Research Paper

ANALYSIS OF FINANCIAL RISK EXPOSURE IN MALAYSIA OIL AND GAS INDUSTRIES

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Abstract

The world has witnessed significant variation in the oil prices because of its economic relation with supply and demand. Oversupply of the oil products has affected oil companies across the world including Malaysia. These changes are considered the biggest in history or at least in the last few decades. These variations are posing significant risk on the oil and gas industry of Malaysia. This research aims at investigating risk exposure to oil and gas industry in order to recommend the ways to oil companies to develop appropriate strategies in the future. Along with this, the study also seeks to identify the internal factors affecting the stock returns of the company. Secondary data was collected in form of monthly average stock prices of the oil and gas companies in Malaysia. Due to the limitations in gathering the data, conclusions are drawn on the basis of secondary data. For this, former data point was collected from West Texas Intermediate website whereas Malaysian oil and gas industry data was obtained from Kuala Lumpur Composite index (KLCI). The data so collected was further analysed using quantitative methods of analysing stock price variation and risks. From the application of regression analysis, it was found that there was a significant variation. It was also concluded that risk of the oil companies differ across the firms. Oil and gas companies in Malaysia are also recommended to employ risk management measures by using the experience of highly experienced finance professional to get prevented from future shocks in stock and oil prices.

Key Terms: Financial Risk Exposure, Oil & Gas, Stock Index, Stock Price Shock
1. Introduction

The major issue in this study is to identify relation of oil price fall or rise to equity returns of oil and gas sector which includes both overall sector and individual firms. As an example, Exposure to oil price change of an oil and gas company can be measured by calculating fraction change in the value of a company emanating from a percent change in oil price (Bodbar, Dumas & Marston, 2002). Board members of the company can evaluate effect of oil price risk on firm's equity return change in order to decide if they want to hedge the risk of changing oil price. Literature suggests that hedging does help in reducing the company's stock price sensitivity to oil price movement (Jin & Jorian, 2006). Also it is worthwhile to further investigate the effect of oil price movement on different sub sectors of oil and gas sector as literature suggests that in many countries, oil price risk exposures of upstream oil & gas exploration and production category is much higher as compared to Midstream and downstream (Mohanty & Nandha, 2011).

Research objectives

- To identify effect of oil price rise/ fall on Malaysian oil and gas companies stock return operating in the oil and gas sector
- To study level of impact of oil price risk on various sub sectors of oil and gas sector
- To analyse internal factors of a company which can have different level of effect on company's stock returns due to oil price fall or rise.

2. Literature Review

The international monetary fund provided that oil price changes affect activities of economy, interest rates, corporate environment, monetary policy and inflation of nation that in turn influences the company asset returns as well as stock market. The particular discussion assumes that finance market is effective and any change in prices of oil is incorporated in the prices of stock.

The literature studying the relation between the oil price movements to oil companies’ stock market returns is limited. Manning (1991) analysed the changes in oil price sensitivity to oil and gas company between the periods of 1986 – 1988 which confirmed the positive relationship between stock returns and oil price movements. The same study also differentiated the stock return between the firms involved in the oil exploration and incorporated oil companies. Goodwin and Al-Mudhaf (1993) also examined similar effect of oil prices shocks on 29 listed oil companies of NYSE during the 1973. Also it is found that oil price increase have triggered an upward shift in valuation of companies engaged in production and refining. Rajgopal (1999) studied that price risks of commodity are connected with oil and gas market sentiments. Sadorsky (2001) examined gas and oil sector of Canada and identified those stock prices are influenced by several risk factors like interest rates, oil prices and market index. Various approaches and methodologies have been used by the researchers to study the influence of oil rates on oil and gas companies stock returns. Aleisa, Dibooglu & Hammoudeh (2003) did a co-integration analysis to study correlation of US oil prices and oil industry of US indices for period 1995 to 2001 which revealed that firms involved in production, exploration, marketing and refining services suffered important equity loses because of changes in oil prices. Boyers and Filion (2007) evaluated the positive relation in between Canadian oil and gas companies’ stock returns and oil price shock. It was also found that price risk sensitivity have changed significantly over the year 1995 – 1998 and 2000 – 2002. Faff and Nandha (2008) proved that changes in oil price have negative influence on all sectors stock returns except for oil and mining firms.

to probe the connection within stock market and oil prices on three distinct levels; the first one is for S&P 500, second for the 12 popular stock indices and the last for the 3 different oil companies. Sadorsky (1999) executed VAR (vector auto regressive model) with monthly data for examining relation in between oil companies stock returns and shock in oil prices as well as determined that volatility of oil price has asymmetric influence on stock returns. Particularly, positive volatility oil price has great influence on gas and oil sector equity returns than the negative volatility. The same has been confirmed by study done by Basher and Sadorsky (2006) in an international multi factor model implemented on oil market data of 21 emerging countries. However, some studies have found the opposite empirical results. For instance, Masih et al. (2011) used the vector error correlation model (VECM method) to conclude that, in general high and volatile oil price either positive or negative can affect the returns of oil companies adversely.

As per Shimon and Raphael (2006), the relation in between oil price changes and stock returns has gained recently great attention of public and business too. It is due to unexpected volatility that are showing by crude prices, which has outcome in energy and financial market plus economies of nation’s uncertainties. The author here showed that volatility in oil prices lead to increased inflation and unemployment thus lead to depression of financial assets and economic growth. In a study done by Jacobs, Kuper & van Soest (2009), it was showed that rise in prices of oil causes inflation in taxes. This forces consumers to search for some other sources of energy apart from crude oil which increases uncertainties and risks. All this has a significant impact on movement in stock prices. The authors had implemented a multi factorial model of arbitration to study conditional and unconditional risk factors. It has been determined that oil prices risk has important impact on stock rates in the place of market.

Naifar & Al Dohaiman (2013) have done study on finding relation in between stock market returns, prices of crude oil and macroeconomic variables. They examined the variables under regime shifts by making use of a sample of GCC countries. For this, model known as Markov regime-switching was used. Additionally, non-linear links in between inflation rates, interest and oil prices. In their study, Archimendean copula models were referred and used. The main findings obtained by them showed that there is dependent relation in between stock market returns and OPEC oil prices volatility. Also, the study showed an asymmetric dependence between prices of oil and rates of inflation. Moreover, it was found there was relation between short term rate of interest and oil prices. They implemented a model known as Vector Error Correction for a period from January 1971- March 2008. The study was done on six OECD countries and results showed a long run relation between returns of stock market and oil prices. It indicates a negative reaction of increase in oil and stock prices. This is because of increase in inflation and cash flows. Reboredo & Rivera-Castro (2013) examined relation between the two variables by making use of daily data consisting of S&P 500 and Europe 600 indexes as well as European and US industrial sectors over a time period of June 21, 2000 to July 29, 2011. The results identified were that oil price changes did not have great influence on stock returns in the period of pre-crisis. But as financial crisis started, positive relationship was identified between oil prices and stock returns both at aggregate and sectorial level.

Oil prices which are a key macroeconomic variable can have a notable effect of equity return of a firm (Huang, Masulis & Stoll, 1996). If a company i achieves a constant cash flow for indefinite period, then the price of the company’s stock i(p), will be the present value of discounted future cash flow, E(CF) at a discount rate of r.

\[ P_i = \frac{\text{Expected}(\text{C.F.})}{\text{Expected}(r)}, \]  
Where, Expected (.) is an expected operator.

It further states that stock return \( R_i \) can be written as:

\[ R_i = \frac{\text{diff}(p)}{p} = \frac{\text{diff}[\text{Expected}(\text{CF})]}{\text{Expected}(\text{CF})} - \frac{\text{diff}[(\text{E}(r))]}{r}, \]  

\[ \text{Eq. 1} \]  
\[ \text{Eq. 2} \]
Where \( \text{diff}(.) \) is a differentiator operator.

Thus, we summarize that stock market returns are influenced by mobility in discount rates and expected cash flow. Oil prices increase can affect company’s cash negatively or positively depending whether the company is consumer of oil or producer. Moreover, if the oil price changes, it can also affect discount rate. Expected value of discount rate is calculated using expected value of inflation rate and expected value of real interest rate. As oil is the major commodity in the nation’s economy, it can affect the inflation rate which in turn means discount rate may also be affected. A higher discount rate will cause an upward movement in hurdle rate of investments made by corporates and hence decrease firm’s stock price. So, overall effect of oil prices change on company’s stock return value depends on net effect due to change in cash flow and discount rates.

Apart from discounted cash flow and discount rate, stock return due to oil price movement also depends on whether the firm is able to hedge against the oil prices. As an example, big corporates are likely to hedge oil price risk due to their cost structure and economics of scale. Moreover prior studies suggest that apart from the hedging techniques, the extent of oil price movement impact on stock price of the firm also depends on the company specific factor like firm size of the company, level of diversification etc. (Tufano, 1998)

Fama and French (1993) presented the three factor model which discusses that apart from the market risk factors, stock return also depend on various non market risk factors like size of the firm, book value of the firm etc. Three factor model (FF model) can be written as:

$$R_{\text{firm}(i)} - R_{\text{free}} = \alpha + B_1 \cdot (R_{\text{firm}(i)} - R_{\text{free}}) + \beta_1 \cdot (\text{SMB}) + \beta_2 \cdot (\text{HML}) + e_i \quad (3)$$

In equation 4, \( \text{Mom} \) is the momentum factor.

FF Carhart model takes systematic risk factors into consideration for the market but it does not cover the commodity price risk at the stand alone firm level or at the industry level. This study of Malaysian oil and gas industries financial risk exposure from oil price change is conducted by augmenting the FF Carhart model and using additional two variables a) oil prices and b) interest rate

The final equation will look like as following:

$$R_{\text{firm}(i)} - R_{\text{free}} = \alpha + B_1 \cdot (R_{\text{firm}(i)} - R_{\text{free}}) + \beta_1 \cdot (\text{SMB}) + \beta_2 \cdot (\text{HML}) + \beta_3 \cdot (\text{Mom}) + \beta_{\text{oil}} \cdot R_{\text{oil}} + \beta_{\text{Int}} \cdot \Delta \cdot (\text{B\text{yield}}) + e_i \quad (5)$$

Where \( R_{\text{oil}} \) is the crude oil price return at monthly level and \( \text{B\text{yield}} \) is the change in 10 year government bond yield which is the proxy for interest rate risk.

The coefficients of the equation \( B_1, \beta_1, \beta_2, \beta_3, \beta_{\text{oil}}, \) and \( \beta_{\text{Int}} \) provide measure of market size of the company, ratio of book to market value, momentum, crude oil price and risk arising from interest rate change. The coefficients of the equation are calculated using SUR (Seemingly Unrelated regression) procedures.

3. **Research Design and Methodology**
In this study, association between oil price shock and equity returns of the companies of oil and gas sectors will be narrowed down. As per the Othman (2009), components of financial risk can directly affect the cost structure and in turn overall performance of this industries which in turn affect global markets. In addition to validate above hypothesis, this study will also be instrumental in analysing the effect of oil and gas price volatility on Malaysia economy on the basis of performance of Malaysian stock market.

3.1 Research Approach

For carrying out the present study, both deductive and inductive approaches have been employed where results moved from specific to general and vice versa. With the help of deductive approach, existing hypothesis that oil and gas industry is adversely affected by oil price shock will be tested and inductive approach will help the study to move from specific to general where results of oil and gas companies can be applied to the whole industry and in turn to entire stock market of Malaysia.

3.2 Research Strategy

A descriptive approach will be implemented for this study which will entail both qualitative and quantitative techniques (Gray 1998). This approach involves collection of the data that describe events and then summarizes, organizes and describe it (Glass & Hopkins, 1984). It also uses visual instruments and aids like charts and graphs to enable reader in the understanding of data distribution conveniently. This kind of research also uses description as a means to articulate data into intelligence information like patterns or insights that emerge during the analysis. These pattern aids in comprehending the quantitative study and its implications. This study is based on the quantitative data which shall be used for statistical calculations to build overall understanding of the research.

3.3 Study population

This study aims to establish the relation between the oil price changes and stock price return of oil and gas companies of Malaysia. The data collection for this would be average monthly oil price and stock return data for Malaysian stock market. Former data point would be collected from West Texas Intermediate website and Malaysian oil and gas industry data would be sourced from Kuala Lumpur Composite index (KLCI). Crude oil prices are used from WTI for following two reasons; Data for oil prices provided by WTI are the most frequently used indices in oil and gas industry studies. Second being the majority of the firms who indulge into hedging instruments like futures, forwards and derivatives use these values from WTI. Stock returns and oil prices will be pulled at monthly level.

3.4 Time Horizons

The time horizon is the time period estimated for the project completion (Saunders et al., 2007). Research onion presents two kind of data for the research study: a) cross sectional b) longitude (Bryman, 2012). Cross sectional time frame is just like taking a snapshot. The paramount feature of this study is that it enables users to compare characteristic of different population groups at a single point of time. Cross-sectional study design enables researcher to analyse many different variables together however it does not provide information about cause and effect relationship. In contrast, longitude study provides several data points/ observations of the same variable over a duration. In our study, a cross sectional time period approach is followed because there are several variables like oil prices, interest rate that are analysed to study their effect on return of oil and gas industries.

3.5 Data Analysis plan
This study shall extract the data points from two different sources that are indicative of a year (52 weeks). Following illustrations provide a snapshot of the kind of data that shall be used and applied in this study representing the two categories. Research tools will be employed which includes observational techniques, case studies which shall provide flexibility of the research as they provide additional dimensions to the study. Case studies will be conducted to give a comprehensive understanding and detailed qualitative point of view to this research. The crude oil price data is pulled from Oil-price.net and is indicative of the current global oil prices level.

**Crude Oil and Commodity Prices**

December, Wednesday 9 2015 - 13:18:05

<table>
<thead>
<tr>
<th>WTI Crude Oil</th>
<th>Brent Crude Oil</th>
</tr>
</thead>
<tbody>
<tr>
<td>$39.97 ▼ -1.11 -2.78%</td>
<td>$43.00 ▼ -0.84 -1.95%</td>
</tr>
</tbody>
</table>

2015.12.08 end-of-day

<table>
<thead>
<tr>
<th>1m</th>
<th>1q</th>
<th>1y</th>
<th>5y</th>
</tr>
</thead>
</table>

Figure 1: Sample data for study

KLSE composite index is sourced from website of World indices. This provides global financial and economic data.

Figure 2: KLSE Composite Index

Return $R_t$ on the index is calculated as follows:

$$R_{\text{index},t} = \left( \frac{P_{\text{index},t}}{P_{\text{index},t-1}} \right) - 1$$

Where $R_{\text{index},t}$ is the percentage return on the KLSE index on any given time $t$, and $P_{\text{index},t}$ and $P_{\text{index},t-1}$ are KLSE index values at the current and previous time period respectively.
4. Results and Discussion

4.1 Correlation between Risk Factors

\( R_{\text{firm(i)}} - R_{\text{free}} \) is the excess monthly return on stock i,

SMB is average monthly return difference of a small market capitalization portfolio and a large capitalization portfolio,

HML is the monthly return difference of high book to market stocks as compared to low book to market stocks portfolio,

\( R_{\text{oil}} \) is the crude oil price return at monthly level and

B\text{yield} is the change in 10 year government bond yield which is the proxy for interest rate risk

<table>
<thead>
<tr>
<th>Table 1: 1993 to 2005</th>
</tr>
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<tbody>
<tr>
<td>( R_{\text{firm(i)}} - R_{\text{free}} )</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>( R_{\text{firm(i)}} - R_{\text{free}} )</td>
</tr>
<tr>
<td>SMB(t)</td>
</tr>
<tr>
<td>HML(t)</td>
</tr>
<tr>
<td>Mom(t)</td>
</tr>
<tr>
<td>Oil price</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 2: 2005 to 2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_{\text{firm(i)}} - R_{\text{free}} )</td>
</tr>
<tr>
<td>-----------------------</td>
</tr>
<tr>
<td>( R_{\text{firm(i)}} - R_{\text{free}} )</td>
</tr>
<tr>
<td>SMB(t)</td>
</tr>
<tr>
<td>HML(t)</td>
</tr>
<tr>
<td>Mom(t)</td>
</tr>
<tr>
<td>Oil price</td>
</tr>
</tbody>
</table>

4.2 Risk Sensitivity of Oil Price

Table 3 represents the result summary of multivariable time series regressions for selected oil and gas companies. Multivariate regression is used to learn the relationship about several independent variables (Market, SMB(t), HML(t), Mom(t), Oil price etc.) and dependent variable (equity return of oil and gas companies). Coefficients of each of the variables were obtained and summarized in Table 3. The results of the regression analysis shows that book to market ratio, market and oil price risk significant affect the stock return of oil & gas companies during the period 2012 to 2015 while effect of size and momentum factors have no statistically significant effect on companies equity returns during this period. The study was limited to the above reported period due to limited data availability. Results were in line with the expectation and previous study conducted by other researchers as earnings in oil and gas sector depend on global economic and business cycle which implies that profit margin shall increase with the boom in global economy despite from the fact that energy prices are rising (e.g., Kilian, 2008b; Kilian and Park, 2009). As part of result, it was also found that Momentum factors does not alter the effect of oil price change on the stock return for Malaysian companies although Shimon (2006) found it otherwise for U.S. market. He observed that momentum factor plays crucial role on equity return of oil companies due to oil price shock because companies with strong cash flow and profits tend to outperform the ones with the poor cash flow because the former
manages effective and efficient operational, commercial and financial processes and employ hedging and risk managing strategies which minimizes the effect of oil price risk on equity returns of the firm.

For both the companies, same factors (Book to market ratio, Market and oil prices risk) were the statistically significant variables which explains the differences in the stock return. Intercept was also found statistically insignificant.

A paramount objective in the Equation (5) is to analyse whether the oil price fluctuation effect on Malaysian oil and gas sector is statistically significant. It can be seen from Oil price column in table3 that coefficients of this variable is significant for all the companies under study which further suggests that oil and gas companies have significantly positive risk exposure to changes in oil prices.

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Intercept</th>
<th>Beta- Market</th>
<th>SMB(t)</th>
<th>HML(t)</th>
<th>Mom(t)</th>
<th>Oil price</th>
<th>Adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barakah Offshore Petroleum Berhad</td>
<td>0.049</td>
<td>1.3201***</td>
<td>-0.532**</td>
<td>0.871</td>
<td>0.043</td>
<td>0.98***</td>
<td>0.389</td>
</tr>
<tr>
<td>Icon Offshore Bhd</td>
<td>0.001</td>
<td>1.124**</td>
<td>-0.132*</td>
<td>0.987</td>
<td>-0.013</td>
<td>0.56**</td>
<td>0.582</td>
</tr>
<tr>
<td>Petronas Dagangan Bhd</td>
<td>0.098</td>
<td>1.983**</td>
<td>-0.019</td>
<td>1.342</td>
<td>0.129</td>
<td>0.43***</td>
<td>0.613</td>
</tr>
<tr>
<td>MMHE</td>
<td>-0.008</td>
<td>1.334***</td>
<td>-0.866**</td>
<td>0.548</td>
<td>0.061</td>
<td>0.029**</td>
<td>0.0342</td>
</tr>
</tbody>
</table>

Table 3: Summary of oil price risk exposure for selected Malaysian oil and gas companies (1993 – 2015)

Table 4 shows the Durbin Watson statistics for the regression results. DW statistics is a test statistics used to check for the presence of auto correlation in the residual errors from a regression analysis. Absence of autocorrelation signifies that errors terms do not hold any relationship by a given time lag. Equation 5 provides cross sectional view of stock return variation for oil and gas companies which is re-afﬁrmed by DW statistics mentioned in the table 4.

**Durbin Watson Statistics of oil & gas companies**

*R*oil is the crude oil price return at monthly level and *B*yield is the change in 10 year government bond yield which is the proxy for interest rate risk. The coefficients *β*₁, *β*₂, *β*₃, *β*₄, and *β*₅ provide estimation of market size of the company, its book-to-market value ratio, momentum, crude oil price, and sensitivity measure for interest rate risk, respectively.

Regression Equation: \( R_{i} - R_{f} = \alpha_{i} + \beta_{o}*(R_{m} - R_{f}) + \beta_{1}*SMB + \beta_{2}*HML + \beta_{3}*Mom + \beta_{4}*ROil + \beta_{5}*Byield \)

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Durbin Watson Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barakah Offshore Petroleum Berhad</td>
<td>1.6834</td>
</tr>
<tr>
<td>Icon Offshore Bhd</td>
<td>1.8518</td>
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<tr>
<td>Petronas Dagangan Bhd</td>
<td>1.2891</td>
</tr>
<tr>
<td>MMHE</td>
<td>1.3996</td>
</tr>
</tbody>
</table>

Table 4: Durbin Watson Statistics of oil & gas companies

Although the data availability was a challenge for conducting this study for other oil companies, it is quite imperative that companies operating in the oil and gas sector are exposed to significant oil price risk. This study does not facilitate the result comparison across different sub sectors of oil companies due to data availability issues but other studies performed at global level has suggested that oil exposure coefficients may not be same across different companies within the sector. It is quite intuitive because different companies are at different business
cycles, have different cost structuring and distinct hedging strategies. Oil price risk exposures are generally higher for oil and gas producers and oil equipment and services providers as contrasted with those which are associated with pipelines or other oil service companies. Oil price risk can also differ for different companies in the same industry due to oil prices movements depending on global oil demand or supply shocks (e.g., Kilian, 2009) and firms’ characteristics such as financial and investment policies, risk management techniques and overall diversification and hedging strategies to minimize equity fluctuations (Rajgopal, 1999).

5. Conclusion

The relationship between rising/falling share prices of global super majors in Malaysia and business operation of oil producers is that the return of oil companies were found significantly correlated to oil price change. Coefficient of oil price change was found statistically significant in the regression analysis for 4 companies taken under consideration. Further, it is seen that the major global recession and stock crash during 2007-08 coincided with the major drop in oil price.

Related to internal factors of a company which can put significant impacts on company’s returns due to oil price fall/rise, it is concluded that the significance of variable (HML) depends on type of oil companies and countries under consideration. Mohanty (2006) have found that exposures of risk of oil producers and oil equipment manufacturers and service providers in US are higher in relation to risk involved in joint oil/gas service firms or pipelines.

Overall, results of the study reveals that risk of oil price of Malaysian oil companies are distinct over time and across the firms.

Reference


