Balance Sheet Strength in the Oil and Gas Industry:

Saving for a Rainy Day or Making Hay While the Sun Shines

Mark Anderson[a] Yan Ma[b]* and Han-Up Park[c]

[ab]*Haskayne School of Business, University of Calgary, Calgary, Canada;* [c]*Edwards School of Business, University of Saskatchewan, Saskatoon, Canada*

*Corresponding author. E-mail addresses:yan.ma@ucalgary.ca; Cell: +1 403-891-5516; Mail Address: 13-9420 Ferndale Road Richmond BC Canada V6Y0A7.

Acknowledgement: The authors deeply appreciate the contributions of Rajiv D. Banker to the development of this study.

Declarations of interest: none

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ABSTRACT

Accounting plays a strategic role when accounting-based measures are used to set, communicate and execute strategy. In this paper, we describe and test a strategic role of accounting in the dynamic context of cyclical industries. Specifically, we examine how a strategic emphasis on balance sheet strength influences firm decisions and performance over time. In a series of discussions with industry insiders and through readings of disclosures for prominent oil and gas companies in Canada, we identify two groups of firms based on how they use accounting-based measures to respond to and manage industry economic cycles. One group of firms grows aggressively when oil prices are strong and funds are available – "*making hay* while the sun shines", while the other group grows conservatively to build balance sheet strength – "saving for a *rainy day*". Through analysis of production and financial data, we first document that *rainy day* companies, which focus on balance sheet strength evidenced by higher cash flows to debt over time, grow less quickly than *making hay* companies, except in periods following sharp price declines. Then, we compare the two groups of companies and find that *rainy day* companies buy assets (oil reserves) at lower prices on average and operate more efficiently than *making hay* companies. Our analysis brings attention to the strategic role of accounting and highlights balance sheet strength as a strategic marker for firms in cyclical industries.

Keywords: balance sheet strength, strategic role of accounting, oil and gas, cyclical industries

1. Introduction

In December 2008, in the wake of the financial crisis, the oil price collapse culminated in a low price of $31 per barrel. A 5-year run-up, to a peak of $147.30, was quickly erased by a demand-driven downturn in only six months (Ristanovic & Solutions, 2020). After a recovery period, the price stabilized at around $95, before a supply-driven downturn in late 2014 slashed the price to $46. Oil prices struggled through 2015 and 2016 and returned to $70 levels in 2017, but then slumped again to hit a record low with the coincidental surge in sustainability investing and the Covid-19 crisis in 2020 (Stevens, 2021). In 2022, due to geopolitical forces, the oil price bounced back to reach prices above $100, kicking off another series of ups and downs, but no one knows when these gyrations will occur or how long they will last (Garcia, 2022).

This "oil market rollercoaster" demonstrates the nature of cyclical industries – they are heavily impacted by industry economic cycles created by exogenous and endogenous forces that affect the balance of supply and demand (Zarnowitz, 1985; Mascarenhas & Aaker, 1989; Mathews, 2005). These cycles are unpredictable in terms of timing, amplitude, and duration, and thus impose high uncertainty on companies (Zarnowitz, 1985) – upcycles which lead to development and prosperity mingled with downturns that threaten survival. Managers in cyclical industries constantly face the challenges of making decisions to grow and thrive while navigating the industry economic cycles that influence the amount and timing of future cash flows. Because accounting is an important way for financial executives to communicate externally and internally, we address two important and underexplored questions: *What role does accounting play in the development, communication and execution of strategy in the dynamic context of cyclical industries? How does the strategic use of accounting influence decisions and performance over time?*

We conduct our study in the context of the Canadian Oil & Gas industry. We began by talking with senior financial executives, senior partners of audit firms, industry consultants and analysts about how O&G companies respond to industry cycles and how chief financial officers (CFOs) play a critical role in managing cycles. Our discussions and readings of financial reports and other disclosures led to the identification of two groups of companies.

The first group manages cycles by "*making hay* while the sun shines" and hunkering down when the sun is gone. The *making hay* companies invest aggressively when prices are high and highlight their intention to grow aggressively in their annual reports and other disclosures. Their aggressive growth is supported by the availability of external funding from capital market investors, who are traditionally hungry for growth in the O&G sector when commodity prices are high. The *making hay* companies typify the maverick approach in the Canadian O&G industry.

The Canadian O&G industry has been known for outspending its cash flow – the nature of energy sector demands substantial capital investments (Potkins, 2022; Canada Energy Regulator, 2018). The O&G companies generally require initial funding in the billions of dollars for activities such as oil and gas extraction, bitumen upgrading, crude oil refining, oil and gas product transportation, or power generation and distribution (Canada Energy Regulator, 2018). When launching a large-scale project, an O&G companies must secure the necessary financial resources. Although the companies may get funds raised internally through operations or asset sales, it often seeks to acquire further funds through capital markets (Canada Energy Regulator, 2018). "Prevailing energy commodity market conditions have a clear impact on capital markets; at the same time, capital market conditions contribute to future energy commodity market outcomes" (Canada Energy Regulator, 2018.)

The second group of companies manage the dynamic environment by "saving for a *rainy day*". The *rainy day* companies invest less heavily during high commodity price periods and prepare in advance for the inevitable low-price periods by focusing their attention on building and maintaining balance sheet strength. They conserve their debt capacity and use high prices in an upcycle period to accumulate cash resources and build their investment capability.

Researchers often refer to the valuation and stewardship roles of accounting, but less attention has been paid to the strategic role of accounting. We assert that accounting plays a strategic role when accounting-based measures are used to set, communicate and execute strategy. A strategy has two essential characteristics – it is made in advance of actions to which it applies, and it is developed consciously and purposefully (Mintzberg, 1987). In business, a strategy is designed to create value. We used our discussions with industry insiders and reading of financial reports to inform and enrich our empirical analysis of the *rainy day* strategy.

First, we consider how a strategic emphasis on balance sheet strength influences capital investment decisions. Based on industry conventions that we identified through interviews with industry experts and other sources, we use cash flows to debt (averaged over time) as the measure of balance sheet strength used to discriminate between the two groups of companies. Our empirical evidence indicates that growth, defined as capital expenditures relative to total assets, is indeed lower for *rainy day* (high cash flows to debt) firms than for *making hay* firms, except in periods following steep price declines. This finding supports our use of the long-term ratio of cash flows to debt as a strategic marker.

We then investigate whether *rainy day* firms make better acquisitions, that is, whether the value of proven oil reserves acquired per dollar of capital expenditure (CAPX) is, on average, higher for *rainy day* than for *making hay* firms. We find that this is the case, and that this investment advantage was enhanced following the sharp drop in oil prices in 2014. This

indicates that *rainy day* companies, which forgo some investment opportunities during up-cycle periods to build and maintain balance sheet strength, obtain higher value for their acquisition expenditures by buying less aggressively in up-cycle periods and buying opportunistically during down-cycle periods.

Next, we test whether *rainy day* companies operate more or less efficiently than *making hay* firms over time. Companies that grow conservatively are more likely to develop human and other capabilities at a measured pace because they have the resources and the time to expend on learning and growth in ways that develop their internal business processes (Kaplan & Norton, 2006). In addition, because such companies make more deliberate acquisition decisions, they can be selective and buy assets that produce more efficiently. We apply data envelopment analysis (DEA) to determine a firm's relative performance in converting corporate resources and inputs into oil and gas production compared with the industry leader (Banker et al., 1984; Demerjian et al, 2012). Importantly, this measure is based on production as opposed to revenue because revenue is tied to the price of oil. Using a two-stage DEA approach (Banker & Natarajan, 2008), we run a second-stage regression that relates the operating efficiency score obtained in the first stage to our indicator variable for the *rainy day* companies and other factors that may affect operating efficiency. We find that *rainy day* companies outperform *making hay* companies in general, and that this advantage is enhanced during periods following steep price declines.

Together, our results from data analysis support our premise that some companies in the Canadian O&G industry follow a distinctive *rainy day* strategy for dealing with industry cycles, consistent with their emphasis on balance sheet strength in the communication of strategy. We show that implementing a *rainy day* strategy, by maintaining higher levels of cash flows to debt, leads to higher operating efficiency in general and that this advantage is even greater in post-

steep price decline periods. Our analysis indicates that higher operating efficiency results in part from making better acquisitions – obtaining greater quantities of proven oil reserves per dollar of capital expenditure.

In an uncertain business environment, an entity's long-term performance depends on its ability to not only avoid risk but transform risk into competitive advantage (Foster & Kaplan, 2001; Collins & Hansen, 2011; Kaplan & Mikes, 2012; COSO.org, 2016; Weidemeyer & Perkin, 2021). This capability is noteworthy in the aftermath of the COVID-19 pandemic, as companies are more sensitive to industry cycles and there is a heightened awareness of uncertainty prevailing in the business environment (Wang, 2021; IEA 2021). The accounting profession has recognized the need for accounting to play a more strategic role (CPA Canada, 2021). Recent surveys indicate increasing expectations of CEOs and boards for CFOs to assist in shaping and executing strategies (Davies & Huey, 2017; FSN Research, 2016; Agrawal, Grube, & Hill, 2021). However, less emphasis has been placed on recognizing the strategic role of accounting itself in contrast to its roles in valuation and stewardship.

Our study is timely in its consideration of the strategic role of accounting in assisting companies to transform threats into opportunities. Capturing and understanding the ways that accounting plays a role in strategic management provides an interesting lens for discussing and describing the impact of accounting in the modern setting of global uncertainty. Our findings highlight the use of balance sheet strength not simply as a measure of financial risk, but also as an important marker for articulating and communicating strategies in cyclical industries. As a strategic indicator, balance sheet strength goes beyond financial risk to provide information on asset acquisition and operating efficiency.

In the next section, we describe more fully our approach for identifying two groups of companies in cyclical industries and develop our hypotheses. In the third section, we describe

the research design, data, and empirical measures. In the fourth section, we describe the results obtained by estimating the empirical models. In the final section, we draw conclusions from our analysis and identify avenues for future research.

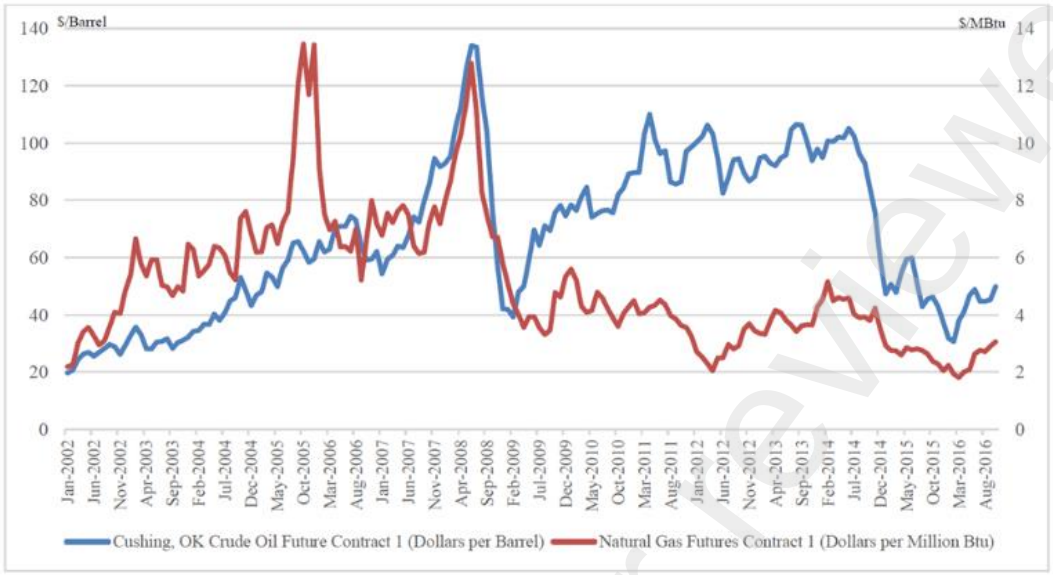
2. Industry Economic Cycles and Balance Sheet Strength

2.1. Industry Economic Cycles and the Canadian Oil and Gas Industry

Industry economic cycles are caused by exogenous and endogenous forces that upset the balance of supply and demand. Those cycles are comprised of periods of growth and decline that are unpredictable in terms of timing, amplitude and duration (Zarnowitz, 1985; Mathews, 2005). “It's very volatile, so you have to manage to those cycles,” comments Canadian Natural President Tim McKay (Williams, 2022). When making strategic decisions, executives and managers in cyclical industries must deal with risk due to uncertainty associated with industry economic cycles that depend on prevailing balances of supply and demand.

The Canadian Oil and Gas Industry provides an ideal setting for this analysis because it experiences shifts in the balance of supply and demand that result in periods of rising and declining prices of uncertain amplitude and duration (see Figure 1). From 2003 to 2008, oil prices increased to around $136/bbl driven, with a peak of almost $148, due to political and economic factors including growing demand in Asia (Deutsche Bank, 2013). Then, the O&G industry experienced major challenges posed by the demand-driven price decline after the global economic crisis in 2008, when oil prices dropped dramatically to $31/bbl (Deutsche Bank, 2013). The industry then experienced a long run-up in oil prices followed by a sharp downturn due to the supply-driven price collapse in late 2014.

Figure 1. Oil and gas prices from 2002 to 2016



Data Source: Energy Information Admiration (http://www.eia.gov/)

Given the commodity nature of the upstream O&G industry, the price cycles are not heavily influenced by product innovations that may change the competitive landscape, enabling us to focus on the uncertainty associated with industry economic cycles as opposed to product life cycles.[1] While there is diversity in terms of the types of oil (light versus heavy oil) and the extraction technologies (conventional wells, horizontal drilling, offshore wells, oil sands), the price effects are similar for all exploration and production (E&P) companies.

2.2. "Making Hay While the Sun Shines" versus "Saving for a Rainy Day"

In a series of personal meetings, we talked with current and former CEOs and CFOs, senior audit partners at Big Four accounting firms specializing in the O&G industry, and consultants and analysts who closely follow the industry. Our conversations were open-ended but focused on the differences they saw across companies in dealing with the uncertainties posed by

[1] Some might argue that the O&G industry is in a decline phase due to the transition to renewable energy, but most experts believe that the transition will take up to 50 years while world demand for oil continues to increase. In fact, technological innovations such as cryptocurrency and artificial intelligence add to global demand for energy.

industry economic cycles. We also read descriptions of strategies in annual reports, industry and financial magazines, and articles written on cyclical industries in both the business press and the academic literature. Our discussions and reading led us to identify two strategies that are prevalent in the O&G industry: "*making hay* while the sun shines" and "saving for a *rainy day*".

Some oil and gas companies grow aggressively during the up-cycle phases of industry economic cycles. "The O&G industry is obsessed with growth. Some companies cannot differentiate on margins from others, so they go after growth", one of our interviewees comments.[2] This aggressive growth is supported by the availability of funding from capital market investors and lenders who are hungry for growth in the O&G sector when demand for oil is strong and commodity prices are high (Garcia, 2022). Firms have high collateralizability to borrow more from different creditors based on attractive growth plans and high commodity prices during the promising up-cycles periods (Rampini & Viswanathan, 2010). "These investors are betting on oil – they are willing to take the risks," a senior analyst told us. Some O&G companies, which are often financially constrained in terms of internal capital, can take advantage of high oil prices to acquire external capital and increase borrowing from banks and bond markets (Canada Energy Regulator, 2018). Those firms then convert those external funding into investment their investment capabilities to aggressively expand and grow and generate high returns when the market conditions are favourable, *making hay* while the sun shines.

[2] "Historically, the largest oil producers in the country were always developing new multi-billion projects to grow their operations."

For instance, Charger Energy Corp. (formerly Seaview) indicates that "Seaview's goal is to create sustainable and profitable growth in production and cash flow. To accomplish this, Seaview has, and will continue to pursue, aggressive, yet focused, acquisition, exploration, exploitation and development opportunities" (Annual Information Form, 2010, p.7). Similarly, PetroNova Inc. states in its annual report that "the Corporation's strategy is to develop its existing portfolio of assets and to pursue further exploration opportunities" (Annual Report 2014, p.3). A Moody's report (2016) comments that "the largest U.S. and Canadian oil exploration and production companies are paying their executives to focus on boosting production and replacing reserves, rather than conserving capital and reducing debt."

At the same time, some firms adopt a conservative attitude and invest less heavily during the upcycle phases – they hold back when sun is shining to prepare for the next cycle. These companies typically do not face the same financial constraints as the *making hay* companies, and may have internal capital that can be utilized. Instead of pursuing aggressive growth, they opt to strategically preserve their debt capacity and focus on maintaining balance sheet strength defined by the level of cash flows to debt, a commonly used industry measure of balance sheet strength. Companies who choose to build their balance sheet strength use the high prices in an upcycle period to accumulate cash resources, reduce debt levels, and build their investment capability (Rampini & Viswanathan, 2010; Bakx, 2022). Current investment and growth are forgone as an opportunity cost of building financial strength during up-cycle periods, in anticipation of future downcycles and low-price investment opportunities, when they come. (Rampini & Viswanathan, 2010; Bakx, 2022) – saving for a *rainy day*.

"We strengthened our balance sheet during the high oil price environment, while others were making unsustainable spending decisions and leveraging up. We knew it was time to prepare financially for the inevitable downturn in prices and the profitable growth opportunities

that would emerge." (Suncor Energy Annual Report, 2016, p.3). Similarly, Encana Corporation indicates that, "despite commodity price volatility and recessionary pressures, our balance sheet remains strong and we continue to employ a conservative capital structure" (Annual Reports, 2009, p.12).

Based on the manner indicated by industry experts, we use a measure of balance sheet strength to discriminate between *rainy day* companies that act strategically across cycles versus *making hay* companies that grow aggressively in upcycles. To examine whether balance sheet strength is a useful metric for discriminating among O&G firms, we state our first hypothesis as follows:

H1: *Rainy day* companies (characterized by low debt to cash flows over time) grow less on average (capital expenditures relative to total assets) than other companies.

2.3. Balance-Sheet Strength and Acquisition Advantage

Rainy day companies forego the opportunities of quick expansion or "seizing the moment" while building financial strength during upcycles. However, when the price of assets is low in downturns, those companies equipped with strong balance sheets are "well positioned to capture upcoming acquisition opportunities" (Reimbold, 2009) and use their free debt capacity in such times to expand (Rampini & Viswanathan, 2010). Encana Corporation, for example, states that its balance sheet strength allows the company to capitalize on opportunities as they arise through commodity cycles (Encana Corporation Sustainability report, 2013). Similarly, Imperial Oil Limited indicates that "Our disciplined, prudent approach and unparalleled financial strength will enable us to take advantage of a period of decreasing costs and improving labour productivity as we invest in our future" (2008 annual report, p.2).

In contrast, *making hay* firms invest and borrow heavily due to investors' thirst for growth during upturns. However, exhausting debt capacity rather than conserving it may render them

unable to take advantage of future growth opportunities, and they may even be forced to scale down during downturns (Rampini & Viswanathan, 2010; Domanski, 2015). *Rainy day* companies can take advantage of downturn periods to acquire assets at low prices from over-committed *making hay* companies, who sell some of their assets at distressed prices to raise cash and satisfy debt requirements during downturns (Mascarenhas & Aaker, 1989; Reimbold, 2009; Campello, Graham, & Harvey, 2010). This is referred to as the "fire-sales effect" (Shleifer & Vishny, 1992; Acharya, Bharath, & Srinivasan, 2007) when firms in cyclical industries that chose to take on high debt levels sell assets to other firms with cash or unused debt capacity. In 1990, for example, companies in the airline industry with extra cash and debt capacity repeatedly said that "they are waiting for the next crunch in the industry to pick up planes and routes from all the other firms that have taken on a lot of debt" (Shleifer & Vishny, 1992, p.24).

Asset sales are a common way for a distressed company to raise cash, and this "fire-sale" effect is more like to happen for industry insiders (Shleifer & Vishny, 1992; Acharya et al., 2007). *Making hay* firms that exhaust financial resources display a much higher propensity to sell off assets to raise funds during a crisis (Campello, Graham, & Harvey, 2010). If *rainy day* firms take advantage of opportunities to purchase oil reserves from distressed *making hay* firms at bargain prices in down cycles, the *rainy day* firms would, on average, obtain greater reserves per dollar of capital expenditure than other firms over time (Mascarenhas & Aaker, 1989). We specify our second hypothesis as follows:

H2: *Rainy day* companies (characterized by low debt to cash flows over time) buy assets at lower prices on average than *making hay* companies.

2.4. Balance-Sheet Strength and Operating Efficiency

While the industry experts we talked to were unanimous in their identification of the two

groups of companies, they were equivocal in saying which group would on average have stronger performance over time. In fact, each group of companies relies on the presence of the other group. *Making hay* companies that take advantage of high oil prices are able to receive strong capital support to fund their investments. They seize current expansion opportunities and earn market rewards for growing during up-cycles. *A making hay* company that experiences sustained growth and hits only minor decline periods would earn high cumulative returns. Such companies hope that O&G prices remain high for a sufficiently long period of time that they can recover much of their investment before a prolonged downturn occurs.

However, no one can guarantee how long the favourable pricing will persist. The concern of *making hay* companies is the risk of being caught unawares when the clouds come and the sun disappears. Making aggressive investments by compromising their financial strength is a risky gamble – those companies may spin into financial distress if a downturn hits when they are vulnerable. High commodity prices allow them to borrow more ex ante, but decrease net worth ex post (Rampini & Viswanathan, 2010). When a downturn does occur, they have to adopt a hunker down and survive attitude – they stop capital spending and may sell premium assets to get cash (Campello, Graham, & Harvey, 2010); they seek refuge from capital suppliers such as relaxation of debt covenants and relief from debt servicing; they cut employee headcount to minimum levels and roll back salaries, wages and bonus pay in various ways (Hussain, 2015; Mortlock, 2015; Campello, Graham, & Harvey, 2010). Ultimately, they may rely on *rainy day* companies to buy their assets.

Rainy day companies, in contrast, choose to build financial strength during the up-cycle periods. They focus on using the high prices to accumulate cash resources and augment balance sheet strength. They forego some of the market rewards of expansion and resist pressure from capital markets in an up-cycle, leaving more growth opportunities for *making hay* companies.

If the oil prices do remain high for a long period of time, those *rainy day* companies miss growth opportunities and lose support from capital market investors who are getting high returns from growth during upturns. The *rainy day* strategy requires commitment and discipline.

Conservative growth versus aggressive growth may have operating implications. *Rainy day* companies that grow conservatively are more likely to build and develop their workforce than *making hay* companies that grow aggressively and hire or fire talent as needed. *Rainy day* companies plan for growth and put systems and processes in place to accommodate growth at a measured pace over time. They have both the resources and time to work on developing internal business processes to improve the efficiency of their operations. They may also retain specialized workers and resources during downturns. Although commodity-producing companies cannot differentiate based on products, they can differentiate based on cost and production efficiency.

As previously discussed, *rainy day* companies may take advantage of downturn periods to acquire assets at low prices from overcommitted *making hay* companies (Mascarenhas & Aaker, 1989; Campello, Graham, & Harvey, 2010). Their deliberate growth may allow them to choose and acquire assets that are more efficient to operate; the lifting costs of producing oil may be lower. Suncor Energy states in its 2013 annual report (p.14) that "a strong balance sheet is expected to help us achieve our growth goals and withstand the ups and downs of the crude oil price cycle". Encana Corporation states that its "strong balance sheet has allowed the company to survive and be resilient through commodity price cycles and maintain its position of strength" (2009 annual report). We state our third hypothesis as follows:

H3: *Rainy day* companies (characterized by low debt to cash flows over time), on average, achieve higher operating efficiency over time than *making hay* companies.

3. Research Design and Empirical Measures

3.1. Sample Selection

Our sample is comprised of publicly traded Canadian O&G firms over the period from 2002 to 2016. We obtain annual and quarterly financial data from the CanOils Database, "which is the leading commercial database for Canadian O&G exploration and production firms" (Badia et al., 2020a, p.7). CanOils provides historical financial data of Canadian O&G firms listed on the Toronto Stock Exchange (TSX), the TSX Venture Exchange or on a U.S. exchange from the period of 2002 to 2016. In addition, CanOils includes O&G production and reserve data for companies following National Instrument 51-101 "Standards of Disclosure for Oil and Gas Activities". O&G financial data and production data are available at a quarterly frequency, and the reserve reconciliation data including acquisition of O&G reserves is available at an annual frequency.

We begin our sample construction with all quarterly and annual observations obtained from the Canoils data. To increase comparability, we focus on upstream O&G companies specializing in exploration and production activities. Therefore, we deleted observations with more than 5% of the total revenue generated from non-exploration and production activities, such as refining, marketing, field gathering, trading, and sales (Badia et al., 2020a; Badia et al., 2020b). We exclude observations with zero production and remove quarterly or annual observations with missing key financial variables. Our final sample comprised 7,150 firm-quarter observations. Following a similar set of procedures for annual data and requiring the disclosure of reserve reconciliations, we obtain a final sample of 1,954 firm-year observations.

3.2. Empirical Models Specification

3.2.1. Identification of "rainy day" and "making hay" firms

We use the ratio of debt to cash flows to classify firms as *rainy day* companies or *making*

hay companies. "This ratio is a measure of how many times greater a company's debt is compared to its current level of cash flow, that is, how long it will take to pay it all off based on the most recent data" (Patel & Young, 2020). According to our interviews and reading, this measure is commonly used by the Canadian O&G industry as a measure of balance sheet strength. "They (the O&G companies) all use debt to cash flows', one of the industry experts told us. "Tight management of debt and reducing cash flow risks through strategic hedging programs will be key to maintaining a strong balance sheet" (Suncor's 2005 Annual Report, p.6). DBRS, a major Canadian credit rating agency, indicates in their methodology document that, "While DBRS recognizes the importance of traditional debt-to-capital ratios as an indicator of financial leverage, the capitalized value of property, plant and equipment and book equity values may not be reflective of the true underlying value of oil and gas reserves in the ground. As a result, DBRS tends to place greater emphasis on debt-to-cash flow, interest, and fixed-charge coverage ratios as measures of balance sheet strength." (DBRS, 2009, p.16) Similarly, Evaluate Energy's senior O&G analysts (Patel & Young, 2020) comments that "The measure (debt to cash flows) is a good indicator of financial health of a company and is more complete than most cash flow coverage ratios in that it includes all forms of debt and takes the cash on the balance sheet into account."

The debt-to-cash flow measure represents a firm's ability to service debt from operating cash flows, reflecting the firm's financial strength and flexibility. *Making hay* companies tend to invest available capital, including their debt capacity, and therefore, have lower cash flows to debt. *Rainy day* firms seek to preserve financial slack, so they are characterized by higher cash flows to debt. To avoid short-term effects, we use a ranking mechanism based on cash flows to debt over the full tenure of the companies in our sample period to identify firms as *rainy day* or *making hay* firms.

For each year, we ranked firms based on the ratio of total operating cash flows to debt and assigned a percentile rank to the firm for that year.[3] Then, for each firm, we sum the percentile ranks for all years that the firm is included in the data and compute the average percentile rank of the firm for the firm's full tenure during the sample period 2002 to 2016. We classify firms that are, on average, above the 50th percentile as *rainy day* firms focused on maintaining balance sheet strength and other firms as *making hay* firms that grow aggressively. The firm-type indicator is a dummy variable, denoted as *rainy day* = 1. Please refer to the appendix for the variable definitions.

3.2.2. Measure of operating efficiency

We apply data envelopment analysis (DEA) to measure how firms utilize input resources to enhance output performance relative to their industry peers in their external environments. DEA is a frontier-based non-parametric method used to benchmark productive efficiency against similar firms (Charnes, Cooper, & Rhodes. 1978). We follow the two-stage DEA approach described by Banker and Natarjan (2008), using DEA followed by regression analysis to evaluate how contextual variables affect productive efficiency. This approach yields consistent estimators of the impact of the contextual variables on productive efficiency.

We estimate our efficiency scores using input-oriented variable returns to scale DEA (Banker, Charnes, & Cooper, 1984). The outputs are oil and gas production in barrels of oil equivalents (BOEs). Inputs are total production expenses, general and administrative expenses (G&A), and depreciation, depletion, and amortization (DD&A). All cost items are deflated by the Canadian CPI index corresponding to the end of the reporting month. We log-transformed all the input and output variables. We estimated the efficiency score for all observations in the

[3] The industry refers to the ratio as the ratio of debt to cash flows. To avoid a discontinuity that occurs when cash flows are negative, we use the ratio of cash flows to debt in our empirical work.

sample period (2002–2016) for the upstream exploration and production firms. To mitigate the effect of outliers, we first estimated a pooled DEA model and excluded observations with super-efficiency (efficiency greater than 1.2) scores, as described by Banker and Chang (2006).

In the second-stage analysis, we relate the efficiency scores obtained using DEA to the rainy day indicator variable and other contextual variables that may influence productive efficiency, including book-to-market, *ln(BTM)*, and debt-to-equity, *ln(DTE)*, to control for growth and leverage, respectively (Obreja, 2013), and operating cash flows to total assets *(OCF/TA)* to control for profitability. We also interact the rainy day variable with two indicator variables for periods beginning with steep price declines: one for the quarters following the 2008 financial crisis, where demand fell relative to supply, and one for the quarters following the 2014 supply driven oil price decline.

4. Results of Data Analysis

4.1. Descriptive Statistics

Descriptive statistics are presented in Table 1. Panel A shows that the average (median) natural logarithm of production efficiency, *ln(score)*, is -0.63 (-0.70), and its standard deviation is 0.26. The mean (median) operating cash flows to debt, *OCF/Debt*, is 0.23 (0.13), with standard deviation of 1.53 and an interquartile value of 0.19, indicating significant sample variation of operating cash flows to debt. Panel A also reports that, on average, 67 percent of our sample firms are *rainy day* companies – operating cash flows to debt is on average above the 50th percentile over time.

Panel B describes the descriptive statistics for the making hay and rainy day firms and shows that the two groups of firms have significantly different mean and median values (at the one percent level) for most of the variables in our model (except for *ln(BTM)* and *CAPEX/AT*). Compared with making hay companies, rainy day companies have higher efficiency scores,

higher operating cash flows to debt, and lower debt-to-equity.

Table 1. *Descriptive Statistics.*

PANEL A: All companies						
	N	**Mean**	**Q1**	**Median**	**Q3**	**Std dev**
Quarterly Variables						
ln(score)	7,150	-0.63	-0.80	-0.70	-0.45	0.26
ln(BTM)	7,150	-0.30	-0.84	-0.35	0.22	0.94
ln(DTE)	7,150	-1.03	-1.56	-0.95	-0.42	1.16
Capex/AT	7,150	0.07	0.02	0.04	0.09	0.08
OCF/TA	7,150	0.03	0.01	0.03	0.05	0.03
OCF/Debt	7,150	0.23	0.05	0.13	0.24	1.53
rainy day	7,150	0.67	0.00	1.00	1.00	0.47
Annual Variables						
ln(Capex)	1,954	9.29	7.82	9.55	11.21	3.118
ln(Ac.Proven)	1,954	7.92	0	10.69	14.67	7.27
PANEL B: Comparison of two groups of companies						
	rainy day		***making hay***			
Quarterly Variables	**N**	**Mean**	**N**	**Mean**	**Diff**	**p-value**
ln(score)	4,779	-0.55	2,371	-0.78	0.23	<0.01
ln(BTM)	4,779	-0.32	2,371	-0.26	-0.06	0.02
ln(DTE)	4,779	-1.16	2,371	-0.75	-0.42	<0.01
Capex/AT	4,779	0.07	2,371	0.06	0.00	0.06
OCF/TA	4,779	0.04	2,371	0.01	0.03	<0.01
OCF/Debt	4,779	0.34	2,371	0.01	0.33	<0.01
Annual Variables						
ln(Capex)	1,296	10.23	658	7.44	2.79	<0.01
ln(Ac.Proven)	1,296	9.57	658	4.66	4.91	<0.01

4.2. Analysis of Capital Expenditures Relative to Total Assets (H1)

To test Hypothesis 1, we investigate whether *rainy day* firms have lower capital expenditures relative to assets, as opposed to *making hay* firms. Table 2 reports the results of the OLS regression of a firm's capital expenditures relative to total assets on the *rainy day* indicator and control variables. We include time fixed effects for each quarter to effectively

capture responses to price changes and other unobservable industry- and economy-wide shocks for each quarter. Standard errors in the model are clustered by firm in order to accommodate the panel data structure. All continuous variables are winsorized at the 1% and 99% levels in all our analyses.

Table 2. *Analysis of Capital Expenditures Relative to Total Assets.*

Capex/TA	**Coefficient**	**Std error**
rainy day	-0.026***	(-0.009)
rainy day × Post 2008 Financial Crisis	0.023**	(0.011)
rainy day × Post 2014 Price Decline	0.025***	(0.010)
ln(BTM)	-0.012***	(-0.004)
OCF/TA	0.200	(0.195)
ln(DTE)	-0.003	(-0.002)
Quarter Fixed Effects	Yes	
Num. obs.	7,150	
Adj. R^2	0.102	

* Standard errors (reported in parentheses) are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

We document that the estimated coefficient of the *rainy day* indicator is statistically significant and negative (β = -0.026, std. error = -0.009), indicating that capital expenditures relative to total assets are lower on average for *rainy day* firms than for *making hay* firms in periods other than those specifically designated through interaction terms. We include two such periods through the interaction terms: the recovery period following the 2008 financial crisis, and the period following the 2014 oil price drop. Both periods begin with steep price decline.

We find that the estimated coefficient for *rainy day × Post 2008 financial crisis* is significantly positive (β = 0.023, std. error = 0.011), and the estimated coefficient of *rainy day × Post 2014 price decline* is significantly positive (β = 0.025, std. error = 0.010). Because these

coefficients are separately incremental to the coefficient on the *rainy day* indicator, we see that lower capital expenditures to total assets for the *rainy day* firms are not observed in these post-steep price decline periods. This indicates that *rainy day* companies that follow a conservative growth strategy (characterized by high cash flows to debt over time) grow less on average (capital expenditure relative to total assets) than other companies, except in periods following steep price declines.

4.3. Analysis of Acquisition of Proven Reserves (H2)

We test whether rainy day companies obtain higher value for their investments over time by relating the value of proven oil reserves acquired during a year to the level of capital expenditure. We estimate the following seemingly unrelated regression (SUR) model with equations for the amount of acquisition of proven reserves: *ln(Ac. Proven)* and net capital expenditure *ln(Capex)*, both in log transformation.

$$ln(Ac.Proven) = \alpha_1\, ln(Capex) + \alpha_2 rainy\ \ day + \ \ \alpha_3 rainy\ \ day \times Post\ \ 2008\ \ Financial\ \ Crisis + \alpha_4 rainy\ \ day \times Post\ \ \ 2014\ \ Price\ \ Decline + \theta_{it} + \varepsilon_{it} \quad (1)$$

$$ln(Capex) = \beta_1 rainy\ \ day + \ \ \beta_2 rainy\ \ day \times Post\ \ 2008\ \ Financial\ \ Crisis\ \ + \beta_3 rainy\ \ day \times Post\ \ 2014\ \ Price\ \ Decline + \gamma_{it} + \omega_{it} \quad (2)$$

In this set of equations, ln*(Capex)* serves as a mediator that enables us to measure the difference in proven reserves acquired based on net capital expenditures for the two strategies. In (1), we estimate an empirical model that includes the log of acquired reserves plus one as a dependent variable, and the log of capital expenditures plus one as an independent variable. Then, the *rainy day* indicator variable and its interactions with the indicators for the two post-steep-price-decline periods pick up information about differences in acquisition of reserves relative to capital expenditures between the *rainy day* and *making hay* firms. These seemingly unrelated regressions enable us to test whether *rainy day* firms make better acquisitions (i.e.,

obtain greater reserves per dollar of capital expenditure) than *making hay* firms.

Results of the analysis are presented in Table 3. The coefficient of *ln(Capex)* is 0.827 (std. error = 0.096), indicating that, on average, a 1% increase in capital expenditure is associated with a 0.83% increase in the acquisition of proven reserves. In Column (1), the coefficient for *rainy days* is 1.768 (std. error = 0.724), indicating that, given the amount of capital expenditure, *rainy day* firms, on average, acquire 1.77 times more proven reserves. The results show that the value of proven oil reserves acquired is, on average, significantly greater for *rainy day* firms than for *making hay* firms. The efficiency of acquisitions increased in the post 2014 price decline period. During this period, the *rainy day* firms acquire more than four times (1.768 + 2.367) the proven reserves of *the making hay* firms that spend the same amount on capital expenditures, suggesting that the investment advantage of *rainy day* firms is significantly enhanced following the drop in oil prices in 2014.[4]

Table 3. *Analysis of Acquisition of Proven Reserves and Capital Expenditures*

	(1) *ln (Ac. Proven)*		**(2)** *ln(Capex)*	
Variables	**Coefficient**	**Std error**	**Coefficient**	**Std error**
ln(Capex)	0.827***	(0.096)		
rainy day	1.768**	(0.724)	1.872***	(0.442)
rainy day × Post 2008 Financial Crisis	0.668	(0.726)	1.202***	(0.385)
rainy day × Post 2014 Price Decline	2.367**	(1.100)	1.007*	(0.514)
ln(BTM)	0.146	(0.234)	-0.321**	(-0.140)
OCF/TA	4.149	(3.038)	6.608**	(3.363)
ln(DTE)	0.498***	(0.146)	0.128*	(0.075)
Quarter Fixed Effects	Yes		Yes	
Num. obs.	1,954		1,954	
Adj. R^2	0.227		0.220	

* Standard errors (reported in parentheses) are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

[4] Proven oil and gas reserves are not wholly-owned by the producing company because they are subject to royalty payments that vary with the price of oil and the costs of extraction.

4.4. Analysis of Production Efficiency (H3)

Table 4 reports the results from an OLS regression of production efficiency *ln(score)* on the *rainy day* indicator and control variables. As before, we include an indicator variable for *rainy day* based on our analysis of cash flows-to-debt over the tenure of the firm in the sample. We also include indicator variables for post-crisis periods that we interact with the *rainy day* variable to test whether a *rainy day* strategy affects production efficiency differently in decline stages versus growth or stagnant stages of the industry life cycle.

Table 4 reports that the estimated coefficient of *rainy day* is statistically significant and positive ($\beta = 0.116$, std. error = 0.031). A positive association between *rainy day* and efficiency score *ln(score*) indicates that *rainy day* companies outperform *making hay* companies in general in terms of operating efficiency. We also see that the estimated coefficient of *rainy day* × *Post 2008 Financial Crisis* is significantly positive ($\beta = 0.087$, std. error = 0.024) and the estimated coefficient of *rainy day* × *Post 2014 Price Decline* is significantly positive ($\beta = 0.092$, std. error = 0.041). These two estimated coefficients represent incremental increases in operating efficiency of *rainy day* firms in the post-steep price decline periods, indicating that the operating advantage of *rainy day* firms is enhanced during the post-crisis periods.

Table 4. *Analysis of Operating Efficiency*

ln(score)	**Coefficient**	**p-value**
rainy day	0.116***	(0.031)
rainy day × *Post 2008 Financial Crisis*	0.087***	(0.024)
rainy day × *Post 2014 Price Decline*	0.092**	(0.041)
ln(BTM)	-0.031***	(-0.010)
OCF/TA	2.023***	(0.273)
ln(DTE)	0.025***	(0.006)
Quarter Fixed Effects	Yes	
Num. obs.	7,150	
Adj. R^2	0.280	

* Standard errors (reported in parentheses) are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

4.5. Robustness Test Using Split Sample

We conduct a supplementary analysis to assess the robustness of our findings. We estimate a regression model relating firm *ln(score)* to the continuous firm-level average of *OCF-to-Debt*. We partition the samples into two groups, *OCF-to-Debt* > 0 and *OCF-to-Debt* < 0, to capture the differences between firms with positive and negative operating cash flows. The results of this analysis are presented in Table 5, with the positive *OCF-to-Debt* group in column (1) and the negative *OCF-to-Debt* group in column (2).

Table 5. *Robustness Test Using Split Sample*

ln(score)	**(1)** *OCF-to-Debt > 0*		**(2)** *OCF-to-Debt < 0*	
	Coefficient	**Std error**	**Coefficient**	**Std error**
ln(OCF-to-Debt)	0.032***	(0.011)		
ln(OCF-to-Debt) × *Post 2008 Financial Crisis*	0.022	(0.016)		
ln(OCF-to-Debt) × *Post 2014 Price Decline*	0.049**	(0.021)		
ln(-ive OCF-to-Debt)			0.001	(0.013)
ln(-ive OCF-to-Debt) × *Post 2008 Financial Crisis*			-0.026*	(-0.014)
ln(-ive OCF-to-Debt) × *Post 2014 Price Decline*			-0.017	(-0.025)
Quarter fixed effects	Yes		Yes	
Num. obs.	7,173		2,138	
Adj. R^2	0.03		0.065	

* Standard errors (reported in parentheses) are clustered by firm. ***, **, and * indicate significance at the 1%, 5% and 10% levels, respectively.

We find that the estimated coefficient of *ln(OCF-to-Debt)* × *Post 2014 Price Decline* is significantly positive at 0.049 (std. error = 0.021) in Column (1), indicating that firms with higher OCF-to-debt ratios achieve higher efficiency in the post-decline period. The estimated coefficient of *ln(-ive OCF-to-Debt)* × *Post 2008 Financial Crisis* is significantly negative at

0.026 (std. error = -0.014) in Column (2), indicating that firms with negative cash flows had lower production efficiency in the post-2008 financial crisis period. Although the statistical significance varied, the coefficients were consistent with the signs predicted from the main results.

5. Discussion and Conclusion

Our research investigates the strategic role of accounting in cyclical industries, where risk is the nature of business. As a cyclical industry, the oil and gas industry is known for its pursuit of growth and investment opportunities. During prosperous times, when the sun is shining and prices are high, the industry experiences high returns on investment and has access to additional capital. But when the rain comes, and prices decline, the companies lose those returns and access to capital. However, no one can predict when the rain will come.

"Having that balance sheet strength was extremely important, especially as we went through the really dark days" (Gonzales, 2002). We find that balance sheet strength, measured by debt to cash flows, is a key accounting metric used by *rainy day* firms to strategically manage uncertainty. Such companies maintain balance sheet strength in upcycles to prepare for downcycles and potentially seize growth opportunities in periods following sharp price declines, whereas *making hay* companies take advantage of growth opportunities when the market is strong and capital is available.

We find that growth, defined as capital expenditures relative to total assets, is indeed lower on average for *rainy day* firms than for *making hay* firms. We then find that rainy day firms on average, make better acquisitions – obtaining higher value of proven oil reserves acquired per dollar of capital expenditures, than *making hay* firms. This investment advantage is further enhanced after the sharp declines in oil prices in 2014. Moreover, using a two-stage DEA approach, we find that *rainy day* firms achieve higher production efficiency on average than

making hay firms, and that this advantage is even greater during post-steep price decline periods.

We believe that the higher operating efficiency achieved by *rainy day* companies may be partially attributed to their ability to take advantage of the decline periods to acquire premium assets from over-committed *making hay* companies. Such assets are more efficient to operate so the lifting costs of oil production is lower. *Rainy day* firms are also able to make investments in their labour force and develop new technology that positions them to operate more efficiently, especially in downturns (Bromiley, Navarro, & Sottilem 2008). This is the learning and growth part of a balanced scorecard (Kaplan & Norton 2007). As Imperial Oil Limited states, "our disciplined, prudent approach and unparalleled financial strength will enable us to take advantage of a period of decreasing costs and improving labor productivity as we invest in our future." (2008 Annual Report, p.2).

While the *rainy day* companies on average outperform the *making hay* companies in terms of acquiring assets and operating efficiency, we see that both groups of firms exist, largely because of financing opportunities that are available to *making hay* companies during up-cycles. In fact, the *rainy day* companies rely on the existence of the *making hay* firms because *rainy day* firms buy assets from *making hay* firms at "fire-sale" prices during prolonged down cycles as experienced after the 2014 steep price declines. On the other hand, the *rainy day* firms open opportunities for *making hay* companies to satisfy the market appetite for growth during up cycles.

Making hay companies can earn market rewards for growth during upcycles but run the risk of over-commitment before a down cycle hits them. *Rainy day* companies forego some of the market rewards of expansion in an upcycle, but are better positioned to survive a prolonged downcycle. The parallel existence of these two groups of firms fuelled growth in the Canadian

O&G industry over time. *Making hay* firms expanded the industry – some were successful and may have transformed into *rainy day* firms, others fell by the wayside, and their assets were picked up by *rainy day* firms.

When we began our study, a senior audit partner told us that managing growth through the industry cycles is the most important problem facing the industry. This is a precarious industry. Van Wielingen (2015) reports that, of 50 companies listed in the oil and gas index 20 years ago, only a few remain today. An analyst we interviewed told us that in order to get out in front of other companies, a company may go after a long-term project that requires big initial investment and puts debt on the balance sheet. These projects have big potential pay-offs but expose the company in the short term. "This works well as long as prices are strong but if prices drop, they lose cash flow from the other assets and end up in a precarious financial position."

In the post-COVID-19 era, the heightened awareness of uncertainty in the business environment along with increased sensitivity to business and industry cycles present challenges and impose demands on corporate managers and investors when making business decisions. Recognition of the strategic role of accounting, beyond the traditional valuation and stewardship roles, would help managers and investors better identify and take advantage of opportunities (Ernst & Young, 2012; FSN Research, 2016; CPA Canada, 2017; HBR, 2018; Agrawal, Grube, & Hill, 2021). Our study is timely in this regard as it represents an initial step towards examining strategic roles for accounting. Our study demonstrates that balance sheet strength is a strategic indicator that goes beyond financial risk to provide information about asset acquisition and operating efficiency.

Our study has limitations that should be noted. First, the paper focuses on a measure of balance sheet strength, cash flows to debt (averaged over time), based on industry conventions, to differentiate between the two groups of companies in terms of their different emphases on

managing industry economic cycles. Other important factors, such as a company's culture, innovation, and leadership style in managing industry economic cycles, were not considered explicitly. Future research may explore alternative methods for dividing groups, such as using textual analysis to capture other aspects. Second, while the DEA method is commonly used to measure operating performance, it has limitations in accurately reflecting a company's overall efficiency since it's based on the input and output variables used in the analysis. We suggest future research include additional inputs, such as investments in technology, to evaluate overall performance. Third, our focus in this study is on the commodity industry. Future research may expand this analysis to other cyclical industries, such as innovative industries where rapid changes in technology fuel product life cycles. Last, research may also look for other ways in which accounting plays a strategic role. In fact, we see some evidence of this in the conservatism literature, where researchers use measures of timely loss recognition to group firms and find evidence of performance differences based on accounting choices (Kravet, 2014; García Lara, García Osma, & Penalva, 2016). Such research may link accounting choices to strategic variables.

APPENDIX. *Variable Definitions*

Variables	Definitions
rainy day or *making hay*	Company type based on the firm's average percentile rank of operating cash flows to total debt for the years the firm is in the data. If the average percentile rank is above the 50th percentile, the firm is classified as *rainy day*. An indicator variable: 1 for rainy day (above the 50th percentile) and 0 for *making hay.*
ln(score)	Efficiency score estimated from input-oriented variable returns to scale data envelopment analysis. Outputs are oil and gas production in BOE, inputs are total production expenses, general and administrative expenses, depreciation, depletion and amortization. All costs items are deflated by Canadian CPI index corresponding to the reporting month end. We log-transform all input and output variables.
ln(BTM)	Book value of total shareholder equity divided by market value of equity at the end of the quarter (year)
ln(DTE)	Book value of total debt divided by book value of equity at the end of the quarter (year)
CAPEX/TA	Capital expenditures for the period divided by total assets
OCF/TA	Operating cash flows divided by total assets
OCF/Debt	Operating cash flows divided by total debts Ln(CAPEX): log of (total capital expenditures by company including property and corporate acquisitions and net of dispositions + 1)
ln(CAPEX)	log of (net capital expenditure including property and corporate acquisitions and net of dispositions net of dispositions +1)
ln(Ac.Proven)	log of (total acquisition of proven reserves +1)
Post 2008 Financial Crisis	Indicator variable = 1 after 2008 Q2 and before 2014 Q3, 0 otherwise
Post 2014 Price Decline	Indicator variable = 1 after 2014 Q3, 0 otherwise

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