



Creditworthiness of North American Oil Companies and Minsky Financing Categories: Assessment of Shifts Due to the 2014-2016 Oil Price Shock

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Abstract: Our study provides a unique and comprehensive analysis of oil and gas companies' performance over the latest oil price crisis of 2014-2016. The oil price declined under the pressure of global oil oversupply instigated by OPEC under the strategic leadership of Saudi Arabia, in an effort to retain market share by diminishing the production growth of shale oil and oil from oil sands in North America. The financial performance of 45 North American oil companies was assessed over the 2014-2016 period of decreased oil prices, distinguishing six peer groups based on market capitalization, of which 11 representative companies were selected for further in-depth analysis. For each selected company, a forensic financial analysis was performed on the three principal accounts of corporate financial performance: profit-loss account, cash flow account and balance sheet. Financial accounts were consolidated in annualized graphs for 2010-2015. Next, the historic production output and operational income from the existing assets (2010-2015) were projected forward to stress test future liquidity positions (2016-2020). These projections incorporated known maturation dates of corporate debt and any announced divestments and/or acquisitions. The majority of the companies are classified in Minsky's speculative financing category, which is riskier than hedge financing and less risky than Ponzi financing. The oil price collapse pushed numerous companies into Ponzi financing and led to a record number of bankruptcies. Lessons learned and recommendations are formulated for company management, shareholders and lenders, based on the corporate financial performance of the analyzed companies during the decade (2010-2012) spanning the 2014-2016 oil price shock.

Keywords: Oil Industry, Oil Prices, Forensic Cash Flow Analysis, Minsky Financing Categories

1. Introduction

The North American upstream oil and gas industry is currently recovering from a serious downturn due to a steep fall in global oil and gas prices (2014-2016). In the wake of the downturn, companies with disciplined financials have risen above those that over-specified during the prior boom. Each oil and gas company was impacted by the latest oil price crisis

of 2014-2016 in a unique way, and the severity of the impact primarily depends upon its portfolio structure and corporate financing risk, as dictated by internal decisions. Problems arise when internal strategy is formulated based on present product pricing with no regard for potential changes in the market. In the latest oil price crisis, many companies implemented a financing strategy at (or near) the peak of the market without consideration that prices could rapidly decline. As a result,

severe market conditions drove numerous companies into precarious situations with high risk of insolvency. A comprehensive analysis of oil prices and extensive literature review was given in Weijermars and Sun [1].

The upstream petroleum industry is comprised of a hybrid group of operators ranging from vertically integrated companies such as Exxon and Chevron (large cap companies with AA credit ratings) to non-investment grade (high yield or junk-bond rated) upstarts. The capital structure of smaller and larger oil companies is distinctly different, particularly with regard to financing for ongoing operations and growth. The financial returns of the large cap petroleum companies are historically driven by handsome operational cash flows that allow such companies to return about 30% of profits to shareholders [2, 3]. When internally generated cash flow is not sufficient to finance capital expenditures on larger projects, mature companies will utilize their balance sheets to raise new capital instead of reduce dividends [4].

In contrast, the smaller oil companies commonly need to supplement lagging cash flow from operations with newly raised capital in order to fund ongoing capital investment programs [5]. Shareholder returns of the smaller companies are driven by speculative growth expectation resulting in capital gains; and the awarding of dividends remains a rarity [6, 7]. Over the past decade nearly all young growth petroleum companies active in the North American unconventional plays resorted to speculative financing. In an effort to regain market share lost to the emergent US shale and Canadian oil sand producers, OPEC targeted these vulnerable producers by maintaining elevated production during the 2014-2016 oil price collapse, instigating a prolonged oil price war [1].

Upstream exploration and production is capital-intensive work, constantly requiring reinvestment in equipment and materials. When unconventional drilling is involved, the turnover is even more frequent because more equipment, personnel, and chemicals are required. Operators with portfolios of upstream oil and gas assets heavy in unconventional plays commonly were debt-laden even before the onset of the last price fall, with capital structures that ultimately led a substantial number of these organizations to default on their debt obligations [5]. This study highlights key insights about the factors that may contribute to company failure in epochs of volatile oil prices, based on a detailed analysis of 45 small to mid-cap oil and gas companies operating in North America. Results are concisely summarized and lessons learned and recommendations are formulated based on the in-depth analysis. The ultimate aim of our study is to identify what differentiates companies that went bankrupt from companies that successfully emerged from the recent epoch of depressed oil prices.

2. Market Conditions

2.1. Minsky Financing Categories

The present study takes a holistic approach and applies a

classification of companies into three broad financing schemes according to Minsky [8, 9]: Hedge, Speculative, and Ponzi. Some introduction is warranted before applying the actual classification scheme.

The correlation between capital structure and corporate performance has been widely studied across industries and has been articulated by a concept known as the Pecking Order Theory [10, 11]. The theory states that companies prefer internal financing over external financing, with *retained earnings as the most preferred source of cash, followed by debt, then equity*. Equity is a last resort because it dilutes current ownership, and buybacks are generally more expensive. More profitable companies commonly borrow less because they have more internal sources of cash. Risk appetite also plays a substantial role in the composition of capital structure, which is most pointedly articulated by Minsky [8, 9], who segregated companies in three categories according to increasingly risky financing strategies: hedge, speculative, and Ponzi financing. Hedge financed companies can fulfill all of their contractual payment obligations by cash flow from operations and generally will have lower debt-gearing. Hedge financing companies conduct business with cash receipts exceeding cash payments by a considerable margin. A company's financing strategy is re-classified from hedge to speculative when, although net worth is positive, a number of individual periods have negative present value. This often occurs due to the "ruling pattern of interest rates" where a rise in interest rates drives value loss. Companies with speculative financing profiles meet their payment commitments partly based on financing activities assuming larger liabilities, even as they cannot repay the principal sums out of income cash flows, and therefore continually "roll over" their liabilities: new debt is issued to meet commitments on maturing debt. When net worth becomes negative or the interest portions of cash payments consistently exceed cash receipts from net income financing is once again reclassified, this time from speculative to Ponzi [8, 9]. Ponzi financing refers to companies that resort to selling assets or borrow increasingly larger sums, because cash flows from operations are insufficient to fulfill either the repayment of the principal loan or the interest due on outstanding debts.

The relative percentages of hedge financing, speculative financing, and Ponzi financing that comprise a financial system dictate the overall state and fragility of that system. Companies engaged in hedge financing are only affected to the extent that their products are affected in the market whereas companies utilizing speculative and Ponzi financing are also affected by what happens in financial markets. Speculative and Ponzi-financed companies are vulnerable to escalation of interest rates as these increases cause a surge in cash flow commitments without increasing income cash flow. In a speculative system, fragility increases as financing increases. A key premise in Minsky's thesis is that the economy harnesses "Systemic Fragility" [8], a concept based on the notion that a prosperous economy leads to the development of a fragile financial structure. When a fragile financial structure develops, disturbances in the ecosystem

amplify fragility. It follows that a financial crisis starts when a large number of companies (normally banks) precipitously cannot refinance their position through normal channels and need to raise cash by unconventional instruments or liquidate debt via restructuring. This is a byproduct of increasing corporate debt with portfolios financed largely with liquid assets such as stocks, bonds, and mutual funds instead of cash. As corporate financial management experiences increasing success with this strategy, it begins to lose sight of the potential for a drop in the economy. As this progresses in a strong economy, a euphoric economy (as coined by Minsky) develops, and long positions are principally funded with short-term financing.

At times when hedge financing dominates, the global economy is likely in equilibrium. The petroleum business as a subsection of the global economy is vulnerable and prone to become unstable due to heavy engagement in speculative and Ponzi financing. When commodity prices decline more than assumed in prior project cash flow projections, these companies may quickly land in Minsky's Ponzi financing scheme. Borrowing money or selling assets to pay interest on loans and even dividends on common stock increases corporate liabilities while eating into the equity and potential future income of the company. Consequently, a company that

employs Ponzi financing lowers the margin of safety offered to its creditors.

2.2. Downturn and Creditworthiness

The ability to survive a downturn varies for each company as it renegotiates terms for debt maturation with lenders, sells assets or subsidiaries, and either succeeds or fails in raising new capital while under duress. Credit ratings of US petroleum companies deteriorated between September 2014 and October 2016 as oil and gas prices continued their decline (Figure 1). Even oil industry giant ExxonMobil lost its S&P AAA credit rating after 86 years. The bulk of the credit ratings until 2014 were investment grade (BB and higher). However, prior to the downturn, companies paid very high multiples for assets—causing them to never recover book value. This was exacerbated during the downturn when collateral value declined. A large portion of companies received non-investment grade ratings (CCC+ or lower) because the credit rating agencies believed that the companies would outspend generated cash flow. The trend of the ratings migrated from investment grade towards junk status, which increased capital costs and limited access to capital markets.

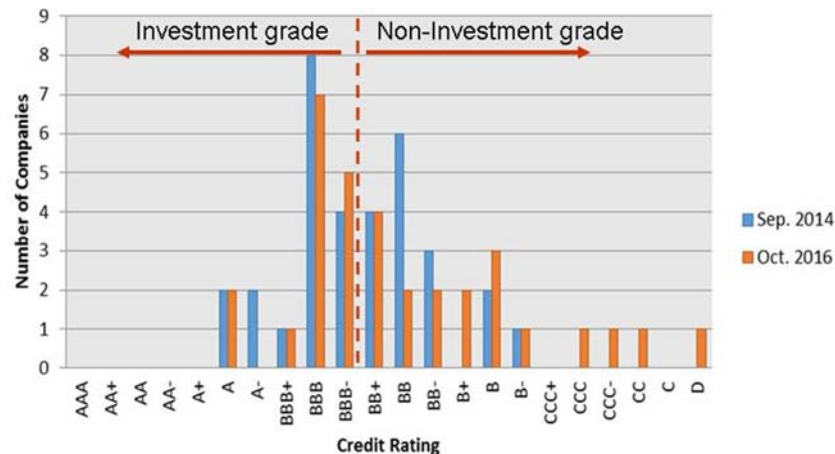


Figure 1. S&P's credit rating recalibration of 33 E&P companies from 2014 to 2016 (see Table 1).

Table 1. S&P Credit Rating Changes between June 2014 and June 2016.

Operator	Rating 2014	Rating 2016	Operator	Rating 2014	Rating 2016
Chesapeake	BB+	CC	QEP	BB+	BB+
Anadarko	BBB	BBB	Cimarex	BB+	BBB-
Southwestern	BBB-	BB+	National Fuel Gas Co.	BBB	BBB-
Devon	BBB+	BBB	SM Energy	BB	BB-
ConocoPhillips	A	A	EXCO	B	B-
EQT Corp	BBB	BBB	Pioneer	BBB-	BBB-
Encana	BBB	BBB	Newfield	BBB-	BBB-
EOG	A-	BBB+	Continental	BBB-	BB+
Antero	BB	BB	Marathon	BBB	BBB-
WPX	BB	B+	Rice	B-	B
Range	BB+	BB+	Freeport-McMoran	BBB	BB-
Occidental	A	A	SandRidge	B	CCC-
Ultra	BB	D	EP Energy	BB-	B
Apache	A-	BBB	Energren	BB	BB
Consol	BB	B	Unit Corp	BB-	B+
Linn	BB-	CCC	Hess	BBB	BBB-
Noble	BBB	BBB			

While investment grade companies can opt for unsecured debt, non-investment grade companies must utilize secured debt from reserve-based lending organizations. Two types of debt vehicles are generally employed by these lenders: term loans and revolvers. Term loans are straight forward, and are paid down over a predetermined period. Revolvers work much like credit cards in that they can be borrowed against and repaid repeatedly. Borrowing bases are used to determine the line of credit. With either type, current and future producing properties are mortgaged, generally at 80-95%. Accurate and reliable reserves reporting backed up by SEC audits are used as the basis in valuing a company's collateral

because reserves can be overbooked [12]. Lending organizations determine the borrowing base amount using an advance rate against the value of a producer's total proved reserves and current production on collateralized properties, as well as associated facilities, with operating and capital costs, taxes, and future product pricing taken into account. Revolvers, which are more common than term loans, fall under the senior secured position (first lien lender). Although the cost of capital of first lien funding is lower than subordinated debt and equity, first lien lenders employ more restrictive financial covenants to protect potential downside.

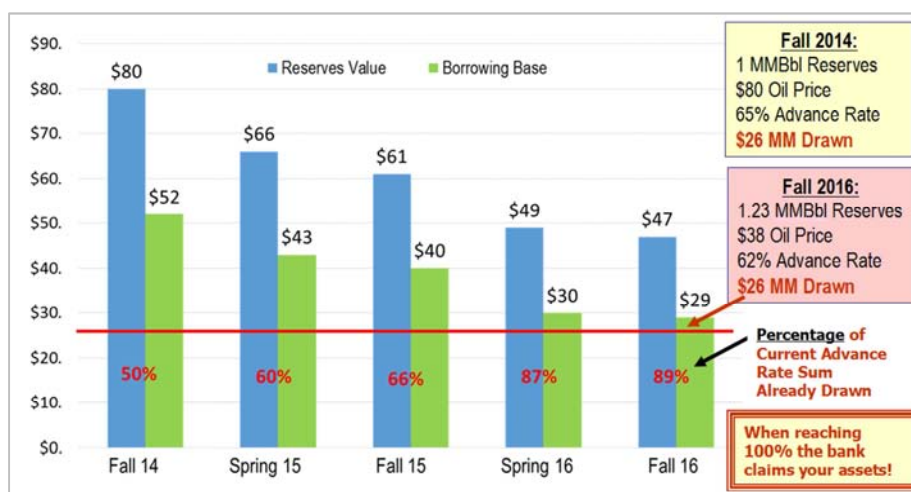


Figure 2. Borrowing base evolution through a commodity price depression.

Figure 2 displays an example of a borrowing base scenario through the 2014-2016 downturn, highlighting the effect of a commodity price decline. The price for crude oil was assumed to be \$80 per barrel at the first determination, where the producer had 1 million barrels of total proved reserves pledged as collateral for the loan. A 65% advancement rate was assumed in this scenario, setting the ceiling of the borrowing base at \$52 million. The producer was assumed to have drawn half of the \$52 million, or \$26 million in outstanding debt. Borrowing base values are re-determined semi-annually so that lenders can regularly confirm their funds are being used wisely and that the value of the reserves still supports the loan. In the example of Figure 2, the borrowing base decreased at each of the four redeterminations. The final redetermination on reserves of 1.23 million barrels and oil price of \$38/bbl yielded \$47 million in reserves-based bank collateral, which, at 62% advance rate, produced a borrowing base of \$29 million. As a result, the original \$26 million drawn in Fall 2014 was then equivalent to 89% utilization of the borrowing base, just short of deficiency. Figure 2 illustrates utilization exceeding the borrowing base when the green bar falls below the red line, representing the debt outstanding.

2.3. Bankruptcy Options

When the borrowing base erodes and blocks access to

credit lines, several bankruptcy options are available for troubled producers including a pre-arranged Chapter 11 bankruptcy in which lenders and the producer "cordially" agree upon terms before entering litigation, a standalone Chapter 11 bankruptcy in which no terms have been discussed prior to entering litigation, and a Chapter 7 (liquidation) bankruptcy. For the present discussion, we will focus on pre-packaged Chapter 11 bankruptcies as these are the most commonly observed filings by oil and gas producers.

Upon receiving notice of deficiency from the agent bank, a financially distressed oil producer is required to pay the entire deficiency within a defined period agreed upon between the two parties. Generally, the deficiency is paid with the proceeds from asset sales, monetization of hedges, junior capital raises (equity or subordinated debt), or free cash flow. Companies will often negotiate a forbearance agreement with lenders, which allows for more time to develop a broader restructuring plan to de-lever the balance sheet in a so-called pre-packaged bankruptcy filing plan through Chapter 11, or an out-of-court troubled debt restructuring plan. If an agreement cannot be reached with its lenders, the company may seek bankruptcy protection without a pre-packaged plan. When a company files for bankruptcy, there is an automatic stay on claims – all actions by creditors to seek debt repayment are halted. Debt

repayment schedules are then determined with the help of a bankruptcy judge, and a new company emerges after a Chapter 11 filing.

2.4. Leverage Ratios and OCC Guidelines

When under duress, it is imperative that company management responds to the changed market conditions by implementing internal adjustments, as well as external negotiations with its financial stakeholders. Given the capital-intensive nature and rapid initial decline of shale production, management of oil companies is commonly concerned with their ability to continue accessing capital markets as the liberal first lien lending climate had changed. During the height of the oil market, 2Q2012-3Q2014, immediately prior to the 2014-2016 oil price collapse, small market capital companies had 2.2x leverage and medium market capital companies had 1.4x leverage. These ratios were within an acceptable range for first lien lenders who followed guidance promulgated by the U.S. Office of the Comptroller of the Currency (OCC). In an effort to standardize acceptable leverage ratio tolerances, the guidance recommended a total leverage ratio of 3.5x or less (OCC, 2016). However, once oil and gas prices fell, earnings dropped, driving the leverage ratio beyond the 2016-revised guidelines. If total leverage exceeds 3.5x, the OCC may downgrade the first lien loan rating to “special mention” or worse, depending on the auditor’s interpretation of the guidelines, causing the lenders to potentially increase their loan loss reserves. This removes capital from the market that could be lent out. The revised OCC 2016 guidelines are a significant departure from prior guidelines because they focus specifically on total leverage limits.

Despite the revised OCC guidelines, first lien lenders have tolerated producers with total leverage ratios in excess of 3.5x as long as the producers have very low decline assets, low operating costs, high scale and highly hedged production, accurate and predictable log information, and stable field development. For example, during the downturn

Cabot Oil and Gas, a low-cost producer in the Marcellus, signed a credit agreement allowing for a maximum total leverage of up to 4.75x. Gulfport Energy Corporation, a growing Ohio Utica operator with actual total leverage of 2.5x, successfully amended their maximum total leverage ratio in 3Q2015 from 3.25x to 4.0x. Accordingly, lenders are still willing, on a limited basis, to establish maximum leverage ratios in excess of the OCC guidelines for shale producers with strong production performance profiles and credit metrics.

2.5. First Lien Lenders and Debt Restructuring in Bankruptcy Proceedings

Bankrupt companies must first pay the first lien lenders who hold senior secured positions in bankruptcy waterfall repayment schedules, second only to the bankruptcy lawyer fees. If first lien lenders receive the full principal and interest obligations from the company, they are said to be “made whole.” Equity injections and subordinated debt helped pay down the revolver or term loan as companies entered the restructuring. Once equity value is eliminated during a restructuring, the next class of capital providers that experience losses is the subordinated debt. Senior debt holders, who are usually skeptical of junior debt due to heavier interest payments, welcomed the companies’ subordinated-debt buffer from losses. In 2015, second lien bank debt, second lien bonds, and senior unsecured notes retrieved on average 24%, 13%, and 6% of the initial principal in post-bankruptcy settlements, respectively.

The number of upstream oil and gas companies filing for bankruptcy swelled in 2015 (44 US bankruptcies), accelerated in 2016 (70 bankruptcies), but slowed down in 2017 (20 bankruptcies; Haynes and Boone [13]). When oil and gas prices decline and stay depressed for a protracted period, like in 2008/2009 and 2014/2016, the share prices of petroleum companies plunge, and their market capitalization shrinks accordingly [14, 15]. Management must respond timely during adverse changes in the product market price.

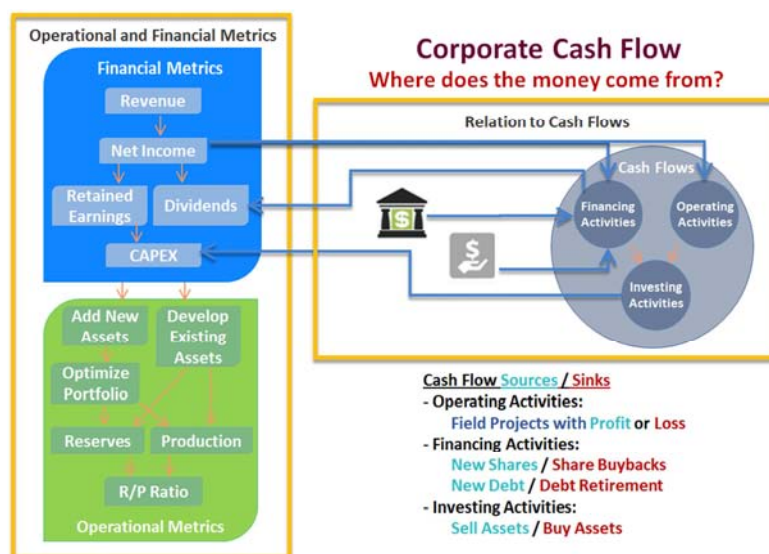


Figure 3. Oil and gas producer operational and financial value chain and relationship to corporate cash flows.

During the 2014-2016 downturn, producers that anticipated filing for bankruptcy, such as Linn Energy, drew the full remaining availability under their revolving credit facilities and placed the cash into bank accounts not controlled by, nor pledged to, lenders. Producers took these actions to strategically enter bankruptcy with as much cash as possible to ensure funds were available to finance ongoing operations. With liberal lending terms, producers and creditors entered the downturn on very contentious terms. However, the financial sector often has short term memory: post downturn, covenants are again being negotiated out of credit agreements and pricing grids (loan rates) have reduced.

Prior to the 2014-2016 commodity price downturn, agent banks competed for lead positions on transactions and important lender protections such as anti-cash hoarding provisions and DACA (Deposit Account Control Agreements) requirements were negotiated out of reserve-based credit agreements. Anti-cash hoarding provisions establish a maximum level of unencumbered cash a producer can leave on its balance sheet without having to use it to pay down revolving credit facility debt. Should a producer have unencumbered cash beyond this threshold, the difference is required to be used for debt redemption. DACAs require the producer to pledge all of its bank accounts to the first lien lender group, which can be foreclosed upon in a default scenario. Removing important covenants in order to secure the lead bank position on a credit facility caused many banks within the syndication of

those loans to write off losses on defaulted producers, thus damaging their own balance sheets.

3. Research Methodology: Peer Group Analysis

3.1. Sample Group Selection and Ranking

The core of this study is based on a detailed, proprietary analysis of 45 North American oil and gas companies ranging from large capitalization to junior size. This study begins by ranking North American oil companies based on market capitalization (see Appendix A), and is limited to publicly traded entities. Privately traded companies were excluded because operational and financial metrics of such companies are commonly inaccessible for scrutiny studies. By looking at corporate financial statements, investors can gain a sense of high-level value drivers within a company and the key management decisions behind them (Figure 3). Revenue in an oil and gas company is primarily generated by sale of produced hydrocarbons and is directly impacted by management decisions to increase or freeze production. Moreover, as reserves are produced, oil and gas companies must extend the reserve base by either further developing current assets or inorganically acquiring new ones. Both decisions require capital expenditures (capex) as financed from cash from operations, cash from debt financing, or cash from equity financing.

Table 2. Peer groups comprising 45 North American E&P companies, with stock ticker symbol and year of incorporation. For detailed KPI comparison see expanded Table in Appendix A.

U.S. "Traditional"			U.S. "Micro Cap"			Canada		
APC	Anadarko	1959	RRC	Range Resources	1976	CNQ	Canadian Natural Resources	1973
DVN	Devon Energy	1971	FANG	Diamondback Energy	2007	COS.TO*	Canadian Oil Sands	1964
EOG	EOG Resources	1999	SWN	Southwestern Energy	1930	CVE	Cenovus Energy	2008
HES	Hess Corporation	1919	GPOR	Gulfport Energy	1998	ECA	EnCana	2002
MRO	Marathon Oil	1887	PE	Parsley Energy	2008	HSE.TO	Husky Energy	1938
MUR	Murphy Oil	1950	RSPP	RSP Permian	1979	IMO	Imperial Oil	1880
NBL	Noble Energy	1932	EGN	Energen Corporation	2010	SU	Suncor Energy	1923
OXY	Occidental Petroleum	1986	QEP	QEP Resources				

U.S. "Small Cap"			U.S. "Juniors"			"Bankrupt" Companies		
PXD	Pioneer	1997	PDCE	PDC Energy, Inc.	1969	CRC	California Resources	2014
CXO	Concho Resources	2006	CNX	Consol Energy	1864	CRK	Comstock Resources	1919
EQT	EQT Corporation	1888	RICE	Rice Energy	2005	DNR	Denbury Resources	1990
COG	Cabot Oil and Gas	1989	CHK	Chesapeake Energy	1989	HK	Halcon Resources	2004
XEC	Cimarex Energy	2002	MTDR	Matador Resources	2003	XCO	EXCO Resources	1955
CLR	Continental Resources	1967	WLL	Whiting Petroleum	1980	SDOC	SandRidge Energy	1984
AR	Antero Resources	2002	SM	SM Energy Company	1915			
			OAS	Oasis Petroleum	2007			
			BCEI	Bonanza Creek Energy	1999			

The 45 North American E&P companies were ranked in six peer groups (Table 2). The peer groups are based on company focus (A: US Traditional, including overseas assets), market capitalization (B: Small Cap – \$6-25 billion; C: Micro Cap – \$2.4-5.5 billion; and D: Juniors – \$1-2.6 billion), country of incorporation (A-D: US Vs E: Canadian) and include a separate peer group of companies that showed

steep decline of fundamentals (F: "bankrupt"; or imminent filing). *Appendix A* gives a more detailed overview of selected financial and operational KPIs for all companies analyzed.

A basis for the ranking of imperiled or "bankrupt" companies was the immediate downward trend of retained earnings in the year following the onset of declining oil

prices, which is summarized for the bankrupt peer group (Figure 4). Retained earnings are net earnings not paid out as dividends and are generally retained by the company to be reinvested in its core business or to pay debt. They can be utilized to measure the health of a company. A surplus in retained earnings shows the company is strong enough to create internally driven growth from operations while not being reliant on outside financing for new ventures. In contrast, negative retained earnings show the company in effect has not generated any net gain over its corporate history.

3.2. Examples of Company Performance

As demonstrated above, a steep decline in retained earnings (Figure 4) is a strong signal for shareholders of increased risk exposure companies with either default or restructuring being imminent. Although financial covenants were broken, lenders were reluctant to enforce Chapter 11 because it would mean debt conversion to equity, and banks are not in the business of oil and gas operations. Investors who believe default or restructuring are imminent will sell their shareholder positions, inducing a further decline in retained earnings, providing insight to potential and existing shareholders that the E&P is not a sound investment.

The liquidity of *Denbury Resources* (Figure 4) indeed plunged during the oil market downturn with nearly \$3.6 billion of debt, sending its share price down more than 90% from the peak at one point. However, the company adopted a more methodical approach to debt reduction and, with the improvement of oil prices, has been able to increase investment spending. The other companies in the "Bankrupt" peer group (Figure 4), did not recover from their losses in retained earnings without restructuring under Chapter 11 bankruptcy protection. Several drawn out and complex financial bailout measures such as Chapter 11 bankruptcies and out-of-court restructurings occurred.

For example, *SandRidge Energy* filed for chapter 11 in

2016, after its stock trading on the New York Stock Exchange (NYSE) was suspended in January 2016, due to reaching "penny stock status"—trading below \$1/share for 30 consecutive days. In October 2016, Sandridge emerged from Chapter 11, having satisfied all the necessary provisions of its plan for reorganization and received approval from the NYSE to relist its common stock, which began trading on the NYSE on October 4, 2016 at \$19.50 (WSJ, 2018).

California Resources (CRC) spent most of 2016 refinancing bonds and deleveraging, largely exchanging unsecured notes for senior secured notes with much lower face value. Unsecured bond investors had little choice other than to accept the new senior secured notes because refusing to do so meant potential subordination in the repayment waterfall if CRC issued new secured notes. *Comstock* shareholders also saw dilution of value by creditors swapping debt for equity.

Halcon Resources hired financial and legal advisors in 2016 to help craft comprehensive balance sheet restructuring. Existing common equity holders had to relinquish 96% of the company to debt holders under the revised structure, as opposed to having their shares eliminated altogether. Nonetheless, Halcon's agreement with banks to swap debt for equity would lead to a 90% rise in the number of outstanding shares, pushing its diluted shares to trade for less than \$0.25 on NYSE. A pre-arranged "reverse stock split" of 34 to 1 kept the stock above \$1 at closing thus averting imminent delisting per NYSE rules.

Exco Resources share price also fell below \$1 in January 2017, and, following in Halcon's footsteps, the company resorted to a reverse stock split to avoid NYSE non-compliance. Exco missed debt payments due December 2017, but reached a temporary deal with its lenders to allow the company to sort out "strategic alternatives" including a comprehensive restructuring to address its near-term liquidity needs.

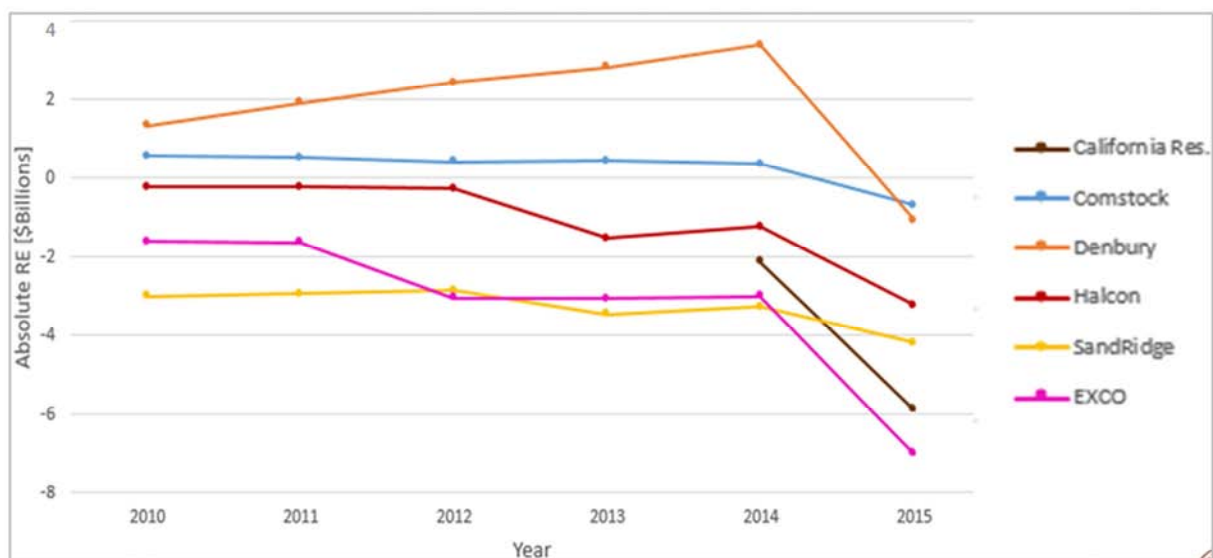


Figure 4. Retained earnings for "Bankrupt" peer group.

3.3. Minsky Financing Classification

The 45 companies screened in our panel can be classified based on their metrics in Appendix A, using the three categories of financing defined by Minsky [8, 9]:

- (1) *Hedge financing* is the least risky, and relies on future cash flow to repay all borrowings, and requires little borrowing and large profits. Hedge financing applies to the US "traditionals".
- (2) *Speculative financing* is slightly riskier. Cash flow is used to repay interest on borrowings and must rollover debt to repay the principal, which works well as long as there is no distress. Nearly all North American independent oil and gas operators in the microcap, small cap and junior size fall into the speculative financing category.
- (3) *Ponzi financing* is the riskiest. Cash flow covers neither principal nor interest payments. Firms bet on underlying asset appreciating to cover their liabilities.

Oil and gas companies in the "bankrupt" group clearly landed in this category.

4. Financial Analysis Selected Companies

Based on a number of ranking criteria, 11 out of 45 companies were identified as having the highest share price recovery potential (Table 3) when completing the company screening stage of our study (May 16, 2016). These companies exhibited the steepest share price depreciations between January 2014 and May 2016, and all but one exhibited steep share price rises in the first half of 2016. The steepest share price recovery occurred during April 2016 (Figure 5). Some of the selected companies, including *Denbury Resources*, initially ranked in the peer group of "bankrupt" companies with Ponzi financing signatures (Table 2).

Table 3. Selected 11 companies and rankings based on share price movements.

Company	NYSE Symbol	Share Price Depreciation Jan. 2014 - 12 May 2016	Rank	Share Price Appreciation Jan. 2016 - 12 May 2016	Rank
Continental Resources	CLR	-243%	11	74.1%	10
Noble Energy	NBL	-45.4%	10	8.6%	3
Range Resources	RRC	-48.3%	9	64.2%	9
Murphy Oil Company	MUR	-52.3%	8	32.3%	7
Husky Energy	HSE	-54.1%	7	7.3%	2
Antero Resources	AR	-57.5%	6	14.2%	4
Marathon Oil Corporation	MRO	-64.7%	5	-3.8%	1
Southwestern Energy	SWN	-69.6%	4	53.8%	8
Denbury Resources	DN R	-75.0%	3	0%	11
Oasis Petroleum	OAS	-78.8%	2	25.7%	6
Whiting Petroleum	WLL	-81.7%	1	14.6%	5

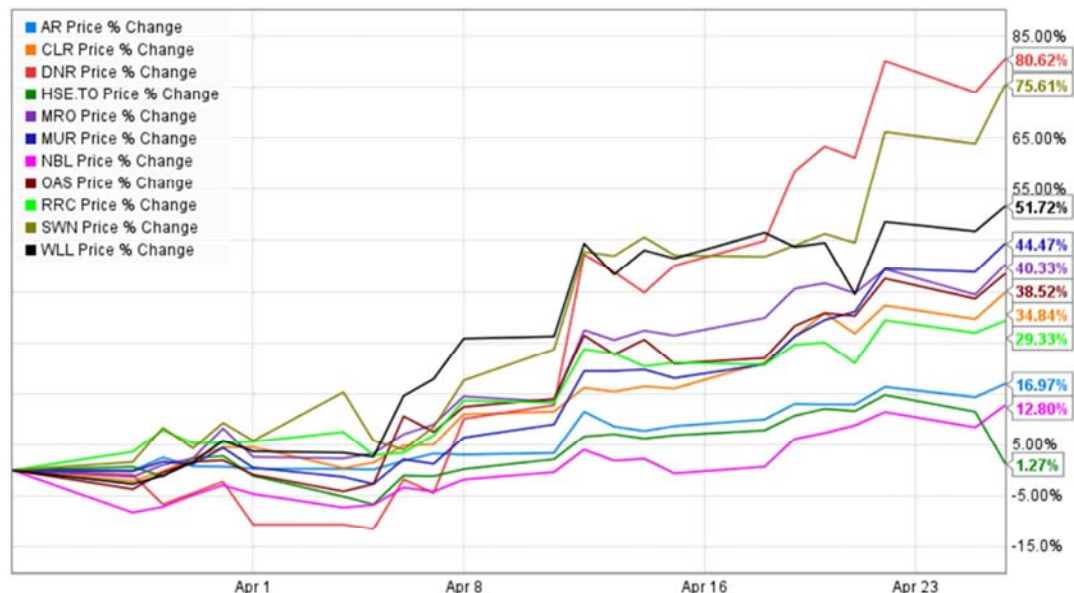


Figure 5. One month normalized share price history (April 2016).

Historic operational and financial performance metrics (2010-2015) were used to construct forward performance metrics (2016-2020) for each company. Five oil and gas price

recovery scenarios (Figures 6a, b) were adopted for forward cash flow modeling and thus used to stress test the corporate liquidity of each company going forward till 2020 by

constructing profit-loss accounts, cash flow accounts and balance sheets. Separate price recovery scenarios apply to oil (Figure 6a), natural gas (Figure 6b) and condensates (NGLs). Condensate price scenarios (not shown) are linked to oil prices. Condensate pricing was found by taking the average ratio of historical average realized price to oil price for the

past five years and applying that percentage to the forecasted oil prices. Hundreds of tables and graphs were generated in a proprietary research project, and permission was obtained (courtesy Mr. Gregg Williams, senior co-author of this paper) to use key data in this public summary article of the research methodology, results and principal conclusions.

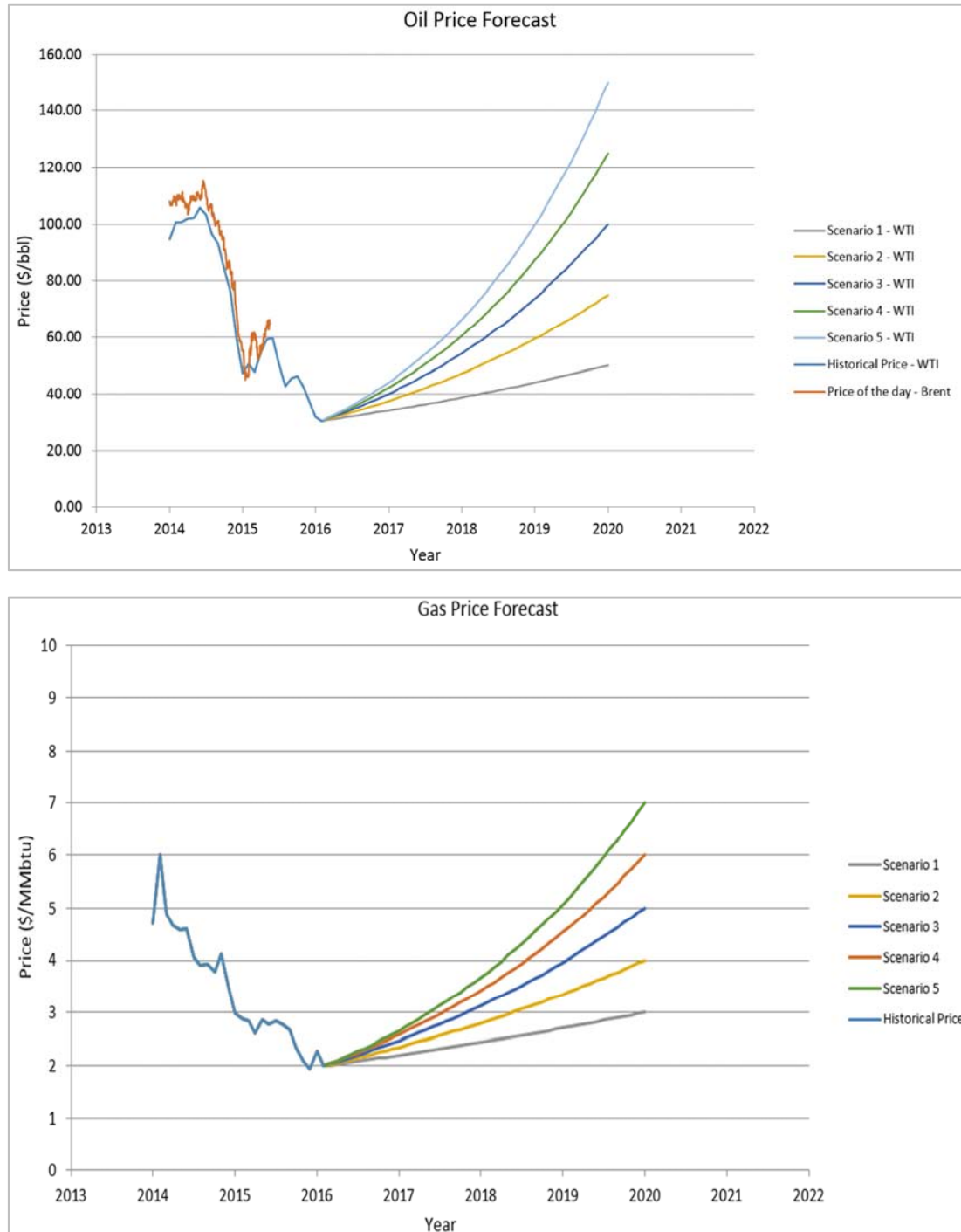


Figure 6. a: Oil price forecast scenarios. b: Gas price forecast scenarios (after Weijermars and Sun [1]).

4.1. Forensic Financial Analysis

For the selected companies in Table 3, time series of historic cash flows were constructed (2010-2015) using the

company's reported cash flow accounts as follows:

- (a) *Cash from operations* equals retained earnings from prior period plus dividends (if any) back in. Check result against reported cash from operations.

- (b) Next step towards total net cash flow needs to add to
 - (a) results from *investment activities* (I) proceeds from any asset sales cash flow and (II) deduct from (a) any expended capital investments in the period.
- (c) Final step to total net cash uses results from steps (a) and (b) and adds net results of any *financing activities* (I) debt redemption, (II) debt loading, (III) Proceeds from new share issuance.

Subsequently, we predicted future cash flows for the period (2016-2020), based on certain commodity price assumptions (Figures 6a, b) and incorporating:

- a) *Cash from operations*, as estimated from the company's documented asset base (e.g. location of the assets, number of wells, decline of output) with projections of likely output levels given cuts in capex. Future revenue was estimated based on production output times commodity prices (oil, gas, NGLs) using various commodity price scenarios (Figures. 6a, b) and taking into account the effect of hedged volumes on realized sales price. Standard operating expenses (DD&A, taxes, etc) were deducted, resulting in certain projections for *cash from operations*. Announced personnel reductions were also incorporated, as this reduces the cost of overhead.
- b) Likely investment activities as projected in company strategy plans for divestments, acquisitions and project capex as detailed in latest annual reports.
- c) *Financing activities*, taking a broader view including outstanding bond size, debt maturity dates and any new financing requirements. A sensitivity analysis was performed for likelihood of success that new capital requirements can be timely secured based on (1) credit rating, (2) impact of gearing ratio, (3) "hidden" liabilities such as Volumetric Production Payments received in the past (not reported on the balance sheet), (4) past and impending future impairment of oil and gas properties on balance sheet due to low commodity prices.

4.2. Results

Production analysis. Figure 7 shows our forward production profiles for the six (of the 11) representative companies listed in Table 3. All 11 companies were analyzed in-depth but for brevity only the principal results for six companies are illustrated in this article. Historical production profiles were generated for each company by pulling production data from financial statements. Forecasted production was based on company guidance and trend analysis. Figure 7 shows examples of the historic production (2010-2015) and the forward projections (2016-2020) that were used as the basis to compute operational cash flows. Denbury, Southwestern, and Marathon were expected to have conservative production levels while Whiting, Range Resources and Antero indicated more aggressive growth of future production based on portfolios and strategy plans published in annual reports. The production was subsequently paired with the price forecasts scenarios (Figures 6a, b) to compute forward revenue projections that

would contribute to the company cash accounts.

Operational revenue and cash account. Figure 8 (left column) shows production revenue and cash account positions for three key companies based on historic data (2010-2015) and 5-year outward forward projection (2016-2020) using five price scenarios given in Figures. 6a, b. The five oil prices used are \$50-, \$75-, \$100-, \$125-, and \$150/bbl, broken down to an equal monthly growth rate starting in March 2016. The same procedure was followed for the natural gas pricing scenarios of \$3-, \$4-, \$5-, \$6-, \$7/mcf. The cash account projections in Figure 8 (right column) show that for the lowest price scenarios considered (\$50/bbl oil in 2020, \$3/Mcf gas) the cash accounts of both Range Resources (moderately positive in 2020) and Southwestern Energy (strong recovery of cash position) are robust against low commodity prices. In contrast, Marathon would drop close to a liquidity crisis in 2020, prompting for more drastic management measures. In 2017, Marathon indeed reshuffled its entire asset portfolio, selling low yield shale acreage and buying significant new acreage position in the more profitable SCOOP-STOCK play of Oklahoma. For the other, more optimistic price recovery scenarios (Figures 6a, b) all companies show strong liquidity positions. This type of analysis was performed to stress test the liquidity strength of all the companies in Table 3, as a basis for investment advice. Lastly, cash from financing was applied to keep the cash account positive due to oncoming debt maturities and dividend payments.

Net income, cash sources and sinks. Figure 9 shows examples of financial metrics analysis using representative companies (Range Resources, Southwestern Energy, and Marathon) with diverse evolution of net income and debt-to-equity ratios. The left column of Figure 10 shows net income for Range Resources is growing and positive towards 2020. Southwestern Energy shows barely any profit growth for the price recovery Scenario 1 (essentially the NYMEX figures reported as of 1H18), while Marathon has negative net income (losses) for the entire period toward 2020. The conclusion is that Range Resources produces at lower cost, Southwestern's production margins are slim, and Marathon's production base was too expensive to make any profit for the price recovery scenarios considered (Figures 6a, b). The right column of Figure 9 shows the cash sources and sinks.

Balance sheet metrics. From the graphs in the left column of Figure 10 it is apparent that the total debt to total equity ratio of Range Resources is highly sensitive to selected price recovery scenarios, with a considerable spread of ratios between the five price scenarios. Leverage ratios of Southwestern and Marathon stay in a narrower band width, with consistent improvement during the projected period (2016-2020), due to debt retirement and cost reductions. Figure 10 (right column) shows that the total equity for shareholders does not deteriorate much even for the lowest price recovery (Scenario 1). Shareholders stand to gain from speculative share price recovery (capital gains) over the next few years, a conclusion also drawn in previous analyses of oil price shock impact on share prices [6, 7, 16].

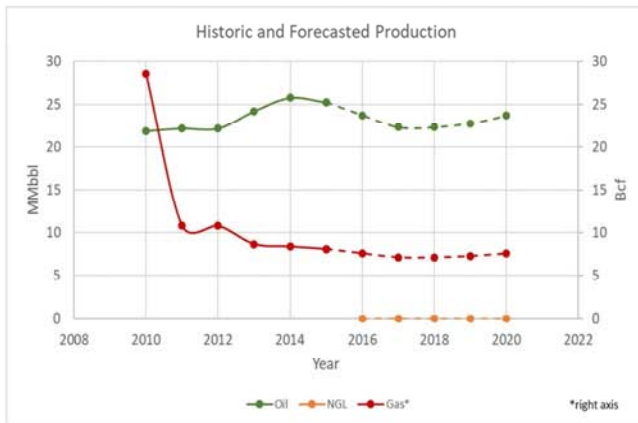
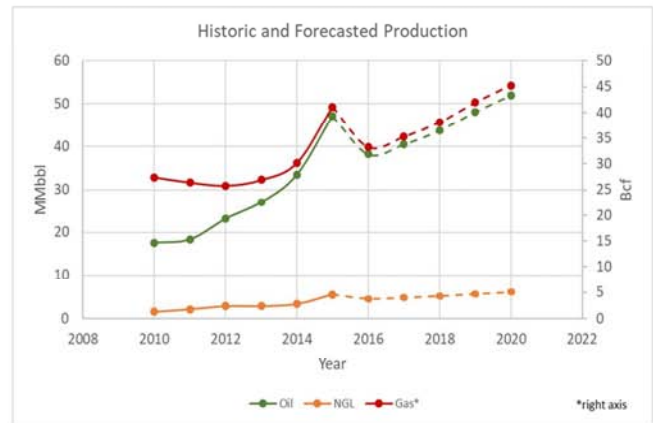
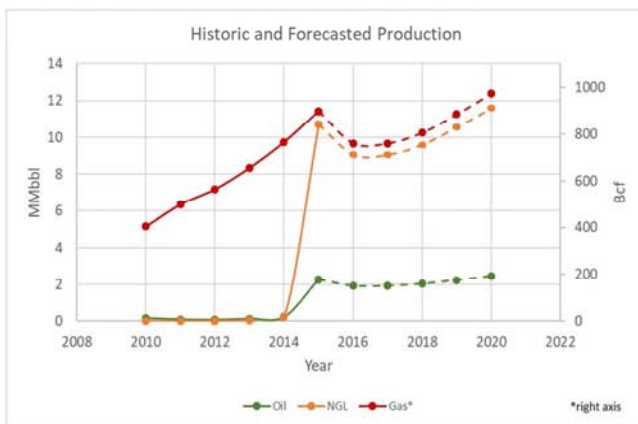
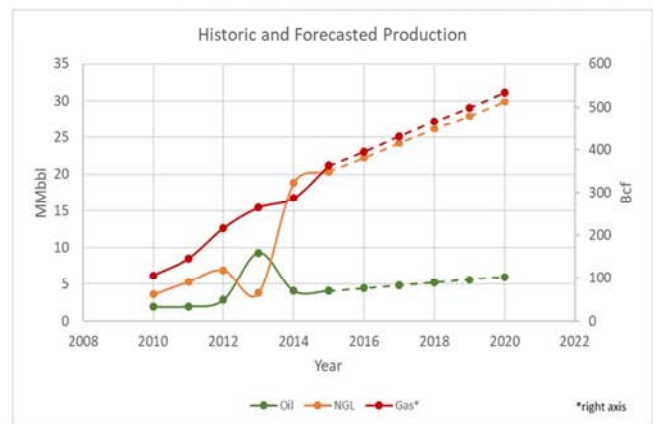
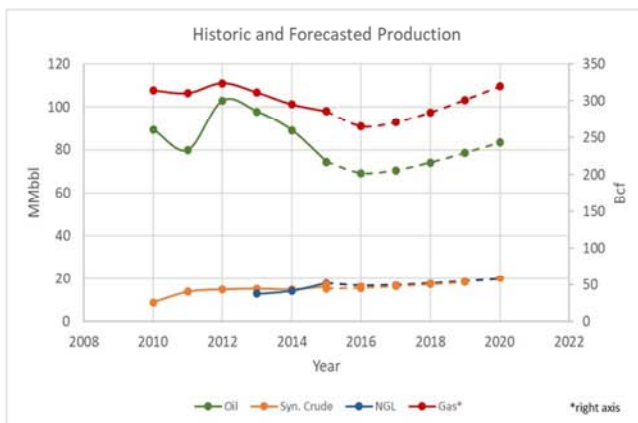
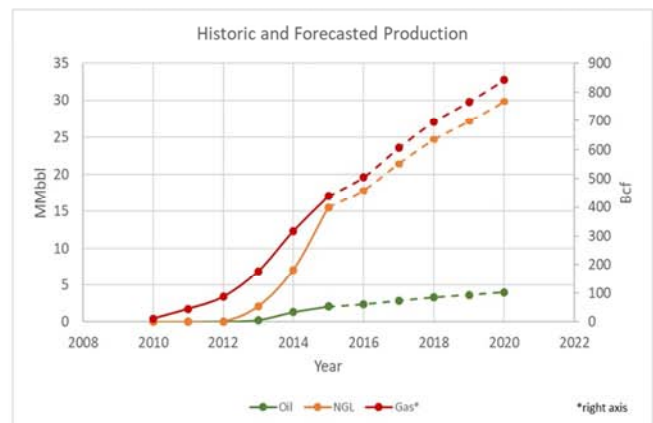
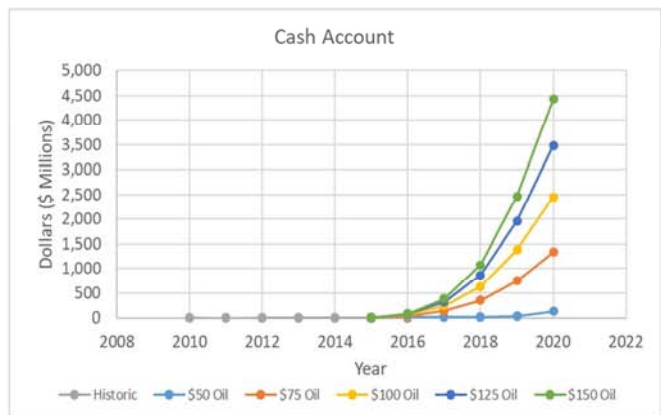
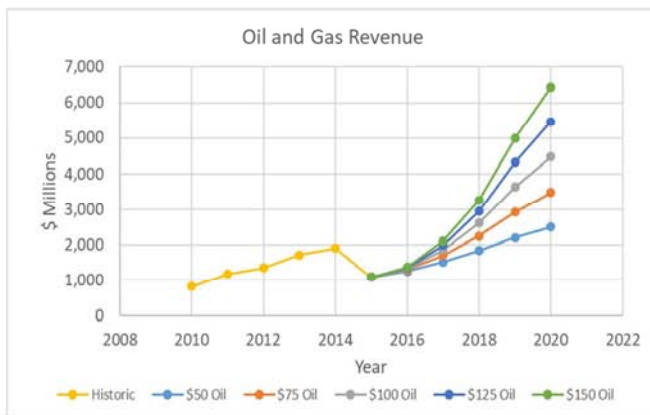
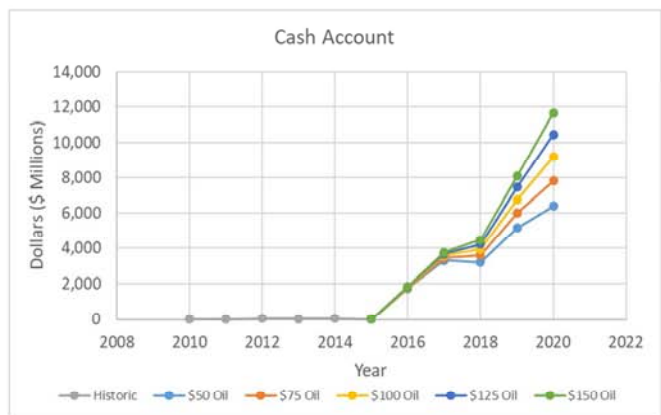
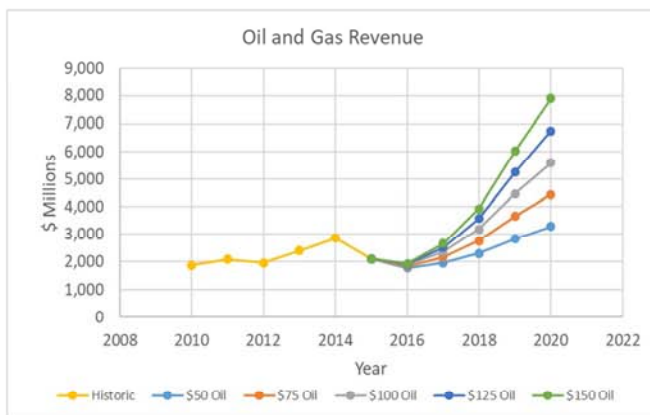
A. Denbury Resources**D. Whiting Petroleum****B. Southwestern Energy****E. Range Resources****C. Marathon****F. Antero**

Figure 7. Production of liquids (oil and condensates, left-scale) and natural gas (right scale) spanning 6-year period of historic time series (2010-2015) and 5-year forward projection (2016-2020) for a number of representative companies included in Table 3.

A. Range Resources



B. Southwestern Energy



C. Marathon

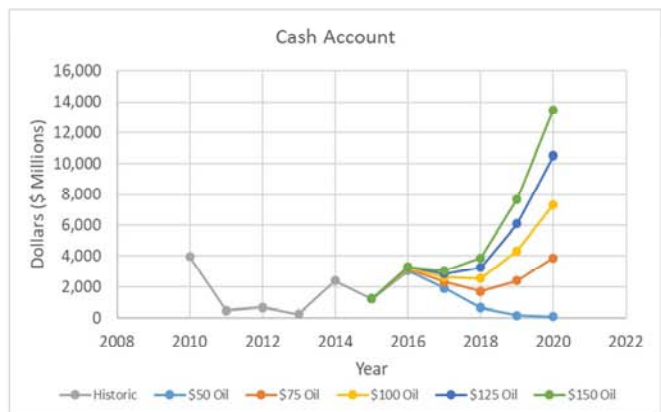
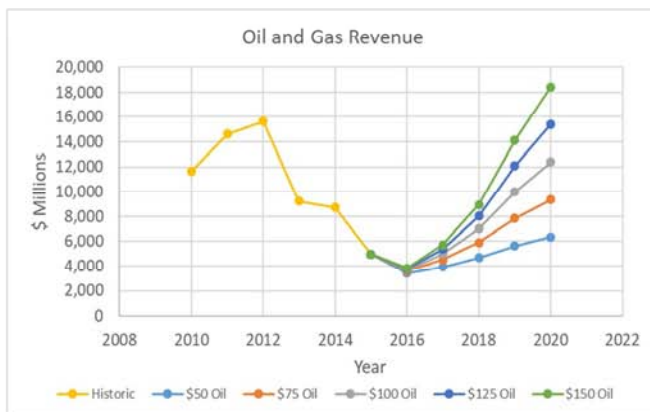
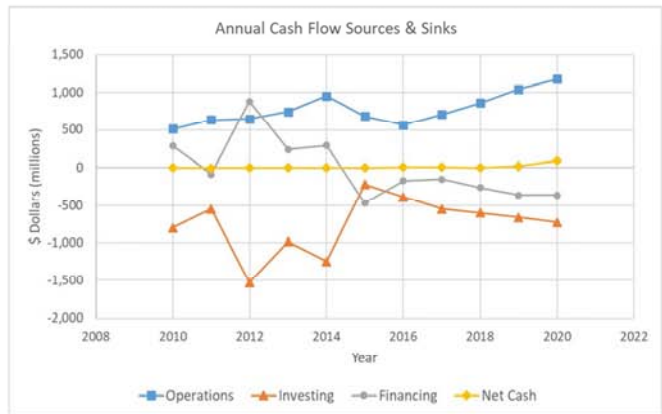
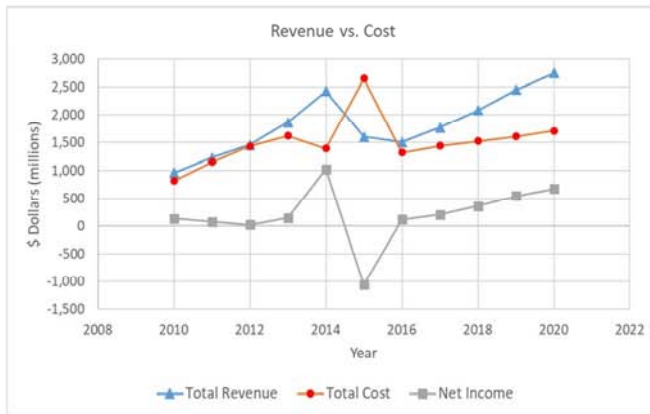
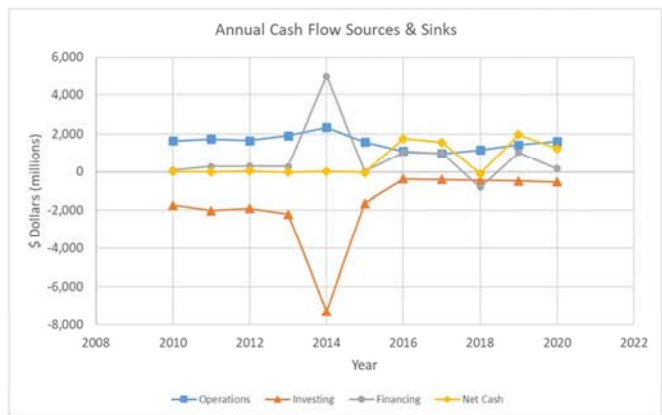


Figure 8. Production revenue (left column) and cash account position (right column) for three companies based on historic data (2010-2015) and 5-year forward projection (2016-2020) using five price recovery scenarios given in Figures. 4 and 5.

A. Range Resources



B. Southwestern Energy



C. Marathon

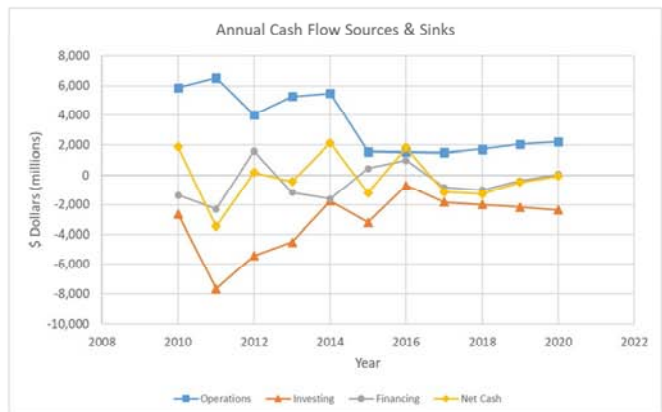
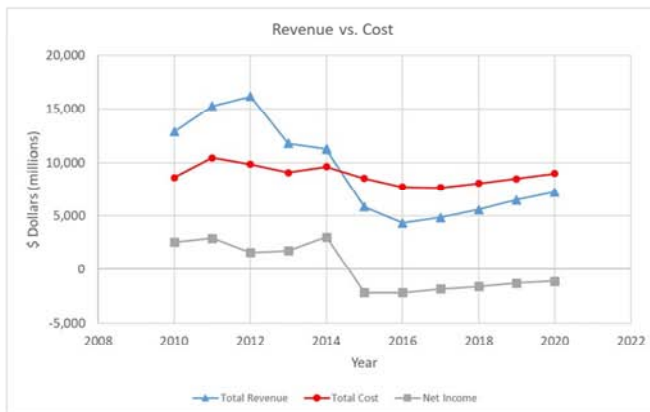
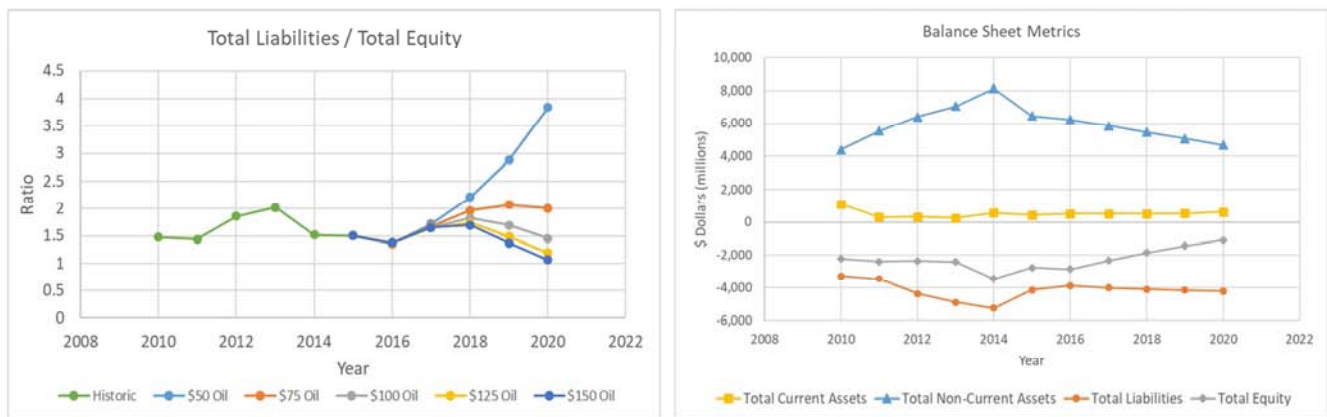
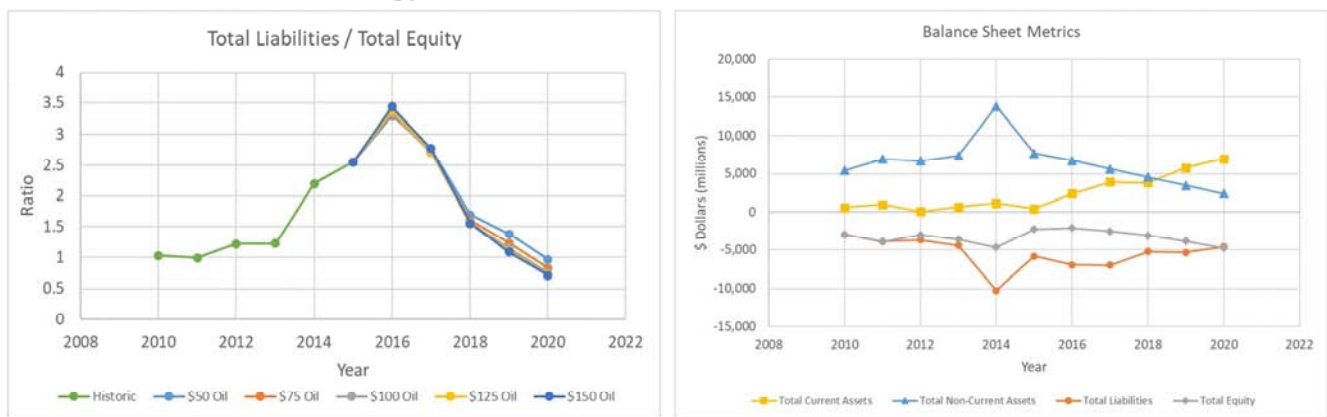


Figure 9. Left column: After tax net income (free cash flow) was computed for all companies for various price scenarios. Graphs shown are for price recovery scenario of \$50/bbl oil and \$3/Mcf gas in 2020. Right column: Annual net cash flow (price recovery Scenario 1) and sources of cash (operations, financing and investment activities) for the three sample companies. All companies are expected to reduce their investment (CAPEX) programs as compared to earlier in the decade.

A. Range Resources



B. Southwestern Energy



C. Marathon

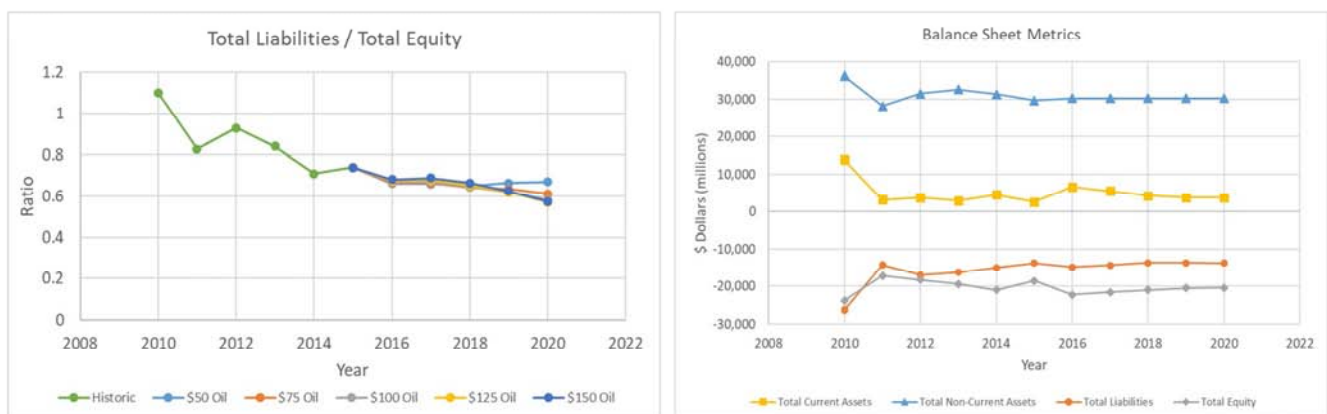


Figure 10. Left column: Ratios of total liability to total equity in time series for the decade (2010-2020). Historic data (2010-2015) and 5-year forward projection (2016-2020), taking into account debt maturation and roll-over, and various price scenario impacts on liquidity positions via cash from operations. Right column: Balance sheet components for price recovery Scenario 1, showing assets (current plus non-current), liabilities, and remaining shareholder equity. Equity value is taken negative for the company as it is owed to shareholders (in case of default).

5. Discussion

5.1. Comparison of Performance Metrics

This study analyzed the capital structure and operational performance of unconventional producers in various peer

groups. Our forensic financial analysis of 45 North American oil and gas companies over the period 2010-2015 and forward projections till 2020 provided a unique perspective on the performance of each company. We recognized so-called failing companies that entered bankruptcy proceedings and correspond to Ponzi-financing category companies. We

also recognized successful companies that can be classified either as hedge financing or speculative financing category companies. By examining their historic financial and operational performance in a forensic analysis, the study demonstrated how the implementation of operational decisions is financed.

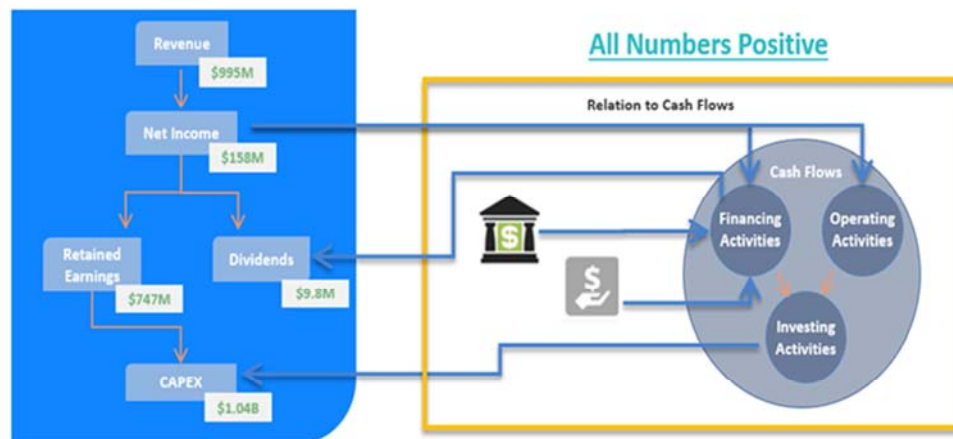
Examples of summary cash flow schedules for the successful and failing companies are given in Figures 11a and b, respectively. The two groups each comprise five companies with similar market caps between \$1M and \$11M during calendar year 2013 to allow for equal comparison. The Successful Group generated positive net income far in excess of dividends distributed and utilized this income to reinvest in the company. Further, it had built up an average \$747 million in retained earnings providing a sizeable safety net when the downturn hit. The Successful Group is comprised of Diamondback, PDC Energy, Carrizo, Cimarex, and Newfield, Figure 11a. The performance of this group mirrors the links observed in Figure 1, with value added to the ecosystem from annual operations. In the comparison, the bankrupt and restructured companies were expanded (Figure

4) (Sandridge, Halcon) with three more entities (Breitburn, Ultra and Linn Energy) to create a clear vision of what led to these companies' failures, where others succeeded.

For the Bankrupt Group (Figure 11b) certain cash flow links were modified to reflect negative or zero contributions to net income and retained earnings, as represented by dashed lines. Although the Bankrupt Group generated more revenue than

the Successful Group, it was unable to achieve profitability after expenses. This was clearly an ongoing occurrence as the Bankrupt Group had -\$1.24 billion in accumulated deficit by the end of 2013 when oil prices were just under \$100 per barrel. Additionally, with an average -\$446 million in net income, the \$228 million paid out in dividends was completely financed from external sources. *These visual representations further illustrate the assertion that Successful Producers had a long-term strategy with risk mitigating tactics while the Bankrupt Producers ran operations as though market conditions would remain favorable for the foreseeable future.*

Successful Companies



Failing Companies

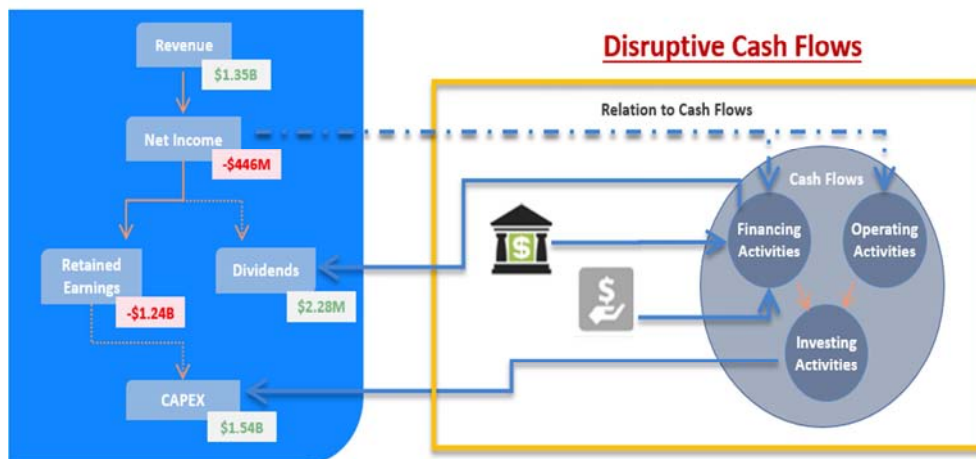


Figure 11. a. Successful Group Financial Value Chain. b. Bankrupt Group Financial Value Chain.

Table 4. Overview of Key Metrics for the Successful Group and the Bankrupt Group.

Metric	Successful Group	Bankrupt Group
Proved Reserves	Year-over-year increases in proved reserves despite commodity prices; 6.6% increase in 2015.	Similar increase as Successful Group in first period followed by 35% decrease the following year.
Production Levels and Composition	Large increases in production with 36.8% increase in liquids production in 2015. Greater than 50% liquids production. Revenue per BOE consistently greater than Bankrupt Group with \$4.94 differential in 2015.	Overall increases in production on smaller scale; 6.2% increase in liquids production in 2015. Less than 50% liquids production. Revenue per BOE consistently less than Bankrupt Group.
R/P Ratio	Successive steady decreases in R/P ratio; settled at 12.4 in 2015.	Large positive and negative swings in R/P ratio; settled at 10.3 in 2015.
Well Activity	Steady changes in well activity; does not appear alarmingly reactive.	Consistently higher volume of gross wells drilled with more significant swings than Successful Group.
Retained Earnings	Generally entered downturn with positive retained earnings. Increases in 2015 followed by decreases in 2015. Largest negative value still less than lowest negative Bankrupt producer.	Entered downturn with negative retained earnings. Continued to drop through following two year period.
Total Liabilities	On par with Shareholders' Equity figure; substantially less than Bankrupt Producers.	Significantly greater than Shareholders' Equity; double that of the Successful Group in 2013 and 2014, triple in 2015.
Shareholders' Equity	Always positive and of similar value to Total Liabilities. Less than Bankrupt Group in 2013 but significantly more in 2015.	Entered downturn with positive, but by 2015 decreased to an average -\$3B signaling significant distress.
Debt-to-Equity Ratio	Steady year-over-year changes. Averages generally fall into normal range of Unconventional Producers.	Volatile swings as observed by Linn Energy from 1.8 in 2013 to -38.10 in 2015 and Halcon from 2.7 in 2013 and 61.48 in 2015.
Dividends	Only 40% paid dividends; dividends paid notably less than Bankrupt Group.	80% paid dividends in substantial sums. Some producers would have had positive retained earnings had they cut dividends.
CAPEX Spend	Smaller reductions in capex after oil prices dropped. Four out of five less than US E&P average reduction.	Large reductions in capex after oil prices dropped. Four out of five considerably higher than US E&P average reductions.

5.2. Recognizing Corporate Distress

For investment purposes, one wants to identify companies that underwent bankruptcy as well as earmark companies that succeeded to fare though the downturn without adversely affecting value of initial shareholders. Likewise, it is important to recognize and address potential distress early on so that the trajectory of the company can be readjusted with minimal effort and cost. Table 4 summarizes the key distinctions between the Successful and Failing Groups for all principal operational and financial metrics reviewed in this study. The Successful Group has a more consistent annual performance than the Bankrupt Group that tends to see extreme fluctuations in both financial and operational metrics. This volatility is a byproduct of the overall lack of preparedness of the Bankrupt Group when oil prices took a turn for the worse. These observations are consistent with the enterprise disconnect concept as presented by Weijermars [17-19] in studies on Corporate IQ Optimization. Companies that are slow to recognize and adapt to changes in the business environment consistently underperform and struggle to maintain profitability because they miss the apparent indicators that change is required. Further, these companies are governed by management that, in addition to disregarding fundamental business indicators, takes excessive risks such as paying multiples for assets that they will subsequently impair.

Companies in the Bankrupt Group exemplify this behavior: long-term strategy did not incorporate any kind of financial shield for the companies in the event of market

changes. Then, when the business environment worsened, these companies continued with business as usual, including distribution of large dividends. Ironically, dividends were ultimately distributed at dire expense of the common shareholders, because the restructuring wiped out shareholder value either by outright bankruptcy (Ch. 7) or by reorganization with reverse stock splits (Ch. 11), greatly adulterating equity value of the original shareholders. Figure 12 demonstrates the available strategies at increasing distress levels. Upon the first sign of bearish trends, a company has the option to change operations, revise financing options, and engage in M&A (mergers and acquisitions) activity. Depending on the breakeven cost of the producing assets, it could be advantageous to either consolidate to a more focused position (this will reduce general and administrative and lease operating expenses), or use the diversity of portfolio to reduce concentration risks and average out performance. Personnel expertise, IRR hurdles, contract labor availability, and capital expenditure budgets will dictate which route and which assets should be retained. For example, companies can add value to their assets when approaching lenders and buyers by booking proved non-developed and proved undeveloped reserves. Additionally, producers can high grade—initially exploit most prolific and valuable acreage with minimal capital input to boost front end cash flow. Renegotiation of contracts with rig crews, midstream companies, and other service providers can stave off illiquidity, but is not a sole strategy to right-sizing a balance sheet in the long run.

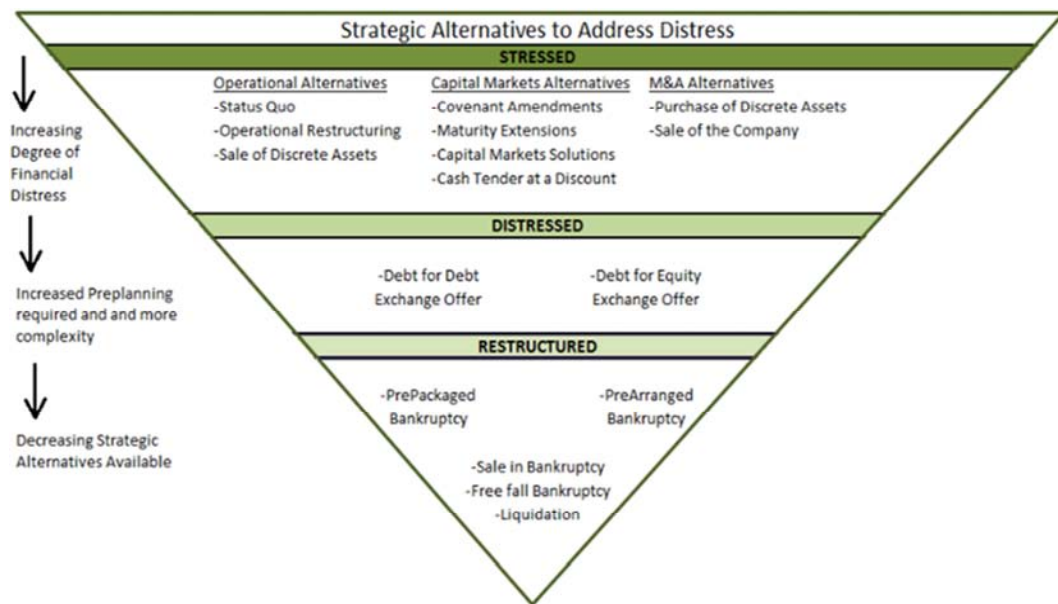


Figure 12. Distress strategies (Courtesy Journal of Petroleum Technology. Surviving the Downturn. April 2016. P. 12).

6. Lessons Learned and Recommendations

Insights based on the preceding in-depth analysis can be formulated in terms of lessons learned and recommendations for the three major stakeholder groups: (A) company management, (B) shareholders and (C) lenders.

A) *Company management*: should consistently monitor the key metrics discussed in this paper (retained earnings, debt to equity, etc.) throughout all commodity price environments. Companies should consider the following:

- Forming a quarterly report to track these metrics and “stress test” the company to ensure financial strength if there is another period of low oil prices.
- Run all financing and asset acquisitions through this framework to ensure that they will provide the financial strength needed during periods of low oil prices.
- Large producers should mitigate risk through the use of price hedging contracts, layered in systematically, regardless of market conditions. The strategy is to maintain a favorable, aggregate weighted average strike prices as hedges are added in over time.
- Smaller companies with lower leverage should exploit their flexibility by opportunistically hedging—wait for market rallies to lock in hedges—as well as employ options to gather more upside.
- Be dynamic in the drilling schedule. Perform re-evaluations of economics concerning a portfolio’s fluid windows to determine which acreage renders the most liquids (as of 2016, producing liquids is more valuable than gas), then determine which wells generate the highest NPV’s or IRR’s. Reschedule the drilling program so that the most profitable wells are

at the front end.

- Additionally, operators should consider their internal business targets. Focus on the economics of the wells rather than growing production. Prioritizing valuable acreage with upside rather than running wells dry immediately bolsters future positions, keeping a company in the speculative-hedge range on the Minsky scale (rather than ending in Ponzi).
 - Appropriate capital structure depends on the company’s business objective: exploratory E&Ps should focus on keeping leverage to a minimum and having more liquidity because their endeavors require intensive upfront capital.
- B) *Shareholders*: Can use the analysis proposed in our study to “stress test” the companies in which they are invested.
- The analysis can be used by opportunistic buyers seeking to purchase shares when oil prices are depressed and determines which companies are going to be successful and which will fail.
 - Alternatively, the stress testing method could also be used to short the companies that do not pass the test.
- C) *Lenders*: can “stress test” the financials of the companies to which they are considering to lend money.
- When considering increasing exposure to an E&P, evaluate all aspects of the company’s operating strategy, financial standing, management track record, and five-year plan in addition to borrowing base coverage, junior debt, and reserve volumes.
 - Though it is more costly, subordinated debt is not necessarily considered a negative attribute in the capital structure, anymore. Bankruptcies that have occurred in the 2014-2016 downturn have been favorable for senior secured lenders because the junior debt holders—along with equity—have taken the brunt of the losses.

- (c) Weaknesses in leveraged lending have shown banks how to properly structure a credit agreement: minimum and maximum hedging limits, Deposit Account Control Agreements (DACA) requirements, anti-cash hoarding provisions, higher bank rates, springing maturity clauses, higher mortgage levels, and more restrictive covenants. Cyclicity must be addressed with adequate preventative measures.
- (d) Implement maximum total leverage ratio covenants in credit agreements of 3.5x or less to avoid OCC scrutiny and enable earlier negotiations with the client as their leverage increases towards the limit

during a downturn. A breach of the covenant does not imply an immediate loss to first lien lenders, but it does provide them the opportunity to renegotiate other protective covenants in exchange.

Acknowledgements

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Appendix

Company Screener

			Financial KPIs										Operational KPIs													
NYSE	Company	Year of Incorporation	Market Cap (\$B) (03/24/16) ¹	Market Cap (\$B) (01/04/16) ¹	% Difference in Market Cap	% Difference in Share Price ¹⁰	Total Assets (\$B) 2015	Total Liabilities (\$B) 2015	Asset/Liab. Ratio	Debt to Equity Ratio 2015 ¹¹	Retained Earnings (\$B) 2015 ¹²	Moody's Credit Rating (02/16) ¹³	S&P Ratings 2016 ²	Asset Liquidation Value (02/16) ³ (\$MM)	2015 Total Liquids Production (MMbbl) ⁴	2015 Total Gas Production (Bcf) ⁴	Liquids/Gas Ratio 2015 ⁴	Liquids/Gas Ratio 2014 ⁵	Liquids/Gas Ratio 2014-15 ⁵	Oil ⁶	Gas ⁷	NGL ⁸	2016 Consensus Prod. (MBoe/d) ⁹	Acct. Method		
U.S. "Traditional"																										
APA	Apache	1954	18.48	35.62	-48%	-43%	18.84	16.28	1.16	3.42	-7.15	Baa1	BBB	17646	127	413	1.84	2.48	1.50	0.49	0.40	0.11	523.00	Full Cost		
APC	Anadarko	1959	23.53	31.89	-26%	-41%	46.41	33.60	1.38	1.23	4.88	Baa2	BBB	21785	163	852	1.15	1.95	1.04	0.35	0.49	0.16	764.00	Successful Efforts		
DVN	Devon Energy	1971	11.68	34.20	-66%	-57%	29.53	22.48	1.31	1.86	1.78	Baa1	BBB	18228	151	587	1.54	1.10	1.38	0.38	0.42	0.20	667.00	Full Cost		
EOG	EOG Resources	1999	40.86	25.35	61%	-10%	26.98	14.03	1.92	0.51	9.87	A3	BBB+	19169	132	462	1.71	1.64	1.56	0.48	0.39	0.13	568.00	Successful Efforts		
HES	Hess Corporation	1919	16.42	20.67	-21%	-36%	34.20	13.79	2.48	0.34	16.64	Baa2	BBB-	10738	101	214	2.84	2.85	2.70	0.67	0.27	0.06	329.00	Successful Efforts		
MRO	Marathon Oil	1887	6.97	15.16	-54%	-71%	32.31	13.76	2.35	0.39	14.97	Baa1	BBB-	12191	109	285	2.29	2.96	2.03	0.56	0.33	0.11	408.00	Successful Efforts		
MUR	Murphy Oil	1950	4.15	10.69	-61%	-62%	11.49	6.17	1.86	0.57	6.21	Baa3	BBB-	6374	51	156	1.94	2.04	2.13	0.66	0.32	0.02	185.00	Successful Efforts		
NBL	Noble Energy	1932	13.87	12.81	8%	-51%	24.20	13.83	1.75	0.77	4.73	Baa3	BBB	11120	57	433	0.79	1.04	0.89	0.34	0.53	0.13	395.00	Successful Efforts		
OXY	Occidental Petroleum	1986	52.33	64.72	-19%	-24%	43.44	19.09	2.28	0.34	25.96	A2	A	22075	181	357	3.04	3.24	2.45	0.60	0.29	0.11	640.00	Successful Efforts		
U.S. "Small Cap"																										
PXD	Pioneer	1997	22.73	5.83	290%	-21%	15.15	6.79	2.23	0.44	2.30	Baa3	BBB-	6639	52	131	2.38	1.10	2.33	0.49	0.30	0.21	232.00	Successful Efforts		
CXO	Concho Resources	2006	13.40	4.07	230%	0%	12.64	5.70	2.22	0.48	2.35	Ba2	BB+	4498	34	107	1.91	1.81	3.76	0.68	0.21	0.11	145.00	Successful Efforts		
EQT	EQT Corporation	1888	9.85	5.86	68%	-27%	13.98	8.90	1.57	0.61	2.98	Baa3	BBB	7730	9	547	0.10	0.10	0.12	0.01	0.89	0.10	342.00	Successful Efforts		
COG	Cabot Oil and Gas	1989	9.10	4.79	90%	-42%	5.26	3.25	1.62	1.01	1.55	N/A	N/A	5446	20	541	0.22	0.04	0.05	0.05	0.95	0.00	283.00	Successful Efforts		
XEC	Cimarex Energy	2002	9.07	4.61	97%	-5%	5.24	2.45	1.14	0.53	0.03	Baa3	BBB-	5171	32	169	1.13	1.03	1.13	0.33	0.47	0.20	171.00	Full Cost		
CLR	Continental Resources	1967	10.83	7.85	38%	-46%	14.92	10.25	1.46	1.52	3.32	Baa3	BB+	7302	53	164	1.94	2.39	4.00	0.68	0.20	0.12	201.00	Successful Efforts		
AR	Antero Resources	2002	6.84	n/a	n/a	-60%	14.16	8.22	1.72	0.79	1.81	Ba3	BB	5459	18	439	0.24	0.16	0.18	0.03	0.85	0.12	299.00	Successful Efforts		
U.S. "Micro Cap"																										
RRC	Range Resources	1976	5.21	8.32	-37%	-65%	6.90	4.14	1.67	0.96	0.32	Ba3	BB+	4627	24	363	0.07	0.48	0.45	0.05	0.69	0.26	245.00	Successful Efforts		
FAANG	Diamondback Energy	2007	5.53	n/a	n/a	19%	2.76	0.88	3.13	0.26	-0.35	B2	B+	1434	11	8	1.38	7.43	8.09	0.76	0.11	0.13	37.00	Full Cost		
SWN	Southwestern Energy	1930	2.88	17.58	-84%	-84%	8.11	5.83	1.39	2.07	-1.08	Baa3	BB+	9418	13	899	0.01	0.00	0.08	0.02	0.93	0.05	426.00	Full Cost		
GPOR	Gulfport Energy	1998	3.00	0.51	485%	-59%	3.33	1.30	2.57	0.46	-0.73	B2	B+	2404	189	156	1.21	0.55	0.32	0.12	0.76	0.12	122.00	Full Cost		
PE	Parsley Energy	2008	3.68	n/a	n/a	-2%	2.51	0.93	2.71	0.35	0.01	B3	n/a	945	7	10	0.70	1.21	3.76	0.57	0.21	0.22	32.00	Successful Efforts		
RSP	RSP Permian	2010	2.90	n/a	n/a	-1%	2.98	1.12	2.66	0.38	-0.02	B3	B+	864	7	5	1.40	7.60	6.69	0.73	0.13	0.14	27.00	Successful Efforts		
EGN	Energen Corporation	1979	2.68	3.40	-21%	-57%	4.61	1.72	2.69	0.27	2.05	B3	n/a	n/a	185	36	5.14	1.21						Successful Efforts		
QEP	QEP Resources	2010	2.37	n/a	n/a	-54%	8.43	4.48	1.88	0.56	3.42	B1	BB+	3388	25	181	0.14	0.01	0.82	0.34	0.55	0.11	147.00	Successful Efforts		
U.S. "Juniors"																										
PDCE	PDCE Energy, Inc.	1969	2.63	0.37	614%	12%	2.37	1.08	2.19	0.58	0.38	B2	B+	1559	10	33	0.30	1.89	1.63	0.48	0.38	0.14	57.00	Successful Efforts		
CNX	Consol Energy	1864	2.51	9.59	-74%	-71%	10.93	6.23	1.75	0.78	2.58	B3	n/a	n/a	7	287	0.02	0.14						Full Cost		
RICE	Rice Energy	2005	1.69	n/a	n/a	-44%	3.97	2.07	1.92	1.14	-0.14	B3	B	1709	0	200	0.00	0.01	0.03	0.00	0.97	0.03	110.00	Successful Efforts		
CHK	Chesapeake Energy	1989	2.83	18.22	-84%	-84%	17.36	15.22	1.14	5.02	-13.20	B3	CCC	12541	70	1070	0.07	0.41	0.39	0.18	0.72	0.10	626.00	Full Cost		
MTDR	Matador Resources	2003	1.62	n/a	n/a	1%	1.14	0.65	1.75	0.80	-0.54	B3	n/a	n/a	4	28	0.14	1.30						Full Cost		
WLL	Whiting Petroleum	1980	1.54	3.80	-59%	-84%	11.39	6.64	1.72	1.09	0.09	Caa2	B+	4973	53	41	1.29	7.36	5.67	0.79	0.15	0.06	146.00	Successful Efforts		
SM	SM Energy Company	1915	1.27	2.27	-44%	-78%	5.62	3.77	1.49	1.36	1.56	B3	BB-	4224	35	174	0.20	1.17	1.33	0.32	0.43	0.25	163.00	Successful Efforts		
OAS	Oasis Petroleum	2007	1.29	n/a	n/a	-84%	5.65	3.33	1.70	0.99	0.83	B2	B+	1599	16	14	1.14	8.36	15.67	0.89	0.06	0.05	49.00	Successful Efforts		
BCEI	Bonanza Creek Energy	1999	0.08	n/a	n/a	-96%	1.27	1.06	1.20	4.23	-0.60	B3	n/a	n/a	8	15	0.53	1.85						Successful Efforts		
Canada																										
CNQ	Canadian Natural Resources	1973	29.10	40.00	-27%	0%	45.22	24.72	1.83	0.60	17.03	Baa1	BBB+	25940	164	1511	0	2.05	2.33	0.65	0.30	0.05	835.00	IFRS		
COG.TO ¹³	Canadian Oil Sands	1964	4.82	n/a	n/a	-50%	7.12	4.32	1.65	0.60	1.15	Ba3	BBB-	2926			100.00	100.00	1.00	0.00	0.00	0.00	104.00	IFRS		
CVE	Cenovus Energy	2008	10.63	19.98	-47%	-44%	18.62	9.67	1.92	0.53	1.09	Baa2	BBB	7908	76	160	0	2.50	3.55	0.68	0.22	0.10	273.00	IFRS		
ECA	EnCana	2002	5.05	25.69	-80%	-59%	17.63	10.58	1.64	0.91	0.47	Baa2	BBB	6857	41	597	0	0.22	0.37	0.18	0.73	0.09	354.00	Full Cost		
HSE.TO	Husky Energy	1938	15.48	26.00	-40%	-53%	24.09	12.02	2.00	0.41	7.97	Baa2	BBB+	11140			2.29	2.03	0.65	0.33	0.02	331.00	IFRS			
IMO	Imperial Oil	1880	27.95	33.44	-16%	-6%	31.06	14.25	2.18	0.34	17.04	WR ¹⁴	AAA	10402			9.12	15.67	0.93	0.06	0.01	434.00	Successful Efforts			
SU	Suncor Energy	1923	41.82	57.34	-27%	-3%	55.87	27.74	2.01	0.39	12.74	Baa1	A-	21754			99.00	99.00	0.99	0.01	0.00	647.00	IFRS			
"Bankrupt" Companies																										
CRC	California Resources	2014	0.48	n/a	n/a	-83%	7.05	7.97	0.89	-6.71	-5.68	Caa3	n/a	n/a	45.00	84.00	0.54	2.88	n/a	n/a	n/a	n/a	n/a	Successful Efforts		
CRK	Comstock Resources	1919	0.04	2.01	-98%	-96%	1.20	1.37	0.87	-7.30	-0.68	Caa3	SD	797	3.00	48.00	0.06	0.25	0.59	0.35	0.63	0.02	30.00	Successful Efforts		
DNR	Denbury Resources	1990	0.80	4.09	-81%	-86%	5.92	4.67	1.27	2.65	-1.06	Caa2	B	2367	25.00	8.00	3.13	18.46	19.00	0.95	0.05	0.00	68.00	Full Cost		
HK	Halcon Resources	2004	0.03	0.03	-23%	-94%	4.25	3.78	1.13	6.58	-2.81	Caa3	n/a	n/a	13.00	10.00	1.30	9.46	n/a	n/a	n/a	n/a	n/a	Full Cost		
XCO	EXCO Resources	1955	0.30	2.1	-94%	-80%	2.99	4.69	0.64	-2.14	-6.99	Caa3	SD	1095	2.00	110.00	0.02	0.12	0.11	0.09	0.90	0.01	50.00	Full Cost		
SDOC	Sandridge Energy	1984	0.07	0.71	-97%	-98%	0.95	1.62	0.59	-2.07	-4.18	Caa3	SD	1686	45.00	90.00	0.48	1.03	1.00	0.35	0.50	0.15	73.00	Full Cost		

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