive relationship between the oil price and return on assets, while model 4 illustrates a positive relationship between the oil price and return on equity.

Models 5 & 6 have shown that the relation between oil prices and profitability is dependent upon the presence of oil and energy related companies in the sample. Model 5 did not include oil and energy related companies in the sample, this resulted in an insignificant relationship between the oil price and return on assets. Contrary, Model 6 only included oil and energy related companies. The regression coefficients of model 6 showed a significant and strong relationship between the global oil price and profitability.

The control variable size (measured as the natural logarithm of market capitalization) is significant for all models. The control variable leverage is insignificant for the model measuring the effects on return on equity (model 4) and the model excluding oil and energy related companies (model 5).

The control variable measuring the degree of internationalization (percent of foreign sales with respect to total sales) is insignificant in all models. If the degree of internationalization is transformed to a dummy variable, it remains insignificant.

The coefficients of determination indicate that model 6 can best explain the variation on return on assets within firms. The model accounts for 32.26% of the variation within firms. Model 6 is also the best in explaining the variation of return on assets between firms. The model accounts for 8.64% of the variation in return on assets between firms.

Since all models on the whole sample are significant and show that the oil price has a significant and positive impact on profitability, the null hypothesis can be rejected:

~~*H0: There is no relationship between oil price and profitability.*~~

Additionally, hypothesis 1 can be accepted. Model 6 has shown that the oil price has much influence on the profitability of Dutch public companies operating in the oil and energy sector.

H1: There is a relationship between oil prices and profitability for companies in the oil & energy sector.

Lastly, hypothesis 2 can only be accepted partly. Model 1, 2, 3 & 4 have shown that the oil price positively affects the profitability of Dutch companies. However, model 5 & 6 suggest that this relationship is mostly based upon the presence of oil and energy related companies in the sample.

H2: There is a relationship between oil prices and profitability.

7. Limitations and recommendations

7.1. Limitations

Honoring pioneer work by André Dorsman, this study handles an interesting but limited topic: the relationship between global oil prices and the profitability of Dutch public companies.

This study has shown that the oil price has a positive impact on Dutch oil and energy related companies. Our conceptual model can explain 4.31% of the variation in return on assets of oil and energy related companies in the Netherlands. The model covers 8.38% of the variation in return on equity of all Dutch public companies.

The research is done in a straightforward way, with little support from the literature, but with an interesting tweak when non-energy companies are left out. Although the findings of the study are mostly similar to the existing literature, the study can still suffer from biases and imperfections. The study is prone to a couple biases. Firstly, no time lags are used. This can result in reverse causality. However,

this bias is limited, since the oil price is more likely to affect profitability than vice versa.

Additionally, the study can suffer from third variable bias. Variables such as the gas price and the exchange rate can have an influence on the outcome of the results. Although the control variables in this study are selected upon the precedent set by several papers, it is possible that more control variables influence the relationship between the oil price and profitability.

Finally, it should be noted that some variables did not follow a normal distribution. To make the variables more normally distributed, natural logarithms were used to transform the variables leverage and market capitalization. Yet, for the independent variables return on assets and return on equity, natural logarithms could not be used to decrease the skewness and kurtosis. The independent variables are dual-signed (negative and positive), and natural logarithms cannot be taken from negative numbers.

7.2. Suggestions for further research

The literature review has indicated that there have been several studies on the effects of the oil price on profitability and the economy. However, these studies lack generalizability. Country and company dependent factors may moderate the relationship between the oil price and the profitability of companies. The results of this study have shown that the presence of oil and energy related companies in the sample change the relationship between the oil price and profitability. Having a better understanding of which factors change the relationship between the oil price and profitability will help company managers to improve their forecasts and make more informed decisions.

Furthermore, the results of the study have shown that leverage negatively influences return on assets. This violates the Capital Assets Pricing Model (CAPM). The model suggests that more risk should be rewarded by more return. Further research could investigate the surprising results that in this study, risk (measured by leverage) was not rewarded by return (measured by return on assets and return on equity).

7.3. Managerial implications

The results of this study provide key points that managers can use to their benefit:

1. Managers of oil and energy related companies should closely analyse the fluctuations in the oil prices. The managers should develop strategies that capitalize on favourable oil prices to maximize their company's profitability.
2. Managers of non-oil and non-energy related companies should not be excessively concerned about fluctuations in the oil price. The focus of these managers should primarily be on their company's industry-specific factors.
3. Managers should carefully manage the capital structure. Excessive leverage can negatively impact the return on assets.
4. Managers should recognize the impact of company size on profitability. Larger companies have certain advantages such as greater access to resources and economies of scale.
5. Managers should carefully examine the potential benefits and risks related to internationalization. While this can offer strategic advantages, there is no guarantee for increased profitability.

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