

Liquidity and Acquisition: Do cash-rich firms accumulate more cash when they anticipate a shock? A study from the oil and gas industry.

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Abstract: This paper examines if cash-rich firms in the oil and gas industry change their cash holding in response to an industry crisis. It further studies whether these firms use the cash to take over firms after the crisis – in other words, it examines if cash rich firms accumulate more cash during a crisis to support merger and acquisition (M&A) activities after the crisis. It submits evidence that on average, cash rich firms hold more cash during the crisis and less cash after the crisis. Lastly, it submits that acquisition spending drops during a crisis, but increases significantly after a crisis.

Keywords: Cash holding, Liquidity, Cash-rich, Crisis, and Merger and Acquisition (M&A)

Table of Contents

1. Introduction	3
1.1 Research Question	5
2. Literature Review and Hypothesis development	5
2.1 Source of Liquidity	6
2.2 Determinant of Cash holding	7
2.3 Free Cash Flow and Acquisitions	9
2.4 Financial distress and corporate performances	10
2.5 Oil and gas Industry – brief overview	12
2.6 Significance & hypothesis development	13
3. Data	15
4. Methodology and Results	17
4.1 Baseline model - Identification of excess cash	18
4.2 Identification of cash accumulation	24
4.3 M&A activities during a crisis.....	31
5. Conclusion	35
References	38
Appendix	41

1. Introduction

In 2010, Royal Dutch Shell Plc made a strategic acquisition of East Resources Inc. for \$4.7 billion in cash making it one of the biggest oil and gas deals in 2010. In the same year, Chevron, one of the world's leading integrated energy companies announced its acquisition of Atlas Energy Inc. The deal closed at \$4.3 billion. Another big acquisition in the oil and gas industry was the purchase of Devon Energy oil assets by BP Plc for approximately \$7 billion in cash. An important element of all these acquisitions is that they were relatively large and were made in cash. These acquisitions also came a few years after the infamous 2008 global recession, which negatively affected the commodity markets. There was a substantial decline in the price of gas in the summer of 2008 when gas production increased, but the demand for gas decreased because of the global financial crisis.

This raises the question of whether firms strategically accumulate more cash during a crisis to take over distressed firms after the crisis. Deciding the level of cash holdings is one of the most critical financial decisions that firms' management have to make. The issue surrounding corporate cash policy has been a prominent debate in finance literature.

Some of the well-recognized literature in corporate finance has attributed cash holding policy to firms' specifics (see Opler et al., 1999 and Kim et al., 1998). In the presence of information asymmetry, it is difficult to narrow down why firms stockpile cash. Managers may strategically hold more cash than necessary to maintain financial flexibility. Financial flexibility allows managers to avoid the costs associated with external financing and the problem of underinvestment.

Managers have incentives to take on more investments to increase resources under their control. Having a strong liquidity position gives firms the ability to meet investments' demand without incurring the cost of raising external funds. Firms use their cash holding to smooth investments when there is a shock to cash flow and external financing. A research by Sun (2014) finds that during a crisis, firms with strong liquidity position are usually reluctant to cut investments. Instead, they use internal funds to finance investments. A paper by Robert et al. (2012) which studies how investment responds to financial crisis finds that investments fall significantly during a crisis. This fall in investment activities can be attributed to an increase in uncertainty during the crisis. In addition, Victoria and David (2010) illustrate that a decrease in investment during a crisis is mostly due to the decrease in supply of external finance. In other words, firms' poor financial positions are the main drivers of the decrease in investments.

Having a strong liquidity position gives rich firms the ability to buy distressed firms at a lower cost without having to raise external funds. This low cost acquisition is driven by the acquiring firm's bargaining power, due to strong liquidity position (Harford, 1999). Harford (1999) also states that firms that have excess cash reserves are more likely to make large acquisitions than those with low cash reserves. Therefore, in the world of capital market imperfection it might be optimal for firms to secure a strong liquidity position when they anticipate a crisis to stand in a good position to take over financially distressed firms. Despite stockpiling cash sounding appealing, it is important to note that it comes with a costs, including a lower rate of return and tax disadvantages.

1.1 Research Question

This paper examines if cash rich firms in the oil and gas industry change their cash holding in response to an industry shock or crisis. Furthermore, it studies whether firms in this industry strategically accumulate more cash to take over firms after the crisis; more specifically, it examines if cash rich firms in the oil and gas industry create a strong liquidity position during an industry downturn to support M&A activities after the crisis. It concludes by submitting that when an industry is hit by a shock, cash rich firms increase their cash position ready to take over other firms after the crisis, therefore, cash rich firms are more likely to increase acquisition spending after the crisis than non-cash rich firms.

However, due to time and data limit, this paper fails to track if most of the acquired firms are distressed or declining. These factors also restrain this paper from tracking the performance of cash-rich firms that acquired distressed firms after the crisis. It would be of interest to compare the rate of return of firms that acquired distressed firms to those that acquired healthy firms. Therefore, I would recommend future research interested in this topic to not only track if most of the acquired firms are distressed, but to also track the performance of cash-rich firms that acquired distressed firms after crisis.

2. Literature Review

This section, outlines a review of studies that are related to cash holding and M&A. Most importantly, it discusses findings by other authors. It is important to note that most studies that are reviewed do not relate corporate cash holding to acquisition or vice versa, but rather, relate them to other factors.

2.1 Source of Cash

In a world of imperfect capital markets, where firms cannot obtain unlimited capital, they must rely more on internally generated funds. It is without doubt that cash from operations activities is the main source of cash. Not only is it reliable, it is the most convenient source of cash. Unlike issuing equity or acquiring debt, cash flow from operations activities does not require additional cost to acquire (Deng et al., 2013).

However, once such cash flow from operations activities becomes uncertain or firm run out of cash, issuing debt and new equity become fundamental sources of cash. Sun (2014) posits that when firms anticipate a future credit risk, they immediately issue long term debt and save the funds in cash. Her research shows that firms do so to secure the current credit capacity for the future. Despite holding cash being more costly than unused credit, firms draw down their line of credit because cash provides more perfect liquidity insurance than unused credit. This is in line with research conducted by Ivashina and Scharfstein (2010) which shows that during the 2008 financial crisis, firms drew down their credit lines and held the proceeds in cash. This demonstrates that in the midst of uncertainty, firms preserve future financial flexibility by drawing down their lines of credit and hold the proceeds in cash to maintain a strong liquidity position.

Firms also generate cash by issuing stocks. Despite this being less attractive to shareholders, managers may find it attractive because, unlike debts, firms are not obligated to pay out dividends and in the case of bankruptcy, they do not have to pay back equity investments. Additionally,

Opler et al. (1999) state that managers cut back dividends if they are short on liquid assets and paying out dividend means drawing down cash on hand.

Selling off assets is another ultimate source of cash. Quite often firms liquidate assets that they no longer need on their balance sheet. A research by Shleifer and Vishny (1993) which explores the determinant of liquidation values of assets states that firms whose assets can be cheaply converted to cash find it easy to raise funds at a lower cost by selling these assets.

2.2 Determinant of Cash Holding

There are three important theories used in past literature to explain corporate cash holdings: trade-off theory, pecking order theory, and agency theory.

Trade-off theory states that firms decide the level of cash holding based on the cost and benefit of holding cash. Explicitly, firms identify and set optimal level of cash holdings by weighing the marginal costs and marginal benefits of holding cash (Opler et al.,1999). Despite managers and shareholders viewing the cost and benefit of holding cash differently, managers can maximize firms' value by adjusting cash ratio so that the marginal cost of the cash holding equals to the marginal benefit (Opler et al.,1999). The main costs associated with holding cash are lower rate of return on liquid assets and tax disadvantages, whereas according to Ferreira and Vilela (2004) the benefits of holding cash include reduced likelihood of incurring financial distress, improved financial flexibility and minimized costs of raising external funds or liquidation existing assets.

Another prominent theory in corporate finance is the pecking order theory brought forth by Myers and Majluf (1984). Pecking order theory states that firms financing comes from three sources: internal funds, issuing debt and issuing new equity. To put it differently, firms prefer to finance investments first with internal funds, then with debt and issue equity as a last resort. Myers and Majluf (1984) goes on to say that this helps minimize the cost of asymmetric information and other financing costs.

Firms are reluctant to issue equity because of the costs associated with adverse selection in the capital market. Opler et al. (1999) adds to this notion by illustrating that firms do not have a target cash level, instead, they use cash as a buffer between retained earnings and investment needs. In other words, when firms have sufficient cash flow to finance current investments, they maintain a surplus of internal funds by accumulating more cash and paying back debt when it is due. When faced with a deficit of retained earnings, firms use the accumulated cash and issue new debt to meet investments needs. In particular, (Opler et al., 1999) research asserts that changes in cash holdings is mainly driven by changes in internal resources.

The agency theory brought forth by Jensen (1986) is another important theory in the financial economics literature. According to Jensen (1986), managers and shareholders are often at conflict because of different interests. This theory is based on the idea that managers and shareholders view the benefits and cost of holding cash differently. The free cash flow hypothesis states that managers are likely to hold the amount of cash that do not maximize shareholders' wealth. Managers may also undertake investments that are not in the best interest of shareholders. In other words, managers may hold more cash to pursue their own interests at the expense of shareholders.

Jensen (1986) goes on to say that managers may hold more cash instead of paying it out to shareholders with a goal of increasing the amount of assets under their control. Holding more cash also allows managers to invest in projects that best suit their own interests without having to raise external funds. Opler et al. (1999) adds to this theory by stating that managers stockpiling cash to gain discretionary power over the firm investment decisions. More importantly, accumulating more cash may imply that management does not want to pay a dividend to shareholders and if managers have less stake in the firm, they may end up spending the cash on poor investments.

2.3 Free Cash Flow and Acquisitions

The free cash flow hypothesis by Myers and Majluf (1984) states that managers endowed with free cash flow will take on value decreasing investments instead of distributing the cash to shareholders. That is to say, managers will stockpile cash to make more investments, and if left unmonitored they will waste the cash on unprofitable investments. Excessive cash gives managers more financial flexibility. Financial flexibility gives managers the ability to pursue investments that best meet their own interests (Opler et al., 1999). Free cash flow hypothesis goes on to state that firms with excessive cash are likely to make poorer investments decisions than those with negative excessive cash. In addition, a strong liquidity position implies that managers can take on investments that capital markets would, otherwise, not finance. In particular, managers stockpile cash because capital market imperfections make it costly for them to acquire funds needed.

One way managers can spend money is through acquisitions. Acquisitions are substantial investment decisions that can have a significant impact on the acquiring firm. Managers have a

propensity to build large empires through acquisitions because that may be considered a signal of past successful performance (Harford, 1999). In the same fashion, managers have an incentive to make more acquisitions to expand their firms because their compensation and power are directly related to firm size.

Harford (1999) goes on to say that cash-rich firms are more likely to make acquisitions than non-cash-rich firms; thus, cash-rich firms are also more likely to become bidders. Explicitly, his research finds that the proportion of cash-rich firms undertaking acquisitions is significantly higher than that of non-cash-rich firms. This is consistent with free cash hypothesis which posits that cash-rich firms are more likely to use excess cash to make acquisitions.

2.4 Financial Distress and Acquisition

There is a significant amount of literature that studies the motives for taking-over financially healthy firms; however, not much research has been done to study the motives behind the acquisition of financially distressed firms. Panayiotiou (1996) examined economic factors that influence the decision to acquire a financially distressed firm using the sequential response logit model (SRL). His research finds that firms are willing to acquire low leveraged financial distressed firms relative to acquiring high leveraged financial distressed firms.

Acquiring a highly leveraged firm increases the debt ratio of the acquiring firm, hence reduction in market value and increased probability of default (Panayiotiou, 1996). His research goes on to state that fundamental factors to consider when acquiring a financially distressed firm are profitability, managerial effectiveness, firm's growth and firm's size. In particular, a financial

distressed firm with profitable assets, efficient management and potential growth is easier to restructure and is therefore attractive to the acquirer.

In a similar study by Meier and Servaes (2014) which studies the returns associated with acquisition of distressed firms, finds that firms that acquire distressed firms or buy assets from distressed firms earn high return than when they make regular acquisitions. These high returns come at the expense of the shareholders of the acquired firm. High returns from acquisition of distressed firms are driven by high premiums that come with lower acquisition cost. Additionally, assets of the target distressed firm may sell at a discount due to low redeployability and having fewer alternative uses. Meier and Servaes (2014) go on to examine whether industry conditions have a significant impact on the returns earned by the acquirer. Not surprisingly, they find that making acquisitions during or after economic downturn leads to higher return relative to making acquisitions during a normal period.

Opler and Titman (1994) add to this literature by investigating the link between financial distress and corporate performance during industry downturns. They do so by examining whether high leveraged firms experience more significant performance losses than conservative firms. Not surprisingly, their research finds that during an industry downturn, the performance of highly leveraged firms decline significantly relative to that of less leveraged firms; thus, highly leveraged firms lose market share to less leveraged firms.

2.5 Oil and Gas Industry: A Brief Overview

The oil and gas industry is one of the largest industries in the world. The state of the oil and gas industry is often reflected in the oil and gas prices. Like any other product in the commodity market, oil and gas prices are mainly determined by demand and supply. That is to say, excessive demand or supply in the oil and gas industry may lead to a crisis in the industry. It is also without doubt that the U.S. and Canadian oil and gas markets are mostly affected by other economic forces. As a matter of fact, the most recent significant spike in the oil price was mid 2008 when oil price reached a historic monthly average price of approximately \$137. Clearly, this spike was triggered by the infamous 2008 global recession. Not only did the 2008 recession have a significant negative affect on the commodity market, it also negatively affected M&A activities in the oil and gas industry. This falling in M&A activities can be attributed to impact the financial crisis had on the capital market.

Of course, the 2008 industry crisis is not the only period that the oil and gas industry experienced a downturn. For the past several decades, the North American oil and gas industry has experienced a number of significant downturns. Most of these downturns were mainly driven by demand and supply. For instance, in 1980 following the 1970s energy crisis there was a significant oil surplus which was fueled by the substantial decline in oil demand. In response to this decrease in demand, from 1980 to 1986, the organization of petroleum exporting countries (OPEC) strategically lowered oil production in an attempt to increase oil prices (Griffin and Neilson, 1994). Another interesting period in the oil and gas industry is the oil crisis of 1990¹ of which oil prices raised

¹ More information on this period can be found on U.S energy information administration website http://www.eia.gov/pub/oil_gas/petroleum/analysis_publications/chronology/petroleumchronology2000.htm

sharply due to the Persian Gulf Crisis - the war between Iraq and Kuwait, (Hamilton, 2011). Hamilton (2011) submits that Iraq and Kuwait accounted for approximately 9% of world oil production and their conflict had a notable impact on the supply of oil, and negatively impacted the U.S and Canada oil prices.

2.6 Significance and Hypothesis Development

This paper contributes to the large and growing literature that discusses the determinants and implication of corporate cash holding (see Opler et al., 1999 and Kim et al., 1998). It also supplements the literature that discusses source of liquidity during a crisis (see Emilia and Judit, 2013, and Vashina and Scharfstein, 2010). Lastly, this paper makes a significant contribution to the vast literature that discusses M&A activities and other investments decisions during and after a crisis since it examines whether cash-rich firms accumulate more cash during a crisis to support M&A activities after the crisis (see, Inklaar et al., 2012 and Harford, 1999). Thus, also adding to the literature that discusses firms' behaviors during and after a crisis.

The hypothesis developed in this paper is based on cash related theories according to which firms accumulate more cash as a caution against uncertainty or as a source of funds to take over distressed firms (Keynes, 1936 and Jensen, 1986). According to Keynes (1936), firms will start to accumulate cash as a precautionary measure when they anticipate future uncertainty. That is to say, if firms hold cash as a caution against uncertainty and the economy is signaling a potential crisis, firms will start accumulating cash in response to that signal (Keynes, 1936). On the other hand, Jensen (1986) states that firms will hold excessive cash later to be used to takeover other firms.

This paper is also informed by Jensen (1986) free cash flow hypothesis, which states that firms with free cash flow will invest it in negative net present value projects, rather than paying it out to shareholders. It is also informed by pecking order theory which states that internal financing is the most preferred source of financing, followed by debt and external equity financing as a last resort (Myers, 1984). Therefore, bringing together the above school of thoughts the following hypotheses have been developed:

Hypothesis 1: Cash-rich firms in the oil and gas industry accumulate more cash during a downturn than during normal times.

Hypothesis 2: M&A activities in the oil and gas industry decline during a downturn and rise significantly after the downturn.

Amalgamating the two hypotheses, cash-rich firms in the oil and gas industry accumulate more cash during a downturn later to be used to take over other firms after the crisis. As an illustration, with respect to the 2008 crisis in the oil and gas industry, we would expect the number of M&A transactions to be at its normal state prior to the crisis (from 2004 to 2007) followed by a decline during the crisis (from 2007 to 2009). However, we would expect the number of M&A transactions start to pick up in 2010. As for cash, we would expect cash-rich firms to start accumulating cash in 2007 shortly after they anticipate a crisis, ready to spend it on acquisitions after the crisis, in this case in 2010 and forth.

Since this paper seeks to examine if cash-rich firms in the oil and gas industry change their cash holding in response to a crisis in the industry and whether they use the cash to take over other firms after the crisis, it looks at how firms change their cash holding prior to the crisis, during the crisis and after the crisis. It also examines the change in both the number and value M&A transactions in these three periods.

The remainder of this paper is organized as follows. The following section describes the data used in this paper. Section 4 discusses methodologies and results of my research. Section 4 is divided into 3 sub-sections of which section 4.1 Identifies excess cash in order to separate cash-rich firms from non-cash-rich firm. Section 4.2 presents evidence of cash accumulation. Section 4.3 examine change in M&A activities before, during and after the crisis. Section 5 provides the conclusion.

3. Data

All the accounting variables that are used to study this topic are extracted from Compustat Database and are sourced annual panel data covering the sample period from 1972 to 2014. The analysis includes data on both survivors and non-survivors companies provided that they fall in the sample period. I use both North America Industry classification (NAIC) codes and Standard Industrial Classification (SIC) codes to separate oil and gas industry from the rest of the industries. This dataset comprises a total of 334 companies with a total of 4,635 firm-years. The data on CPI is available on Federal Reserve Economic Data (FRED) database. This paper, includes variables that have greater impact on the level of cash recorded on balance sheet or at least variables that past literature has identified to have significant impact on cash holding level (see Opler et al. 1999, Myers 1977, and Murray and Vidhan, 2003).

I was able to access data on M&A transactions for both the acquirer and the target firms from SDC database. This paper only includes data of completed acquisitions that were announced over the period of 1970-2014. I also use both NAIC Code and SIC codes to separate oil and gas industry from the rest of the industries. Furthermore, it only includes data on acquisitions that involve US and Canadian firms as acquirer and targets. Lastly, the data on oil price is sourced from Financial Trend Forecaster². This data set includes the annual average inflation adjusted price of crude oil.

Table 1 provides descriptive and summary statistics of the main variables used in the paper. On average, firms in the oil and gas industry hold about 0.553 cash ratio with the median of 0.03. There is also a wide variation in the level of cash holding which can be attributed to different in firms' size and level of cash flow.

Table 1 also records both the overall and between minimum and maximum values. Overall minimum and maximum values denote the lowest and the largest values from total firms-years. While between minimum and maximum are the lowest and largest average values abstained from each firm's average values. For instance, cash holding varied between 0 and 244.66 - Overall Min and Max values. While average cash held by each company varied between 0 and 88.68 - between Min and Max.

² http://inflationdata.com/Inflation/Inflation_Rate/Historical_Oil_Prices_Table.asp

Table 1
Descriptive and summary statistics

Table 1 provides summary statistics of the key variables used in the paper covering firm years from 1970 – 2014. Assets are measured as the total assets minus cash. All real variables (e.g. real assets) are deflated using CPI in 1984 dollars. The cash holding is measured as cash recorded on the balance sheet divide by assets. Real size of the firm is the natural log of real assets. Market to book value (MBV) is the ratio of market value of equity to book value of equity. The book value of equity is measured as total assets less intangible assets and total liabilities. Both cash flows from operation (CFO) and cash flows from financing (CFF) are directly available from Compustat, however they are deflated by assets. Net working capital (NWC) to assets is calculated as current asset less cash and current liability. Leverage is the ratio of total debt to assets. Other variables include acquisitions and capital expenditures (Capex) of which both are divided by assets. Dividend is total amount of dividend that was paid out in a particular year. Lastly, revenue is price times quantity sold divided by assets.

Variable	Mean	Median	Between		Overall	
			Min	Max	Min	Max
Total assets	3213	234.3	0.005	45689	0	177757
Real assets	16.55	1.490	0	259.7	0	850.28
Cash/assets	0.553	0.030	0	88.68	0	244.66
MBV/assets	0.403	0.325	-11.89	11.89	-53.30	66.057
CFO/assets	-0.88	0.102	-421.2	3.120	-841.9	76.333
CFF/assets	0.607	0.037	-27.79	101	-662.4	420.33
NWC/assets	-1.49	-0.01	-451.9	0.856	-903.4	0.9794
Leverage/assets	2.369	0.535	0.0013	3.877	0.0134	5.4340
Capex/assets	0.246	0.151	0	47.55	0	94.999
Acquisitions/assets	0.015	0	0	0.250	0	0.9965
Dividend/assets	0.147	0	0	15.51	0	433.09
Revenue	0.624	0.353	0.7549	63.95	1.4432	84.666

4. Methodology and Results

The analysis begins by developing a baseline model that examines the determinants of cash holdings in the oil and gas industry using data from 1970 to 2014. The baseline model is used to identify cash-rich firms – firms that hold cash reserves above that predicted by the model. It is then determined whether cash-rich firms accumulate cash during a crisis and finally, how firms in the oil and gas changed their acquisition spending before, during and after the crisis.

4.1 Baseline model - Identification of excess cash

This section develops a baseline model to examine the key determinants of cash holdings in the oil and gas industry. This baseline model is used as a benchmark of normal cash holdings that can be used to identify cash-rich firms in the industry; that is to say, this model is used to identify firms that hold excessive cash. A baseline model is established by identifying firms' characteristics that play a key role in explaining cash holding, meaning, variables that are used have that have greater impact on the level of cash. Past studies that have conducted similar or related research are used as a guide on which variables to include in my regression model (see Kim et al., 1998, Opler et al., 1999, Harford, 1999, and Myers and Majluf, 1984). In other words, both theoretical and empirical literature are used to determine which variables to include in the regression.

To start with, market-to-book ratio are employed as a proxy variable to measure the degree of information asymmetry between internal management and other stakeholders (or to capture agency theory posit by Myers and Majluf, (1984)). Another key factor that past literature highlights as having significant influence on the level of cash holding is firms' size. Research by Kim et al. (1998) which studies the determinants of corporate liquidity found a significant negative relationship between cash level and firm size. These findings are consistent with that of Opler et al. (1999). In this paper, net working capital is used as a measure of cash substitutes. It is, however, important to note that cash is subtracted from net working capital.

The degree of cash flows is another key factor that drives the level of firms' cash holding. This research captures the degree of cash flow using operating cash flows and financing cash flows. The regression indicates a significant relationship between cash flow and the level of firms' cash holdings. It is also certain that capital expenditure is a key determinant of corporate cash holding, as one would argue that an increase in capital expenditure leads to a decrease in cash holding.

I include dividend in the model. Firms mostly pay dividends by drawing down their cash holding. Adding on to that, firms with shortage of liquidity tend to cut or reduce dividends. Thus, we should expect a negative relationship between cash and dividends. The leverage ratio is also included, which is measured as total debt divided by total assets. Lastly, I include price of oil of which we would expect to have a positive relationship with cash holding. Therefore, taken in conjunction with the model developed by Opler et al., (1999) I estimate the following model to establish baseline cash holdings.

$$\text{Cash}_{i,t} = \beta_0 + \beta_1 \text{ oil price} + \beta_2 \text{ Market to book value}_{i,t} + \beta_3 \text{ Real Size}_{i,t} + \beta_4 \text{ Revenue} + \beta_5 \text{ Cash Flow Operations}_{i,t} + \beta_6 \text{ Cash flow Financing}_{i,t} + \beta_7 \text{ CPEX}_{i,t} + \beta_8 \text{ Leverage}_{i,t} + \beta_9 \text{ Dividend}_{i,t} + \beta_{10} \text{ NWC} + \mu_{i,t}$$

$$t \in \{1,2,\dots,T\}, \& i \in \{1,2,\dots,I\}$$

Harford's approach (1999) is used to calculate excessive cash in which cash-rich firms are firms whose cash holdings are greater than 1.5 standard deviations above that predicted by the model for any year. More formally, excess cash is defined as:

$$\text{Excess_cash}_{i,t} = \text{Actual_cash}_{i,t} - (\text{Estimated_cash}_{i,t} + 1.5 \sigma_i) \quad t \in \{1,2,\dots,T\} \& i \in \{1,2,\dots,I\}$$

Table 2 presents the results for the estimated regression model covering the period from 1970 to 2014. The first 3 columns document the results of a random effects regression, while the last 3 columns document the results of fixed effects regression.

Fixed effects regression model assumes that firms unobserved characteristics are correlated with independent variables. While random effects regression model assumes that firms unobserved characteristics are uncorrelated with independent variables. Fixed effects regression models also controls for the effects of time - invariant variables of which random effect regression does not.

Table 2
Results of panel regression

Table 2 provides the results of panel regression. The dependent is cash. Cash is measured as cash recorded on the balance sheet divided by assets minus cash. Assets are measured as total assets minus cash. All real variables (e.g. real assets) are deflated using CPI in 1984 dollars. Real size of the firm is the natural log of real assets. Market to book value (MBV) is the ratio of market value of equity to book value of equity. The book value of equity is measured as total assets less intangible assets and total liabilities. Both cash flows from operation (CFO) and cash flows from financing (CFF) are directly available from Compustat, however they are deflated by assets. Net working capital (NWC) to assets is calculated as current asset less cash and current liability. Leverage is the ratio of total debt to assets. Other variables include acquisitions, capital expenditures (Capex) and revenue of which are all divided by assets.

	Random effects regression			Fixed effects regression		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Oil price	0.0095 (0.005)	0.0113 (0.005)	0.0099 (0.005)	0.0314 (0.006)	0.0298 (0.006)	0.0313 (0.006)
Market to book value	-0.1055 (0.0512)	-0.0764 (0.0501)	-0.104 (0.051)	-0.1332 (0.0494)	-0.1154 (0.0493)	-0.132 (0.049)
Real size	-0.3500 (0.0659)	-0.3849 (0.0802)	-0.3277 (0.0664)	-1.2549 (0.1358)	-1.1793 (0.137)	-1.222 (0.137)
Revenue		0.0821 (0.051)	0.1242 (0.049)		0.0447 (0.060)	0.0902 (0.061)

CFO	0.0776 (0.012)		0.08211 (0.0125)	0.0409 (0.012)		0.0447 (0.012)
CFF	0.4841 (0.013)	0.4665 (0.012)	0.48708 (0.0132)	0.5323 (0.013)	0.5219 (0.013)	0.5341 (0.013)
Capital expenditures	-0.6413 (0.1619)	-0.6485 (0.1613)	-0.6329 (0.1617)	-0.6426 (0.1619)	-0.6605 (0.1623)	-0.6415 (0.1619)
Leverage	0.1191 (0.015)	0.0831 (0.014)	0.1214 (0.015)	0.0970 (0.015)	0.0795 (0.014)	0.0991 (0.015)
dividend	-1.1160 (0.1383)	-1.1534 (0.137)	-1.1077 (0.1382)	-1.4782 (0.1378)	-1.4854 (0.1382)	-1.4718 (0.1379)
NWC	0.1450 (0.018)	0.1297 (0.018)	0.1469 (0.018)	0.1357 (0.018)	0.1290 (0.018)	0.1370 (0.018)
Cons	-0.4276 (0.4798)	-0.7903 (0.5394)	-0.5279 (0.4810)	-1.6303 (0.4269)	-1.547 (0.427)	-1.6803 (0.428)
R²	0.3701	0.3616	0.3718	0.3100	0.3127	0.3130

Notes: The numbers in the parenthesis represent the standard error.

Looking at both the random effects regression and fixed effects regression, the models seem to be well-specified with predictive power of roughly 0.3700 for the random effects regression and R^2 of roughly 0.3100 for the fixed effects regression. All variables in both regressions are significant at 5 % and 10% levels. Taking a closer look at the coefficients from both the random and fixed effect regression, the coefficients on oil price, revenue, cash flow from operation, cash flow from financing, leverage ratio and net working capital are positively related to firms' cash holdings. Conversely, market to book ratio, real size, capital expenditure and dividend are negatively related to cash holding. The majority of the coefficients signs are similar to those of past literature (see Opler et al., 1999 and Kim et al., 1998).

A similar regression to that above is run, only that this time a change in cash is used as the dependent variable (check table II appendix). This is done to check if the same factors that affect the level of cash also affect change in cash. The predictive power in the fixed effects drops remarkably while that of the random effects regression increases. All variables, but Real firm size, remain significant at 10% level in both the fixed and random effects regression.

Since both random effects regression and fixed effects regression seems to be well specified, the Hausman test is used to choose between the two models (check table III appendix). Explicitly, Hausman test is used to test the null hypothesis that the coefficients from random effects regression are the same as the those from fixed effects regression and the alternative that they are different. The Hausman test indicates that the fixed effects regression model is preferred to the random effects regression model.

The regression model is used above to separate cash-rich firms from non-cash-rich firms. Firms are considered to be cash-rich if their cash holding is 1.5 standard deviations above the value predicted by the baseline model. It is important to note that the 1st and 99th percentile of firms' cash holding were not included in the standard deviation calculation. This exclusion helps control for the large variation that might be caused by outliers.

Table 3 compares summary statistics, specifically the mean and median of firms that are identified as cash-rich to those that are not. Noticeably, Table 3 shows that cash-rich firms tend to be large in size. The average cash/asset ratio of cash-rich firms is significantly larger than that of non-cash-rich firms. This may be understood as a sign that cash-rich firms hold a substantial

amount of cash. Looking at Wilcoxon rank-sum tests (Z test) (check table IV appendix). Cash-rich firms are significantly different in total assets, total cash and cash/assets level from the rest of firms.

Despite the mean leverage ratio between cash-rich firms and non-cash-rich firms being different, the median leverage ratio is comparable (0.540 for cash-rich firms' vs 0.485 for non-cash-rich firms). The z test for statistical difference in leverage ratio between cash-rich and non-cash-rich indicates that the two firms' categories are not statistically significant different from each other. All-in-all, it is certain that the model did a good job in predicting the value of normal cash.

Table 3
Summary Statistics for Cash-Rich Firms

Table 3 compares the mean and median of total assets, cash to asset ratio and leverage ratio, and cash flow from operation of cash-rich firm years to non-cash-rich firm's years. Firms are considered to be cash-rich if they hold cash reserves that are more than 1.5 standard errors from the cash reserves predicted by the cash baseline model. The Wilcoxon rank-sum tests (Z) is used as a test for significant differences between cash-rich and non-cash-rich firms (check table IV appendix).

	Cash-rich firms		Non cash-rich firms	
	Mean	Median	Mean	Median
Total assets	4460.05	755.1	115.75	27.84
Total Cash	174.96	12.55	11.244	1.419
Cash/asset	0.6428	0.027	0.3447	0.055
leverage ratio	1.0633	0.540	5.3184	0.485
Cash flow opt	-0.159	0.120	-2.272	0.014
Acquisition	0.0181	0	0.0100	0
obs	2,846	2,846	1,232	1,232

4.2 Cash Accumulation

I now examine if cash-rich firms accumulate cash during a crisis. A crisis period has been chosen based on periods that existing literature has identified as downturn periods in the oil and gas industry (see Hamilton, 2011 and Hsu et al. 2014). After a number of considerations, it is decided that the 2007-2008 crisis as my period of investigation. Therefore, with respect to the 2008 crisis, we expect cash-rich firms to have started accumulating cash in 2007 soon after they observed a crisis ready to spend the cash on acquisitions after the crisis, in this case in 2009 and forth.

In order to examine firms' cash accumulation during the crisis, the period is divided into three sub-periods. The first period is the pre-crisis period which covers years from 2004 to 2006; The second period is the crisis period which covers from 2007 to 2009; and the last period is the post-crisis period, which covers years from 2010 to 2012. The motive of dividing the period into three sub-periods is that it gives a scope to assess whether the crisis period cash holding differs from both the pre-crisis cash holding and the post-crisis cash holding.

Table 4 shows firms cash holdings of all the sample firms in the oil and gas industry for different periods as classified in my study. On average, firms in the oil and gas industry hold about 0.553 cash ratio. The pre-crisis has the largest mean and median of 1.047 and 0.044 respectively. The post crisis has the lowest mean and median of 0.745 and 0.033 respectively. All 3 periods seem to have same variation. From these observations, we can infer that firms have stronger liquidity position before the crisis. The results above indicate that the cash level during the crisis is higher than that after the crisis.

Table 4
Descriptive and summary statistics of cash holding

Table 4 provides descriptive and summary statistics of cash holdings. I measure cash holding as cash recorded on the balance sheet divided by assets. Assets are measured as the total assets minus cash. **Pre-crisis period** covers years from 2004 to 2006. **Crisis period** covers period 2007 to 2009. **Post-crisis period** covers period years from 2010 to 2012. Full crisis period covers period from 2004 to 2012. **All period** includes years from 1970 to 2014.

Time Period	Mean	Median	Standard Deviation	Between		Overall	
				Min	Max	Min	Max
Full crisis period	0.897	0.036	10.42	0	88.68	0	244.66
Pre-crisis period	1.047	0.044	12.32	0	122.3	0	244.66
Crisis period	0.982	0.034	11.53	0	139.7	0	198.20
Post crisis period	0.745	0.033	8.072	0	88.68	0	177.16
All	0.553	0.030	7.144	0	88.68	0	244.66

Table 5 compares cash holdings between cash-rich firms and non-cash-rich firms for different periods as classified in the study. The mean cash holding of cash-rich firms increased from 1.371 during the pre-crisis to 1.523 during the crisis and later decreased after the crisis to 1.129. However, this is not the case with non- cash-rich firms whose mean cash holding dropped nearly by 45% from 0.577 during pre-crisis to 0.304 during the crisis. All the median values for cash-rich firms fall in the same range.

Table 5 indicates a large difference in the level of cash holding between cash-rich firms and non-cash-rich firms. This difference increases during the crisis. That is to say, we observe a difference in cash holding policy between the two firms' categories as cash-rich firms hold more cash, on average, during the crisis while non-cash-rich firms hold less cash during the crisis. These distinctions in cash holding can be attributed to the precautionary motive brought forth by

Keynes (1936). The Wilcoxon rank-sum test (Z test) is run to compare how significantly the two firm's groups differ in level of cash holding during these three periods. The Wilcoxon rank-sum tests (Z test) indicate that cash-rich firms are significantly different from non-cash-rich.

Table 5
Descriptive and Summary Statistics of Cash Holding for Cash-rich & Non Cash-rich Firms

Table 5 provides descriptive and summary statistics of cash holding for both cash-rich firms and non-cash-rich firms. The cash holding is measured as cash recorded on the balance sheet divided by assets. Assets are measured as the total assets minus cash. **Pre-crisis period** covers years from 2004 to 2006. **Crisis period** covers years from 2007 to 2009. **Post crisis period** covers years from 2010 to 2012. **Full crisis period** covers from 2004 to 2012. **All periods** include from 1970 to 2014.

Time Periods	Mean		Median		Standard Deviation		Overall Min		Overall Max		Z-Test	No. of Firms	
	Cash rich	Non cash-rich	Cash-rich	Non cash-rich	Cash-rich	Non cash-rich	Cash-rich	Non cash-rich	Cash-rich	Non cash-rich		Cash-rich	Non cash-rich
Full crisis period	1.317	0.361	0.027	0.060	13.79	1.91	0	0	244.67	44	8.775	202	182
Pre-crisis period	1.371	0.577	0.029	0.081	15.77	3.38	0	0	244.67	44	5.871	105	75
Crisis period	1.523	0.304	0.027	0.055	15.42	0.87	0	0	198.20	8	5.096	124	101
Post crisis period	1.129	0.284	0.025	0.052	10.85	1.21	0	0	177.17	19.48	4.698	177	153
All	0.643	0.343	0.027	0.055	8.505	1.61	0	0	244.67	44	10.63	247	215

It is certain that cash-rich firms' better access to capital market is the key driver of the difference in cash holding level between the two groups. That is to say, when cash-rich firms observe a crisis they draw down their lines of credit, consequently increasing the level of cash holding during that particular crisis period (Sun, 2014). Evidently, the results above indicate that cash-rich firms maintain a stronger liquidity position during crisis than non-cash-rich firms. One can argue that this increase in cash is driven by transaction motive after the crisis. The remainder of the paper will concentrate on cash-rich firms.

Table 6 provides the results of panel regression for cash-rich firms. The first three columns of table 6 report estimate for my panel regression with cash as the dependent variable, while the last three columns of Table 6 report estimates for the panel regression with change in cash as the dependent variable. Note that non-cash-rich firms are not included in the regression. The regression results from the first three columns indicate that cash decreases with market to

Table 6
Panel Regression with Crisis Dummy for Only Cash-rich Firms

Table 6 provides the results of panel regression for only cash-rich firms. The dependent variable in the first 3 columns is cash, while the dependent variable in the last 3 columns is change in cash. The cash holding is measured as cash recorded on the balance sheet divided by assets. Assets are measured as the total assets minus cash. **Pre-crisis period** covers years from 2004 to 2006. **Crisis period** covers period 2007 to 2009. **Post crisis period** covers period 2010 to 2012. **All periods** include year's 1970 to 2014. **Full crisis period** covers period 2004 to 2012.

	Cash			Change in Cash		
	Pre-crisis period	Crisis period	Post crisis	Pre-crisis period	Crisis period	Post crisis
Oil price	0.0415 (0.009)	0.0378 (0.009)	0.0468 (0.009)	0.0042 (0.008)	0.0017 (0.008)	0.0099 (0.008)
MBV	-0.3028 (0.337)	-0.3813 (0.337)	-0.3671 (0.318)	-0.0681 (0.193)	-0.091 (0.193)	-0.0834 (0.192)
Real size	-1.6480 (0.269)	-1.6931 (0.268)	-1.6528 (0.263)	-0.1343 (0.116)	-0.138 (0.116)	-0.1317 (0.1162)
Revenue	-7.7800 (0.347)	-7.6404 (0.343)	-7.6296 (0.342)	-0.9038 (0.288)	-0.8754 (0.286)	-0.8875 (0.286)
CFO	-4.3789 (0.185)	-4.3028 (0.182)	-4.2619 (0.183)	-0.600 (0.154)	-0.5842 (0.153)	-0.5915 (0.153)
CFE	0.2973 (0.073)	0.3023 (0.073)	0.3362 (0.069)	0.9073 (0.042)	0.9092 (0.042)	0.9114 (0.042)

capex	-1.8681 (0.839)	-1.8443 (0.840)	-1.9898 (0.794)	0.0896 (0.476)	0.1056 (0.476)	0.1087 (0.475)
Leverage	-5.8064 (0.409)	-5.7030 (0.408)	-5.8071 (0.391)	-2.4353 (0.262)	-2.4133 (0.261)	-2.4385 (0.261)
dividend	-14.589 (0.814)	-14.344 (0.809)	-14.349 (0.785)	-4.6059 (0.563)	-4.5621 (0.5610)	-4.6109 (0.561)
NWC	-5.7735 (0.412)	-5.6690 (0.411)	-5.7749 (0.394)	-2.4363 (0.264)	-2.4145 (0.263)	-2.4408 (0.263)
Crisis dummy	0.9541 (0.433)	1.1921 (0.403)	-0.8834 (0.409)	0.5264 (0.544)	0.6839 (0.502)	-0.9470 (0.511)
Cons	7.9624 (1.175)	8.1521 (1.175)	7.9562 (1.111)	1.9278 (0.663)	2.0326 (0.653)	1.8268 (0.663)
R²	0.6061	0.6092	0.6108	0.6240	0.6242	0.6247
Number of firms	152	152	152	151	151	151

Notes: The numbers in the parenthesis represent the standard error.

book value, firms size, revenue, cash flow from operations, capital expenditure, leverage, dividend and net working capital. Surprisingly, cash flow from operations and revenue are negatively related to cash holding. This negative relationship between cash flow from operations and cash might be instigated by the falling in cash flow from operation during crisis and firms mainly relying on cash flow from financing and credit. In other words, cash-rich firms react to a decrease in cash flow from operation during the crisis by drawing down their lines of credit, consequently leading to an overall increase in cash. On the other hand, cash increases with cash flow from financing. Furthermore, the regression above shows that large firm and highly leveraged firms hold less cash which is consistent with the pecking order theory. Not surprisingly, cash holdings decrease with payment of dividend which is consistent with the trade-off theory.

Looking at the coefficients on pre-crisis, crisis and post crisis dummy, the post-crisis dummy has a negative coefficient while both crisis and pre-crisis dummies have positive coefficients. The coefficient on the crisis dummy is significantly larger than that on the post crisis dummy (1.1921 vs -0.8834 respectively). The results from the first three columns indicate that cash-rich firms hold more cash during the crisis than any other period.

The last three columns of table 6 report estimates for my panel regression with change in cash as the dependent variable. The negative coefficient on real size, cash flow from operations, leverage and dividend persist. Comparing the coefficients on pre-crisis dummy, crisis dummy and post-crisis dummy (0.5264 vs 0.6839 vs -0.9470 respectively). As we can see, the pre-crisis and crisis dummies are positively related to change in cash while the post-crisis dummy is negatively related to change in cash. However, that coefficient on the crisis dummy is larger than that on pre-crisis dummy.

Therefore, from the results above we can infer that cash-rich firms hold more cash during the crisis than any other period. That is to say, cash-rich firms increase their cash holding significantly ready to spend it after the crisis. This is evidently by significant positive coefficient on the crisis dummy and negative coefficient on the post-crisis dummy.

Before forming a conclusion, the same panel regression is estimated, as was the one above - with cash as the dependent variable and another one with change in cash as the dependent variable.

The only difference is that I include year dummies in the regression (Check table V in appendix). Another regression is also run with all crisis dummies in the one regression equation (Check table V in appendix). The results show that 2008 and 2009 year dummies have the largest positive coefficient in both regressions – the regression with cash as the dependent and the one with change in cash as the dependent. Another interesting outcome in the regression with change in cash as the dependent variable is that the 2010-year dummy has a significantly large negative coefficient (Large in absolute value). Not only that, both regressions indicate that the crisis dummy is significantly positively related to cash holding and has a larger coefficient.

I also re-estimate all the regression models specified above omitting dividend, leverage and capital expenditures. This step stems from the static trade off theory which states that firms tend to choose leverage and cash holdings simultaneously. Therefore, if a model is not well specified, this simultaneous determination could lead to inconsistent estimators. The results from these regressions lead to the same conclusion as that stated above.

The results from the above analysis indicate that the manifestation of a crisis induces corporate desire to holding more cash. In particular, cash-rich firms increase their cash holding during the crisis to secure strong liquidity position after the crisis. This is consistent with the hypothesis which states that cash-rich firms in the oil and gas industry hold more cash during a downturn than in the normal times. Furthermore, cash level drops significantly after the crisis and fall in cash after the crisis can be attributed to firms spending on acquisitions.

4.4 M&A Activities During a Crisis

Acquisitions are substantial investment decisions that can have a significant impact on the value of the acquiring firm. Firms engage in acquisitions to mitigate competition, expand production and diversification. Acquisitions may come with some disadvantages including; high transaction cost associated with the acquisition process and high premiums that the acquirer might have to pay the shareholders of the target firm. In addition, research by Singh and Cynthia (1987) shows that acquiring a firm in related operation has higher return than acquiring a firm with unrelated operations. This is not surprising given that this research finds that most acquisitions in the gas and oil industry are related acquisitions.

Table 7 shows descriptive and summary statistics of cash-rich firms' acquisition in the oil and gas industry for different periods as classified in my study using Compustat data. On average, cash-rich firms in the oil and gas industry spend about 0.0181 on acquisition. The pre-crisis has the largest mean of 0.0490 compared to the crisis and post crisis with means of 0.0199 and 0.0262 respectively. Large values of acquisition spending appear in the pre- and post- crisis periods. Just by looking at this table, we can infer that, on average, cash-rich firms cut their acquisition spending during the crisis and increase it after the crisis. However, these results indicate that the mean values of crisis and post crisis periods are not statistically different from each other.

Looking at the overall and between minimum and maximum acquisitions values during the crisis. Acquisitions spending varied between -0.051 and 0.657 - Overall Min and Max values. while average acquisition spending by each company varied between -0.0258 and 0.21493-

between Min and Max. Negative acquisition values on minimum are due to the costs associated with failed acquisitions.

Table 7
Descriptive and Summary Statistics of Acquisition Spending

Table 7 provides descriptive and summary statistics of acquisition spending. Acquisition spending is direct available from compustat. Acquisition is divided by assets. Assets are measured as the total assets minus cash. **Pre-crisis period** covers years from 2004 to 2006. **Crisis period** covers period 2007 to 2009. **Post crisis period** covers period years from 2010 to 2012. Full crisis period covers period from 2004 to 2012. **All period** includes years from 1970 to 2014.

Time Period	Mean	Median	Standard Deviation	Between		Overall		Z-Test
				Min	Max	Min	Max	
Full crisis period	0.0303	0	0.09622	-0.1313	0.49922	-0.131	0.996	-9.10
Pre-crisis period	0.0490	0	0.12276	-0.0126	0.77095	-0.012	0.770	-6.61
Crisis period	0.0199	0	0.07133	-0.0258	0.21493	-0.051	0.657	-3.77
Post crisis period	0.0262	0	0.09192	-0.1313	0.49922	-0.131	0.996	-5.35
All	0.0181	0	0.17688	-5.3487	2.70165	-8.050	0.996	-9.57

Table 8 provides statistics of all completed acquisitions listed on the SDC database announced over the period 2004 to 2013. Looking at the column with total sum value of all transactions, 2011 recorded the lowest value of 15,266.45 followed by 2010 with the value of 25,004.13. This column also indicates that the total sum value of all transactions started to decline in 2008 and picked up in 2012. Interestingly, the total sum value of all transactions dropped by 50% from 71,820.92 in 2007 to 35,621.11 in 2008. Table 8 also shows that the number of transactions above one billion dollars dropped during the crisis – this number does not include missing values because missing values are treated as transactions bellow one billion dollars. Nonetheless, the

number of transactions above one billion dollars raised to a total of 12 in 2012 from its lowest value of 3 in 2011.

Table 8
Tabulation of M&A Transactions using SDC Data

Table 8 provides statistics of all completed acquisitions listed on the SDC database announced over the period 2004 to 2013. This period covers the pre-crisis period from 2004 to 2006, crisis period from 2007 to 2009 and post-crisis period from 2010 to 2012. The table also records number of transactions that closed above one billion dollars, the percentage number of firms that were identified by the baseline model to be cash-rich in that particular year. The baseline model is developed using Compustat data. The target is considered bankrupts if it was declared bankrupts before or during the transaction.

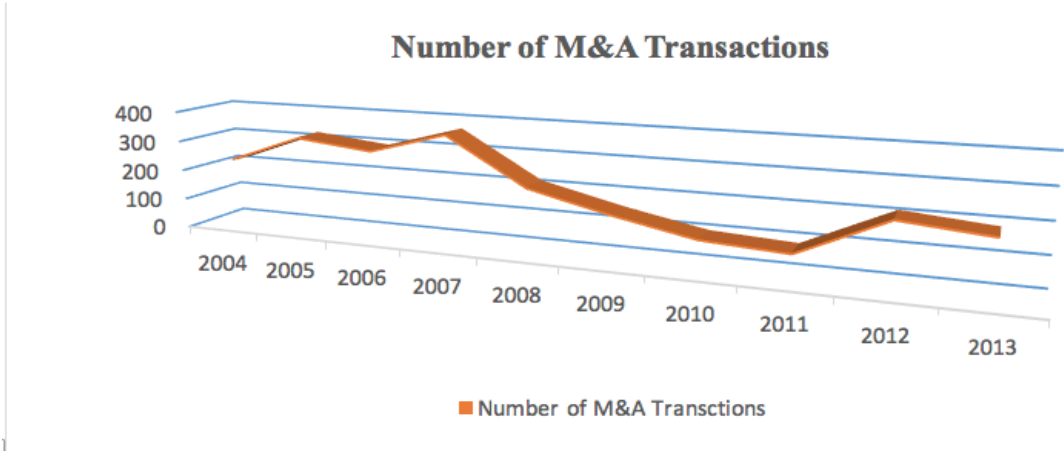
Year	Total number of transactions	Number of transactions Above \$1 billion	Total sum value of all transactions	Number of bankruptcy firms acquired	Percentage number of firms Identified as cash-rich	Total number of Acquire firms
2004	231	5	29,280.68	1	57 %	175
2005	322	14	99,395.02	0	55 %	244
2006	295	15	68,089.03	0	57 %	221
2007	366	15	71,820.92	0	56 %	272
2008	215	9	35,621.11	2	61 %	181
2009	153	4	32,986.32	4	63 %	134
2010	101	7	25,004.13	0	62 %	92
2011	86	3	15,266.45	1	61 %	79
2012	212	12	46,315.20	0	59 %	168
2013	188	8	45,759.31	3	57 %	156
Total	2,169	92	469,538.1	11		1888

Note: One firm might participate in more than one M&A activity in a particular year. Values are in millions of dollars

Looking closer at the column that documents the number of bankruptcy firms that were acquired, the year 2009 recorded the highest value of 4. It is certain that the increase in the number of

firms that went bankrupt was triggered by the 2008 crisis. Not surprising, the percentage of firms identified as cash-rich increased during the crisis period and resumed to its normal value after the crisis. While still on table 8, we can also see that, just like other variables, the total number of acquire firms dropped during the crisis from its highest value of 272 in 2007 to the lowest value of 79 in 2011; however, the number of acquired firms doubled from 79 in 2011 to 168 in 2012.

Figure A: Total number of M&A transactions in the oil and gas industry from 2004-2013



Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Number	231	322	295	366	215	153	101	86	212	188

Figure A plots the total number of M&A transactions for the period of 2004 to 2013. Looking at the graph, there is an upward trend in the number of M&A transactions from 2004 to 2007, however, this did not persist as there is a decline in the number of M&A transactions from 2008 to 2011. Clearly, this decrease in M&A activities from 2007 to 2011 can be attributed to the 2008 crisis which negatively affected the commodity market. The crisis also led to the tightening of credit which without doubt affected the number of M&A transactions in the industry. Shortly

after the crisis, the industry started to recover with the number of M&A transactions rising to 212 in 2012 from its lowest value of 86 in 2011.

To summarize this section, the above statistical analysis suggests that both acquisitions spending and the number of M&A transactions declined during the crisis and escalated after the crisis. Explicitly, the total sum value of all transactions declined in 2008 and picked up in 2012. We observe similar trends in the number of M&A transactions. Not only that, the total number of acquired firms dropped during the crisis and rose substantially after the crisis. These findings are in line with the hypothesis that M&A activities in the oil and gas industry decline during a downturn and rise significantly after the downturn.

I take a step further to examine if acquirer firms that made acquisitions above one billion dollars after the crisis were among firms identified by my model to have held excessive cash; These firms held excessive cash prior to the acquisitions. Altogether, it is noted that cash-rich firms in the oil and gas industry accumulate cash during the crisis and at the same time cut acquisition spending during the crisis. Furthermore, these firms reduce their cash level after the crisis and increase acquisition spending instantaneously.

5. Conclusion

This paper uses North American data to examine if cash-rich firms in the oil and gas industry accumulate more cash during an industry crisis. Furthermore, it studies whether M&A activities after the crisis are the main motive of this cash accumulation. In particular, it examines if cash-

rich firms accumulate more cash during a crisis to secure a strong liquidity position to support M&A activities after the crisis.

A baseline model is developed of normal cash holding which is used to identify cash-rich firms. The results indicate that cash-rich firms accumulate more cash during the crisis period than other periods. Furthermore, the results indicate that high leveraged firms and large firms accumulate less cash relative to low leveraged firms and smaller firms.

This paper also finds that firms cut their acquisition spending during the crisis. Not only that, but also the number of firms that participate in M&A activities decline significantly during a crisis. In fact, total value of M&A transactions falls significantly during a crisis. This paper also finds that both acquisitions spending and the number of M&A activities rise substantially after the crisis. These findings are in line with the hypothesis which states that M&A activities in the oil and gas industry decline during a downturn and rise after the downturn. While on the same note, this paper finds that the number of firms identified as cash-rich increases during the crisis period. Moreover, this research finds that the proportion of cash-rich firms undertaking acquisitions is significantly higher than that of non-cash-rich firms and this is consistent with Harford's (1999) findings.

Despite this paper adding new credible evidence on motives for firms' cash accumulation during the crisis. This paper fails to track if most of the acquired firms were distressed. It is recommended that future research interested in this topic take a step further and track if most of

the acquired firms were distressed. Another important issue for further research is to track the performance of cash-rich firms that acquired distressed firms after crisis.

In conclusion, taken in conjunction with research done by Opler et al. (1999) and Harford (1999) this paper provides additional evidence of the determinant of cash holding during a crisis and the use of this cash after the crisis. It has been determined that cash-rich firms in the oil and gas industry hold more cash during a crisis and that acquisitions spending drops during a crisis and picks up after the crisis.

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Appendix:

Table I
Variable definition

Panel A

Variable	Full Name	Description	Predicting
Cash ratio	Cash ratio	Cash and cash equivalents / Net Assets.	Cash holdings
Capexp	Capital Expenditure	The annual change in fixed assets added to depreciation.	Investment Activity
Cashflow	Cash flow	(net profit After tax + Depreciation) / Net Assets.	Business operations
Leverage NWC	Leverage Ratio Net working capital	Total debt / Net assets (Current assets- cash and cash equivalents – current liability) / net assets.	Financial Leverage Liquid Asset Substitutes
ROA Size	Return On Assets Firm size	Net income / net assets. Natural logarithm of Net assets	Profitability Financial constraints
Divyield	Dividend yield	Dividends paid / stock price	Financial constraints
Tobinq	Tobins' Q	(Book value of debt + Market value of equity) / book value of assets.	Long-term growth

Panel B

Variables that are not directly available from Compustat.

Variable	Description	Predicting
Capital Expenditure	The annual change in fixed assets added to depreciation.	Investment expenditure
Leverage Ratio	Total debt / Net assets	
Net working capital	(Current assets- cash and cash equivalents – current liability) / net assets.	Substitutes of liquid asset
Firm size	Natural logarithm of net assets	
Book value of ssets	Assets – Intangible assets – total liabilities	
Market to Book values	Book value asset / (Book value asset – book value per	degree of information

Table II
Results of panel regression

Table 2 provides the results of panel regression. The dependent variable is change in cash.

	Random effects regression			Fixed effects regression		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
Oil price	0.0020 (0.0051)	0.0034 (0.0052)	0.0024 (0.0051)	0.0049 (0.0062)	0.0047 (0.0062)	0.0051 (0.0062)
Market to book value	-0.1070 (0.05041)	-0.1000 (0.05045)	-0.0928 (0.0503)	-0.1167 (0.0521)	-0.1083 (0.0521)	-0.1036 (0.0523)
Real size	0.0363 (0.0473)	0.0728 (0.0554)	0.0464 (0.0475)	-0.0048 (0.1616)	0.0319 (0.1584)	0.0008 (0.1613)
Revenue		0.1233 (0.0461)	0.2244 (0.0504)		0.1840 (0.0618)	0.2480 (0.0882)
CFO	0.0848 (0.0316)		0.1582 (0.0356)	-0.0508 (0.0360)		0.0521 (0.0513)
CFF	0.6122 (0.0149)	0.5939 (0.0132)	0.6317 (0.0155)	0.4139 (0.0283)	0.4364 (0.0244)	0.4579 (0.0323)
Capital expenditures	-0.3272 (0.22431)	-0.3262 (0.2265)	-0.2477 (0.2242)	0.1075 (0.2578)	0.0838 (0.2575)	0.0730 (0.2577)
Leverage	0.1140 (0.0257)	0.0625 (0.0188)	0.1575 (0.0274)	0.5701 (0.0977)	0.5588 (0.0972)	0.5472 (0.0978)
dividend	-0.7546 (0.20883)	-0.8010 (0.2065)	-0.5708 (0.2121)	-0.608 (0.223)	-0.5101 (0.2176)	-0.4282 (0.2320)
NWC	0.1577 (0.0280)	0.1134 (0.0234)	0.2015 (0.0296)	0.6086 (0.0970)	0.5973 (0.0965)	0.5850 (0.0972)
Cons	-0.3277 (0.38721)	-0.5151 (0.4184)	-0.5316 (0.3894)	-1.1036 (0.4396)	-1.1731 (0.4395)	-1.1983 (0.4402)
R²	0.4879	0.4877	0.4923	0.0502	0.0593	0.0703

Table III
Hausman test for fixed and random effects

. hausman fe re

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
	(b) fe	(B) re		
oilprice	.0313064	.0099021	.0214043	.0023943
MBV	-.1328893	-.1040075	-.0288818	.
lnAssets	-1.222168	-.327743	-.8944254	.1205704
Revenue	.0902997	.1242058	-.0339061	.0376259
CFO	.0447562	.0821142	-.037358	.
CFF	.5341656	.487081	.0470846	.0040465
capex	-.6415856	-.6329953	-.0085902	.0078697
Leverage	.0991675	.1214247	-.0222572	.0037926
div	-1.471809	-1.107791	-.3640185	.
NWC	.1370864	.1469651	-.0098787	.0040781

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(10) = (b-B)' [(V_b-V_B)^(-1)] (b-B)
= 309.37
Prob>chi2 = 0.0000

Table IV
Wilcoxon rank-sum tests (Z test)

Wilcoxon rank-sum tests (Z) as a tests for significant differences between cash-rich and non-cash-rich firms

Variable	Z_value	P_value
Total assets	z = -30.041	Prob > z = 0.0000
Total Cash	z = -21.119	Prob > z = 0.0000
Cash/asset	z = 10.629	Prob > z = 0.0000
leverage ratio	z = -1.230	Prob > z = 0.2187
Cash flow Opt	z = -17.131	Prob > z = 0.0000
Acquisition	z = -9.572	Prob > z = 0.0000

Table V
Panel Regression with Crisis and Year Dummies for Only Cash-rich Firms

Table V provides the results of panel regression for only cash-rich firms. The dependent variable in the first 2 columns is cash while the dependent variable in the last 2 columns is change in cash.

	Cash		Change in Cash		
	Yeah dummies	Crisis Dummies		Year dummies	Crisis Dummies
Oil price	0.0030 (0.0069)	0.0044 (0.0063)		-0.0011 (0.0063)	0.0024 (0.0058)
MBV	-0.1056 (0.05150)	-0.1038 (0.0511)		-0.0934 (0.0504)	-0.0946 (0.0503)
Real size	-0.3200 (0.0637)	-0.3306 (0.0664)		0.0480 (0.0469)	0.0451 (0.0477)
Revenue	0.1255 (0.0484)	0.1270 (0.0490)		0.2238 (0.0503)	0.2247 (0.0504)
CFO	0.0845 (0.0126)	0.0832 (0.0125)		0.1588 (0.0355)	0.1584 (0.0356)
CFE	0.4864 (0.0132)	0.4880 (0.0132)		0.6323 (0.0156)	0.6320 (0.0155)
Capex	-0.6404 (0.1622)	-0.6321 (0.1616)		-0.237 (0.2241)	-0.2423 (0.2243)
Leverage	0.1239 (0.0152)	0.1223 (0.0152)		0.1575 (0.0274)	0.1571 (0.0275)
Dividend	-1.0877 (0.1389)	-1.1052 (0.1380)		-0.5716 (0.2122)	-0.5738 (0.2124)
NWC	0.1495 (0.0183)	0.1476 (0.0182)		0.2017 (0.0295)	0.2008 (0.0296)
2004	-0.123 (0.6317)			-0.0259 (0.6097)	
2005	-0.172 (0.5980)			0.1150 (0.5828)	
2006	0.6465 (0.5750)			0.0061 (0.5597)	
2007	0.5471 (0.5551)			0.1437 (0.5379)	
2008	1.4456 (0.6190)			0.9788 (0.5875)	
2009	1.3741 (0.5327)			0.3717 (0.5145)	
2010	0.7192 (0.5264)			-0.821 (0.51603)	
2011	0.1989 (0.5343)			-0.0305 (0.5222)	
2012	0.2714 (0.4972)			0.5035 (0.4972)	

Pre-crisis dummy		-0.2069 (0.4409)			0.1933 (0.4341)
Crisis dummy		0.7539 (0.3889)			0.6015 (0.3817)
Post crisis dummy		0.3362 (0.3618)			-0.1695 (0.3559)
Cons	-0.2944 (0.5172)	-0.421 (0.4925)		-0.3660 (0.4322)	-0.5763 (0.4058)
R²	0.3750	0.3739		0.4942	0.4929

Notes: The numbers in the parenthesis represent the standard error

Table VI
Total value of transactions of M&A activities by year

Time	No. of Obs	Mean	Std. Dev.	Max	Total sum value of transactions
2004	231	126.7562	368.1607	2954.126	29280.683
2005	322	308.6802	2258.149	35395.01	99395.015
2006	295	230.8103	1123.396	16087.22	68089.03
2007	366	196.232	1032.837	17298.66	71820.921
2008	215	165.6796	553.6174	5454.254	35621.108
2009	153	215.5969	1296.055	15581.71	32986.319
2010	101	247.5657	655.0814	4000	25004.133
2011	86	177.5168	484.6667	3500	15266.447
2012	212	218.4679	545.6503	5428.4	46315.203
2013	188	243.4006	664.5997	6000	45759.305

Figure I
Total value of transactions of M&A activities

