Do Oil Industry Merger Waves Reveal Any Trends?

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ABSTRACT

The dynamics of the stock prices of oil industry acquirer companies are studied during in-wave and out-wave years between 1998 and 2013. The research question is do oil industry merger waves reveal any trends? This quantitative study focuses on stock returns of acquirer companies over a 4-year horizon for each merger transaction. Portfolios created from these transactions provide a comparison between in-wave and out-wave years. Three benchmarks are incorporated to provide various economic adjustment factors. Six cases are presented whose outcome largely follow other similar studies. The main contribution of the study is the identification of a dynamic during oil industry in-wave years which sees a substantial increase in the Brent oil market price, of at least 29% for these in-wave years. This dynamic is not identified previously in the literature.

Keywords: Oil Industry Mergers, Waves, Crude Oil Price, 1998-2013
JEL Classifications: G15, G34, P18

1. INTRODUCTION

The objective of this study is to explore the stock price performance of oil industry acquirers using various scenarios to determine if any trends can be revealed. One of the market dynamics during the study time frame is the substantial increase in merger transactions during certain years. Between 1998 and 2013, using the criteria established in this study, there are 4 years declared as in-wave years as a part of the merger wave dynamic. This study is a quantitative endeavor to explore the acquirer returns relative to the comparative benchmarks for these in-wave years and for the other out-wave years relative to the same benchmarks.

The study focus is on the stock price total return performance of acquirer companies over a 4-year horizon for each merger transaction. The first data point in 4-year horizon is the last trading day of the year prior to the transaction in order to provide a price basis before full market expectations. The merger transactions for the acquirers are included in portfolios for in-wave years and out-wave years. Portfolios are also created for the benchmarks for the same time periods. This approach utilizes six cases which explore these comparisons and are bulk of the quantitative portion of the study.

Three hypotheses are included which hone down the discussions to relevant topics for digestion. H1: The Brent oil market sees superior returns during in-wave years relative to the benchmark. H2: Acquirers see superior returns during in-wave years relative to the global market. H3: Acquirers see inferior returns during in-wave years relative to the Brent oil market. All three hypotheses are confirmed and the study results are consistent with previous established knowledge related to links between merger waves and company performance and between oil price and company performance.

A strange dynamic occurs during the oil industry in-wave years which sees a substantial increase in the Brent oil market price, of at least 29%, along with a total deal value of $150 billion or more for these in-wave years. This price link is not something found in other literature. It is one of the contributions of this study. The other contributions of the study include confirmation on issues related to merger waves and the link between oil price and oil company performance previously documented.

Results of studies mostly document lower performance during these in-wave periods (Carow, et al., 2004; Duchin and Schmidt, 2012; Haleblian et al., 2012). There are also studies documenting the positive link between oil price and oil company financial performance

(Pirog 2005; Baaij et al., 2011; Dayanandan and Donker, 2011; Mohanty et al., 2013). In addition, many of the studies examine mergers and merger wave dynamics (Porter, 1980; Scharfstein and Stein, 1990; Chen, 1996; Mitchell and Mulherin, 1996; Rhodes-Kropf and Viswanathan, 2004; Bouwman et al., 2009; Gorton et al., 2009; Maksimovic et al., 2013; Doukas and Zhang, 2016).

2. LITERATURE REVIEW

During the 1990s, oil companies, hoping to take advantage of rising prices, focus on growth (Marko, 2000). Other ways of expansion, such as merging with another firm or acquiring a new one may provide an easier route to growth (Gorton et al., 2009). These tie-ups can provide a means for continued growth and profitability for the companies (Baaij et al., 2011). It is usually quicker and may provide more certain growth (Gorton et al., 2009). Many of the mergers in the oil industry are horizontal in nature and provide these added economies (Maschoff, 1996).

Mergers are then seen as a valuable mechanism for growth for many oil companies (Baaij et al., 2011). These types of industry mergers lead to opportunities to further increase value (Gorton et al., 2009). The M&A activity in the oil industry that occur during this time change the breadth and scope for the majority of the major players (Baaij et al., 2011). Mergers and acquisitions continue to play an important role in shaping business activities, and have become an important business strategy for those companies that focus on growth (Gorton et al., 2009).

2.1 Merger Waves
Merger transactions tend to group together within various industries (Mitchell and Mulherin, 1996). This is because merger activity is not a static function and can vary substantially from year to year (Rhodes-Kropf and Viswanathan, 2004). As such, M&A dynamics tend to come in peaks and troughs (Haleblian et al., 2012). Research confirms that clusters of peak M&A activity exist within industries and these peak time periods are referred to as merger waves (Maksimovic et al., 2013). These merger wave time periods see intense activity grouped together within industries (Haleblian et al., 2012).

There are two common views on the merger wave theory. The first view that is clarified by Rhodes-Kropf and Viswanathan, (2004) is that periods of increased merger activity, also known as waves, are caused by incorrect stock market valuations and these can be both over-valuation and under-valuation, as they both create potential opportunities for exploitation in the merger arena. The second view is that the merger waves are the result of somewhat of a seismic event or shock which impacts the industry or other jolts such as regulatory changes or new financing methods (Mitchell and Mulherin, 1996). Other impact areas can also be included, such as technology implementation or improvements in supply chains, which can create efficiencies which by themselves create value (Ahern and Harford, 2014).

2.2 In-wave versus Out-wave
The time during these peak waves is referred to as in-wave while the time outside of these peak periods is referred to as out-wave

(Duchin and Schmidt, 2012). The start of the in-wave periods see large increases in the number of acquisitions (Haleblian et al., 2012). There are several views on what constitutes a wave. One study identifies a wave as the 24-month period of highest merger concentration in each decade (Harford, 2005). Another looks at transactions within an industry that are at least one standard deviation above the study sample mean for the time period under evaluation (Maksimovic et al., 2013). Still another study looks at the number of mergers that exceed the 95th percentile in a normal distribution over a decade (Duchin and Schmidt, 2012). Regardless of the metrics used, the onset of these in-wave periods is characterized by a large increase in activity (Maksimovic et al., 2013).

There are studies that quantify the economics of in-wave mergers. One study with a sample size of 9,854 acquisitions from 1980 to 2009 compares transactions after 36 months. It confirms "in-wave acquirers have annualized buy-and-hold abnormal returns that are on average 4.65 to 6.25 percentage point lower than out-wave acquirers" (Duchin and Schmidt, 2012). Another study evaluated 520 acquisitions between 1979 and 1998 and reveals that the in-wave acquirers also tend to underperform the industry. After a 3-year assessment, compared to the value weighted returns for the acquirer's industry, the mean deficit is 15.71% and the median deficit is 24.43% (Carow et al. 2004).

2.3 Elective or Necessity
Competition varies within industries (Mitchell and Mulherin, 1996). Rivalry includes more than just sharing markets and access to resources (Chen, 1996). Companies close in relative size and capability tend to be more competitive with each other and share many of the same beliefs (Abrahamson and Fombrun, 1994). This impacts the configuration of the industry itself, and the players in that industry (Chen, 1996).

Merger waves do not always happen in-sync across industries, but there is sufficient evidence that M&A activity within an industry is grouped together (Mitchell and Mulherin, 1996). Mergers in response to regulatory, technological, or competitive change in the environment could be deemed as "mergers of necessity" as opposed to "elective mergers" where the participants may feel more freedom not to consummate a merger (Duchin and Schmidt, 2012).

The economics of the "necessity merger" transactions may become of secondary importance (Mitchell and Mulherin, 1996). Making such a merger may become obligatory to stay in the game (Duchin and Schmidt, 2012). This mentality may exist during the time periods when the corporate strategy may be focused on restructuring and consolidation in order to ensure or solidify a competitive position (Mitchell and Mulherin, 1996). However, the returns may not be as attractive as a typical "elective merger" (Duchin and Schmidt, 2012).

2.4 Market Over-valuation
There are two common ingredients in the merger game: The financial markets have ample liquidity and the acquiring company usually has an incorrectly valued stock price (Maksimovic et al., 2013). This incorrect valuation is typically an overvaluation and

the in-wave periods are typically characterized by high stock valuations (Rhodes-Kropf and Viswanathan, 2004).

Because of this, publicly-traded companies are almost twice as likely to participate in M&A activity during in-wave years as opposed to out-wave years since they are able to use their high stock valuations as currency in the merger transactions (Maksimovic et al., 2013). Acquiring firms tend to use these high stock valuations periods as "acquisition currency" (Rhodes-Kropf and Viswanathan, 2004). A study from the mid-1970s to 2004 of 40,000 companies confirms that merger waves typically occur during times of high liquidity and high market valuations (Maksimovic et al., 2013).

Even if the stock is not used as currency, other methods of financing are available if the company has a strong stock valuation and a good reputation (Fombrun and Shanley, 1990). This allows good access to both capital markets and debt markets (Haleblian et al., 2012). This cheap money is an advantage that not all companies enjoy. However, there is a potential downfall to acquiring during high stock valuations, namely potentially lower long-term performance (Bouwman et al., 2009).

2.5 Merger Strategy

Identifying potential targets is a key part of an overall strategy to deal with industry competitors (Porter, 1980). Focusing on employee capabilities is of upmost importance including developing professional skillsets related to strategic planning, business analysis, and human resources (Grant, 2003). There is a straightforward methodology with regard to broad M&A activities, which is referred to by the acronym of AMC. This stands for "awareness, motivation, and capability" (Chen, 1996). As these skills are developed, employee confidence increases and may allow staff to move forward on M&A activities (Grant, 2003).

Before merger schemes are envisioned, a strategic analysis of competitors may provide a guide on how to position a company within the industry (Subramanian and IsHak, 1998). Focusing on the overall strategic vision for a company with regard to its placing among the industry competitors and the steps to implement this vision is paramount (Porter, 1980). Depending on the timing, it may be prudent not to undertake a specific merger if suboptimal market factors exist (Haleblian et al., 2012). This awareness may also allow management the ability to reflect on the current situation and possibly wait until more suitable merger candidates arise (Porter, 1980).

2.6 Early Movers or Late Comers

Companies likely to move early in a merger wave possess market awareness and often have concerns about their rival's actions (Haleblian et al., 2012). Typically, it is the smaller companies that move early as they may become a target themselves (Aldrich and Auster, 1986). Some of these mergers can be defensive where the acquirer looks to pre-empt being a target by moving first (Gorton et al., 2009).

There is usually a first-mover advantage in the merger game as the early movers usually outperform those who wait (Carow et al.,

2004). Normally it is the smaller and more nimble companies that are seen to move early since they are more likely to be focused on innovating with new technologies or experimenting with new opportunities (Haleblian et al., 2012).

Moving first may be beneficial, but what about waiting? Late comers to the merger game may over-pay for synergies since assets could be over-valued during later stages (Haleblian et al., 2012). These late comers typically include the larger, more diversified firms that are more complex with bureaucratic processes which may protect them from competitive pressures (March, 1981). Being overly bureaucratic might limit the awareness of opportunities and may provide insulation against motivating factors to making acquisitions (Haleblian et al., 2012). These late comers may still get in the game, but by then the synergies identified in a potential deal may have been bid up compared to earlier deals (Doukas and Zhang, 2016).

2.7 Herding

The acquirers who are late to the game usually see returns that are less than the returns of the early movers (Doukas and Zhang, 2016). Those who join the merger game later may be participating in an activity called "managerial herding" (Bouwman et al., 2009). This herding or sharing the blame with other managers is one potential reason for the number of increased transactions during the merger waves (Scharfstein and Stein, 1990). Value-maximizing managers often rely on information from the early-movers, and this information loop continues until it is obvious that the results of these late-movers are inferior to that of the early-movers (Persons and Warther 1997).

Managers who move late in this herding process may be able to share the blame for these mergers since their behavior is conforming to their peers (Bouwman et al., 2009). Studies have shown that in-wave managers are less likely to be terminated following a bad merger compared to out-wave managers (Duchin and Schmidt, 2012). This is because management can share the blame with their in-wave peers (Scharfstein and Stein, 1990). There is a common thread in the research that in-wave governance is not as strong as out-wave governance (Duchin and Schmidt, 2012).

2.8 Merger Governance

There is not widespread agreement that company performance improves with an independent board (Bhagat and Black, 1999). However, at least one study confirms that independent directors see higher returns related to mergers (Byrd and Hickman, 1992). There is also evidence that block ownership, where an institution owns at least 5% of the shares is a moderating influence and may lead to fewer mergers that are conducted during the in-wave periods (Duchin and Schmidt, 2012).

Implementing proper strategies in order to steer the company through the various competitive battles to achieve long-term stability is becoming ever more important as competition in most industries is becoming more aggressive as companies vie for larger markets (Chen, 1996). Mergers can be a way forward to if they fit with the overall corporate strategy (Rani et al., 2013).

Developing staff capabilities in order to become more effective in implementing corporate strategy will help when playing the merger game (Grant, 2003). However, perhaps the most import issue is governance because while the other items contribute to a successful business, governance ensures that the enterprise is on the right track and that proper incentives exist to keep it there (Rani et al., 2013).

2.9 Oil Price Link to Performance

With regard to the connection between crude oil prices and the financial performance of oil companies, there is widespread agreement that the two are connected (Pirog 2005; Baaij et al., 2011; Dayanandan and Donker, 2011; Mohanty et al., 2013). Using general accounting measures for comparison, oil prices are positively related to the financial performance of oil and gas companies (Dayanandan and Donker, 2011). Oil prices impact both a company's revenue and its profitability (Baaij et al., 2011). The profitability of oil companies increases as a result of an increase in oil prices (Pirog 2005). Hence, there is an oil price risk exposure for oil and gas companies (Mohanty et al., 2013).

This price risk exposure may not be the same for all companies. "Larger oil and gas firms are likely to have lower oil price risk exposures (oil beta) than smaller firms" and oil and gas players deemed with higher growth opportunities are also likely to have less oil beta than other players (Mohanty et al., 2013). The measure of systemic risk for a company in relation to general stock market moves is known as market beta (Fombrun and Shanley, 1990). A profitable player is also normally seen to have lower market risk (market beta), hence, an oil and gas player's profitability is negatively related to its beta, both for oil and the market (Mohanty et al., 2013).

Mohanty et al., (2013) illustrate the volatility of changing oil prices and the effect on company returns confirming this dynamic by looking at crude oil prices between January 1986 and July 2008. They compute cumulative abnormal returns (CAR) over a two-day period for both positive changes and negative changes if the daily crude oil price changes are >5%. The study identifies 102 negative moves and 78 positive moves meeting this criteria. Based on this, they find that the CAR readings are higher for the negative changes as compared to the positive changes. Negative changes have CARs of -1.56% at the company level while at the portfolio level they are -1.46%. Positive changes have CARs of 0.98% at the company level while at the portfolio level they are 1.02%. An average of the two levels sees a 51% increase for the negative changes as compared to the positive changes (Mohanty et al., 2013).

3. METHODOLOGY

The methodology to collect and evaluate the data is based on an empirical and analytic approach. This type of research is focused on using objective knowledge acquired from deductive reasoning using the collection of objective data from independent third-party providers and utilizing quantitative methods. The data providers include the following: Thomson Reuters, Dartmouth College, and the US Energy Information Administration, known as the EIA.

3.1 Data acquisition

The screening of data through the Thomson Reuters product called Eikon provides data on all transactions for public, private and government transactions in the world market place and selection begins from the MASRCH application in the Eikon product (Thomson Reuters, 2017). Transactions are selected from 1998 through 2013. Only publicly-traded, commercial M&A transactions which represent over 50% ownership of the target companies in the oil & gas and petrochemicals industries are chosen where each of those transactions exceeds $300 million. Private and government transactions are excluded, as are stock buybacks and exchange offers. For more information on the selection of records for the data set, please see Table A1 in the Appendix.

In order to provide a more complete picture of the stock total return dynamics, the first data point in the 4-year horizon is the price on December 31 or the last trading day for the year, the year before the transaction date. This provides a price before the market expectations of the M&A activity are fully digested. Monthly prices are then aggregated until the final price in the 4-year horizon is taken 4 years after the initial December 31 date.

This is done for each transaction, and included into calendar time portfolios which include monthly returns for all applicable transactions active in the portfolio during that month. Similar portfolios are also created for the comparative benchmarks: The CRSP Global market, the CRSP oil industry (of 49 industries), and the Brent oil market price (Dartmouth, 2017; EIA, 2017). The benchmarks along with the portfolios exclude the risk free rate, which is the US one month Treasury-bill rate.

In the analysis using the total return formula, monthly price changes are measured and compared against the comparative benchmarks in the cases. How the groups perform against the benchmarks is key. Are they more volatile or less volatile than the market? This is called beta.

3.2 In-wave Calculations

There are various methods for calculating in-wave periods. For the purposes of this study, the annual number of deals, the total deals in USD, and average deal size in USD are the selection criteria. If the average of these measurements are one standard deviation above the mean for these items, the years are in-wave. No time restrictions are placed on the selection criteria and the time frame used in the evaluation is from 1990 through 2013.

The wider time frame and less restrictive parameters allow for a more realistic gauge of activity. Using this criteria, there are 4 years of in-wave activity: 1999, 2000, 2005, and 2010. For more information, please see Table A2 for the In-Wave Criteria and Calculations in the Appendix. Please see Figure 1 below using data from Thomson Reuters (Thomson Reuters, 2017).

3.3 Oil Price Link to Merger Waves

Some studies suggest a strong relationship between the oil price and company share performance in the oil industry (Pirog 2005; Baaij et al., 2011; Dayanandan and Donker, 2011; Mohanty et al., 2013). But the oil price does not only impact the performance of the

oil companies, according to a direct quote from one study on the oil industry from 1930 to 1990, "changing prices also influenced industry consolidation" (Ollinger, 1994).

The following graph illustrates this phenomenon. Total deals in the Oil industry as measured in USD billions is displayed along with the annual price changes in the Brent oil market. For more information, please see Table A3 Oil Industry Mergers and Brent Oil Price: 1990-2013 in the Appendix. Please see Figure 2 below using data from Thomson Reuters and EIA (Thomson Reuters, 2017; EIA, 2017).

There are 4 years in which the total deals in the oil industry meet or exceed $150 billion. Those are: $150 billion in 1999, $151 billion in 2000, $197 billion in 2005, and $160 billion in 2010. In each of these years, the change in the Brent oil market price from the previous year exceeds 29%. Those include: 40% in 1999, 60% in 2000, 42% in 2005, and 29% in 2010.

There are other years which have similar upward movements in oil prices, specifically 30% in 1990, 32% in 2004, 34% in 2008, and 40% in 2011. However, there are no other years with total deals at $150 billion or above which has oil price movements <29%.

It is interesting to note that these 4 years are the same 4 years identified as in-wave years in section 3.2. That there is a potential

link between a substantial rise in oil prices and merger waves in the oil industry is a new connection not previously identified in previous research.

3.4 Analytical Cases
The research question is: Do oil industry merger waves reveal any trends? The objective of this study is to evaluate the performance of the acquirers to the comparative benchmarks and assess if certain dynamics or trends are revealed which may give broader meanings. The stock price total return of the acquirers is the dependent variable in this analysis. The independent variable is if the time period is in-wave or out-wave along with the comparative benchmarks.

The research is classified as causal and correlational. The intent is to establish a causal connection and quantify the relationship of the stock price total return performance of the acquirers to the merger wave dynamics and to quantify the relationship of oil price movements to these same wave years. To further explore this topic and focus on quantifying the research question, three hypotheses are considered.
- H1: The Brent oil market sees superior returns during in-wave years relative to the benchmark.
- H2: Acquirers see superior returns during in-wave years relative to the global market.
- H3: Acquirers see inferior returns during in-wave years relative to the Brent oil market.

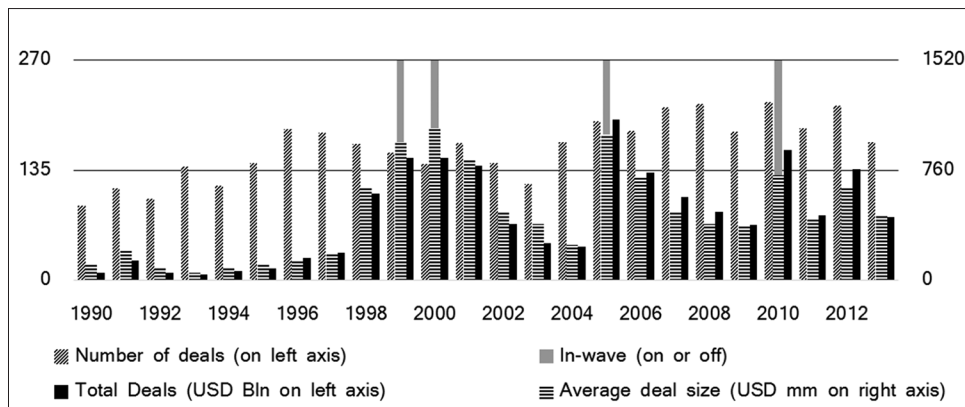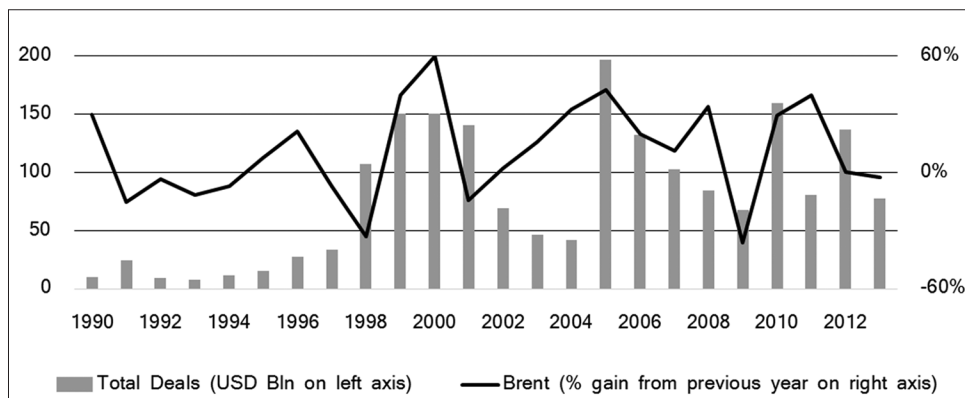**Figure 1:** Oil industry mergers 1990-2013

Figure 2: Oil industry mergers and Brent oil price: 1990-2013

The research approach matches the monthly portfolio to one other factor and is a two-factor version of the three-factor model of Fama and French (1993). This method adheres with the strategy that long-run abnormal returns should be calculated as the long-run return of a sample less the long-run return of an appropriate benchmark (Barber and Lyon, 1997). The first formula is a Brent oil market comparison to a steady 1% per month stream. The second formula is an acquirer comparison to the global market. The third formula is an acquirer comparison to the Brent oil market. RF Rate represents the risk free rate.

Brent oil market return−RF rate = α + β (1% per month)

Acquirers return−RF rate = α + β (Global market−RF rate)

Acquirers return−RF rate = α+ β (Brent oil market−RF rate

The analytic approach utilizes six cases which examine the stock price total return monthly percent changes. The first set of two cases compares the Brent oil market to a steady 1% per month stream. The next set of two cases compares the acquirers against the global market. The third set of two cases compares the acquirers against the Brent oil market. All sets compare the in-wave and out-wave returns based on comparative benchmarks, and subtracts the risk free rate from all variables except from the steady 1% per month stream.

The cases provide the means to gauge the acquirer performance relative to the benchmarks during the in-wave and out-wave years. The expectation is that the in-wave performance is inferior to the out-wave performance for the acquirers. However, if the oil price performance is superior during the in-wave years, the influence that the oil price has on oil company performance has the potential to override the in-wave influence on the oil company performance. For more information, please see the Table 1.

4. RESULTS

A summary of the results of the cases analyzed are included in Table 2 below. The alpha readings in four of the cases are negative while only two are positive. The detailed comparisons are discussed in Table 2.

In case 1, the Brent oil market in-wave performance is superior to the comparative benchmark at a 0.01 level, while in case 2, the Brent oil market out-wave performance is inferior to the comparative benchmark at a 0.01 level. These results confirm superior performance during the in-wave periods.

In case 3, the acquirers' in-wave performance is superior to the global market at a 0.01 level, while in case 4, the acquirers' out-wave performance is inferior to the global market at a 0.01 level.

When comparing both results, acquirers' performance relative to the global market is superior during the in-wave periods.

In case 5, the acquirers' in-wave performance is inferior to the Brent oil market at a 0.10 level. In case 6 the acquirers' out-wave performance is also inferior to the Brent oil market, but at a 0.01 level. However, the alpha reading in case 6 is higher than the alpha reading in case 5 suggesting a relatively better performance during out-wave periods. This implies that the acquirers are not able to capture the gains seen in the Brent oil market during the in-wave periods.

Cases 1 and 2 display adjusted R^2 readings of 0.61 and 0.57, respectively. These two readings confirm similar relationships between the two variables during both in-wave and out-wave periods. The moderate correlation to a steady 1% per month stream is interesting and suggests a general oil price increase during both the in-wave and out-wave periods which is the case.

Cases 3 and 4 for the acquirers and the global market have adjusted R^2 readings of (0.01) and 0.61, respectively. The in-wave measurement of (0.01) shows virtually no correlation between the dependent and independent variables, while the out-wave measurement of 0.61 shows a moderate correlation between the dependent and independent variables.

Cases 5 and 6 for the acquirers and the Brent oil market have adjusted R^2 readings of 0.55 and 0.83, respectively. Case 5 shows a moderate correlation between the variables. Case 6 documents a stronger correlation between the variables and shows more of a relationship that would normally be expected between the acquirers and the Brent oil market as many studies document the positive connection between crude oil prices and oil company financial performance (Pirog 2005; Baaij et al., 2011; Dayanandan and Donker, 2011; Mohanty et al., 2013).

On the subject of hypothesis testing, five out of the six cases have alpha readings at the 0.01 level with one out of the six cases with an alpha reading at the 0.10 level. This level of certainty confirms that for the purpose of hypothesis testing, the measurements associated with these readings are statistically significant.

With regard to the first hypothesis considered, H1: The Brent oil market sees superior returns during in-wave years relative to the benchmark, the regressions confirm at a 0.01 level that the Brent oil market sees superior returns during in-wave years in comparison to the benchmark. During out-wave years, Brent oil prices see inferior returns in comparison to the benchmark, also at a 0.01

Table 1: Analytical case results

Analytical cases: All cases minus the risk free rate	Global market	Brent oil market	1% per month
In-wave years: Brent oil market with 1% per month			X
Out-wave years: Brent oil market with 1% per month			X
In-wave years: Acquirers with the Global market	X		
Out-wave years: Acquirers with the Global market	X		
In-wave years: Acquirers with the Brent oil market		X	
Out-wave years: Acquirers with the Brent oil market		X	

Table 2: Summary of the results of the cases

Regression statistics table	Alpha (Y intercept)	t-statistic	Beta one	Adjusted R²
In-wave years: Brent oil market with 1% per month	0.67***	6.98	2.95***	0.61
Out-wave years: Brent oil market with 1% per month	(0.39)***	(9.38)	0.69***	0.57
In-wave years: Acquirers with the Global market	1.26***	5.83	1.04	(0.01)
Out-wave years: Acquirers with the Global market	(0.24)***	(12.83)	1.16***	0.61
In-wave years: Acquirers with the Brent oil market	(0.48)*	(1.86)	1.32***	0.55
Out-wave years: Acquirers with the Brent oil market	(0.19)***	(16.89)	0.76***	0.83

*10%,**5%,***1% denote significance levels

level. These results confirm the H1 null hypothesis. Using the selected benchmark as a comparison, the Brent oil market sees superior returns during in-wave years. The H1 results are further confirmation of the discussion in section 3.3 of the link between oil industry in-wave years and a substantial rise in the crude oil price. The oil industry in-wave years appear to be correlated with a substantial rise, at least 29%, in the Brent oil market price.

With regard to the second hypothesis considered, H2: The acquirers see superior returns during in-wave years relative to the global market, the regressions confirm at a 0.01 level that the acquirers during in-wave years see superior returns in comparison to the global market. During out-wave years, the acquirers perform inferior to the global market at a 0.01 level. These results confirm the H2 null hypothesis. Using the selected benchmark as a comparison, the acquirers see superior returns during in-wave years. The H2 results show that during the study time frame the acquirers are able to take, to some extent, advantage of the rise in oil prices during the in-wave periods. These results confirm other studies which show a positive link between oil price and oil company performance, in terms of both revenue and profitability (Baaij et al., 2011), of sole profitability (Pirog 2005), and of stock performance (Dayanandan and Donker, 2011; Mohanty et al., 2013).

With regard to the third hypothesis considered, H3: The acquirers see inferior returns during in-wave years relative to the Brent oil market, the regressions confirm at a 0.10 level that the acquirers during in-wave years see inferior returns in comparison to the Brent oil market. During out-wave years, the acquirers also perform inferior to the benchmark at a 0.01 level, but less inferior in relation to the in-wave years. These results confirm the H3 null hypothesis. Using the selected benchmark as a comparison, the acquirers see inferior returns during in-wave years. The H3 results are in line with other studies that document inferior performance during merger waves. Despite single company variations, it is clear that in-wave mergers perform worse than out-wave mergers (Duchin and Schmidt, 2012). In-wave acquirers underperform the industry (Carow et al., 2004). The in-wave time frame is associated with late-comers and these players may over pay for synergies (Haleblian et al., 2012).

The research question for this study is: Do oil industry merger waves reveal any trends? Based on the research methods in this study and the significance of the resultant differences in measurements, a confirmation of the hypothesis is warranted. There are three trends reported in this study:
1. H1: Establishes that the link between oil industry in-wave years and a substantial rise in crude oil price is a new trend

not previously identified in the research. In conjunction, a substantial rise in oil price, of at least 29% in concert with a jump in the total annual value of deals to at least $150 billion, would signal an in-wave period appears to be a new concept.
2. H2: Confirms that the continued trend that a rise in oil price may lead to an improvement in oil company financial performance, in line with other studies (Pirog 2005; Baaij et al., 2011; Dayanandan and Donker, 2011; Mohanty et al., 2013).
3. H3: Confirms that despite the increase in crude oil price, the acquirers perform inferior during the in-wave years when compared to the Brent oil market. This is confirmation of a trend where in-wave returns are inferior to out-wave returns as established by other studies (Carow, et al., 2004; Duchin and Schmidt, 2012; Haleblian, et al., 2012).

5. CONCLUSIONS

The intent of this study is to identify trends related to oil industry merger waves. In the study, there are four declared in-wave years using the criteria established in this study. One link to the wave periods which is not identified prior to this study is that the in-wave years appear to be coordinated with a substantial rise in oil price, of at least 29%. This phenomenon appears to coincide with the rise of other factors normally associated with in-wave years such as an increase in the number and size of deals (Harford, 2005; Haleblian et al., 2012; Duchin and Schmidt, 2012; Maksimovic et al., 2013). That there is a potential link between a substantial rise in oil prices and merger waves in the oil industry is a new connection not previously identified in the research and is one of the contributions of this study.

Studies have already linked a rise in oil price to improved financial performance for oil companies (Pirog 2005; Baaij et al., 2011; Dayanandan and Donker, 2011; Mohanty et al., 2013). However, when the oil company performance improvement does not match the improvement in oil price then the oil company performance may be viewed as inferior, at least relative to the oil price movement. When it is also linked to merger wave dynamics, the inferior outcome may be viewed as being caused by the wave dynamics as documented by other studies (Carow et al., 2004; Duchin and Schmidt, 2012; Haleblian et al., 2012). This may not be entirely true. Further research may be needed.

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APPENDIX

Appendix Tables

Table 1A: Selection of records for the data set

Selection criteria	Records
Initial Data Set from Thomson Reuters Eikon:	>1,000,000
MASRCH application for Advanced Search of Mergers and Acquisitions	
Select "Completed" in the Deal Status field	>750,000
Select Date Effective between "01-Jan-1998 and 01-Jan-2014"	>500,000
Select "Oil & Gas" and "Petrochemicals" in the Target Industry field	>18,000
Select "Oil & Gas" and "Petrochemicals" in the Acquirer Industry field	>11,000
Select "Public. Subsidiary. Joint Venture" in the Target Public Status field	>6,900
Select "Acquisition of Assets. Acquisition of Partial Interest. Merger. Acquisition of Majority Assets. Acquisition of Remaining Interest. Acquisition of Certain Assets" in Transaction field	>6,700
Select "Over 50%" in the % Acquired field	>4,400
Select "Over 300 M ($300 million)" in the Deal Size field	672
Select non-blank entries in the Acquirer RIC field	459
Eliminate records with missing Acquirer Size information	409
Eliminate records which generate NULL or #N/A values when using the Total Return query	401
Eliminate records with same Acquirer RIC within the same calendar year	364

Table 2A: In-wave criteria and calculations

Year	Count	Total amount	Average deal size	Count mean+1 standard deviation	Total amount mean+1 standard deviation	Average size mean+1 standard deviation	% of wave limit	In-wave
1990	92	9,698	105	201	135,631	761	22	
1991	113	24,696	219	201	135,631	761	34	
1992	100	9,394	94	201	135,631	761	23	
1993	140	7,709	55	201	135,631	761	28	
1994	116	11,078	96	201	135,631	761	26	
1995	144	15,234	106	201	135,631	761	32	
1996	186	27,232	146	201	135,631	761	44	
1997	181	33,790	187	201	135,631	761	47	
1998	168	106,783	636	201	135,631	761	82	
1999	157	150,120	956	201	135,631	761	105	Yes
2000	143	150,555	1,053	201	135,631	761	107	Yes
2001	169	140,379	831	201	135,631	761	99	
2002	144	68,789	478	201	135,631	761	62	
2003	118	46,097	391	201	135,631	761	48	
2004	170	41,637	245	201	135,631	761	49	
2005	195	196,753	1,009	201	135,631	761	125	Yes
2006	184	131,817	716	201	135,631	761	94	
2007	212	102,396	483	201	135,631	761	82	
2008	217	84,422	389	201	135,631	761	74	
2009	182	67,767	372	201	135,631	761	63	
2010	219	159,530	728	201	135,631	761	107	Yes
2011	187	80,143	429	201	135,631	761	70	
2012	215	136,535	635	201	135,631	761	97	
2013	170	77,253	454	201	135,631	761	67	

Table 3A: Oil industry mergers and brent oil price: 1990-2013

Year	Total deals (USD Billion)	Brent (USD)	Brent (% gain from Previous year)
1989		18,25	
1990	9,70	23,68	30
1991	24,70	20,01	−15
1992	9,39	19,31	−4
1993	7,71	17,04	−12
1994	11,08	15,84	−7
1995	15,23	17,04	8
1996	27,23	20,64	21
1997	33,79	19,12	−7
1998	106,78	12,78	−33
1999	>>150,12<<	17,85	>>40<<
2000	>>150,56<<	28,52	>>60<<
2001	140,38	24,45	−14
2002	68,79	24,96	2
2003	46,10	28,88	16
2004	41,64	38,23	32
2005	>>196,75<<	54,42	>>42<<
2006	131,82	65,15	20
2007	102,40	72,47	11
2008	84,42	96,85	34
2009	67,77	61,49	−37
2010	>>159,53<<	79,51	>>29<<
2011	80,14	111,26	40
2012	136,54	111,65	0
2013	77,25	108,64	−3