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Analyzing the Market Cap Responsiveness to Capital Discipline Policies for Us Oil and Gas Producers

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Analyzing the Market Cap responsiveness to Capital Discipline policies for US Oil and Gas Producers

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ABSTRACT

In this paper, the effect of specific capital discipline policies, capital structure and capital expenditures, is measured. Financial data from 2014 to 2022 are used to measure the impact of capital discipline policies on market cap. Capital structure measured through the debt-to-equity ratio and capital expenditures were both regressed against market cap to determine correlation. The regressions were sorted according to correlation strength and then grouped based off certain firm characteristics: Market cap, Resource produced, Geographical diversity, and level of integration. The results show little to no relationship between the studied characteristics and the level of market responsiveness to the studied capital discipline policies.

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Introduction

In the 21st century energy can be considered a basic need of people on par with food, water and shelter. Energy heats our homes and places of work, energy powers our technology from consumer electronics like iPhones and laptops to complex communal systems like the water distribution system, and large scale public transportation. As of the beginning of 2022 the United States relies on Oil and Natural Gas for 70% of its energy needs. The renewables sector and other green energy sectors (nuclear, biofuels) have been steadily increasing, but they still only make up about 19% of United States energy usage. Assuming a 2% growth rate in demand there are still enough proven Oil and Natural gas reserves in the US alone to last us another 80 years with more unproven reserves predicted to last up to 170-190 years. The ready abundance and current reliance on fossil fuels combined with the lobbying power of traditional energy companies means Oil and Natural Gas will be relevant in the United States and more than likely the world for years to come.

From a financial perspective the energy sector of the S&P 500 has been the best performing sector in the whole S&P year to date 2022, and on top of that the only sector that has a positive return for the year as a whole. Specifically, E&P, exploration and production, the upstream part of

the fossil fuel supply chain, has been a large driver of these positive returns with a YTD return of 51%.

This paper will be Analyzing the effect of firm characteristics on their responsiveness to Capital Discipline policies specifically in U.S E&P Energy companies. For years on earnings quarterly earnings calls Energy companies some strictly E&P and some integrated (involved in other areas of the energy supply chain) have been emphasizing their use of 'Capital Discipline Policies'. This is really a broad term that refers to some specific actions that firms take to 'satisfy' these policies. The three primary actions are: (1) Paying down debt (2) Countercyclical capital expenditure (3) Aggressive/growing dividend policy. This paper will be focused on analyzing the first two capital discipline policies mentioned (Debt repayment, and Capital Expenditure) leaving the last (dividend policy) for future research due to constraints and limitations to be discussed.

Literature Review

When testing Market cap as the dependent variable it is important to consider as many contributing factors to the market cap as possible. The purpose of my paper is to test the effect that different capital discipline policies have on the performance of US Energy E&P equities. Prior to this study there were other researchers that helped to fill in the gaps surrounding the varying factors that could possibly affect market cap.

Indonesian palm oil study

The most directly relevant paper was an analysis of the effect of Capital structure, firm growth, and dividend policy on the profitability and firm value of Indonesian Palm Oil companies. Similarly to the question presented in this paper the palm oil study focused on capital discipline policies such as dividend policy and capital structure(Paminto, Setyadi, Sinaga 2016).

They used a smaller sample of the larger Indonesian Palm oil industry with a five company sample of the 13 available publicly traded Indonesian Companies. Palm oil is dissimilar from traditional crude oil and natural gas in that its primary use is for retail and industrial cooking as opposed to energy and transportation. Different from the traditional natural fuels extracted by E&P companies, palm oil comes from palm trees through a completely different extraction process. The fundamental actions of the companies, however, are similar though in that they have to put up large capital investments to develop the sites of production which represent significant liabilities and investments until they start returning oil that then needs to be refined and transported to the end user.

This study used the debt to equity ratio to measure capital structure, and return on equity to measure equity performance over a period. The researchers found that there was a strong negative linear relationship between capital structure and equity performance. The researchers stipulated that the more leveraged companies had less healthy appearing balance sheets leading to worse balance sheet ratios and lower trade volume/demand.

The research also concluded that there was a positive linear relationship between 'positive' dividend policy which refers to an increasing dividend, and Return on Equity. This is a much more easily explainable phenomenon where declaring an increasing dividend provides investors with a stable cash flow that is viewed favorably and reflects positively on equity price and hence market cap in secondary equity markets.

Dividend Policy

The effect of dividend policy on different dependent variables is a popular research topic that has been tested out in different industries and using different time periods. Unfortunately

specifically US energy has not received much attention, but Black, Scholes' research on the effect of dividend policy and yield on common stock prices and returns is a cornerstone paper that can be used as a more than serviceable substitute (Black, Scholes 1973).

Black, Scholes' premise is based on the fundamental idea that investors tend to prefer stocks with dividends because of the general human behavior summed up in the old adage that "a bird in the hand is better than two in the bush" meaning that the potential for future growth in overall intrinsic value can be outweighed by the guarantee of consistent short term cash flows in the form of dividends. Black and Scholes also made the important note of considering the tax implications (from 1974) of a dividend payment versus a capital gain to be thorough in the financial implications of dividend yielding vs not dividend yielding equities. Their models and calculations are adjusted for this.

The researchers here also made an important distinction of choosing a different structural hypothesis from their predecessors. Most papers prior to this one tested the statement: Increasing the dividend will increase the price of the company's shares. The Black Scholes paper tested the counter statement which was: increasing the dividend will reduce the expected return on a companies share, with the goal of rejecting the hypothesis if the empirical data supported it. This testing of the counter statement makes an assumption that dividend yield is linearly related to the expected return. This addition allowed for a modification to the capital asset pricing model equation so that it could include both expected dividend yield and dividend yield of the market.

The empirical results found that there is no statistical difference between the return of equities that have high dividend yields to the return of equities with low dividend yields. This result leads to a larger conclusion for portfolio managers: focusing on dividend payouts tends not

to increase overall gains. In addition the act of focusing on dividends tends to be a poor move for managers because of the industry bias placed on payouts. Some industries have a larger portion of their companies pay a disproportionately high dividend as opposed to other industries, so focusing on dividends could lead to an under diversified portfolio which poses its own separate risks.

The Black Scholes paper combined with another reason that will be explained later on is the reason why dividend policy was not one of the primary capital discipline policies that was looked at relating to market capitalization.

Capital Structure

The next aspect of capital discipline to discuss is capital structure over time. The researchers (Graham, Leary, Roberts 2013) postulate that corporate America has, with a great deal of consistency been, increasing their propensity to use leverage as a tool to meet fiscal goals and secure funding for projects. This paper is able to give a comprehensive view of corporate America due to its large sample size. The researchers used all firms listed on the New York Stock Exchange (NYSE) since 1925, all firms listed on the American Stock Exchange (Amex) since 1962, and all firms listed on the Nasdaq since 1972. The key exclusion from this data set is any firm in the financial sector, due to at different points in time different sub sectors of the financial industry have had capital requirements as well as regulation imposed that limited their use of leverage for operating activities. The authors state that financial firms would contaminate the data not giving a full scope of management decision in corporate America.

The researchers used Total debt to Total Capital as a metric for measuring capital structure which was the inspiration for this paper to use Debt to Equity as the measurement

metric for the same thing. The researchers further segmented their data into regulated vs. unregulated. The regulated industries included utilities, railroads, and telecommunications, but the main focus of the paper was the unregulated firms because their managers were more free to make their own capital structure decisions, and therefore more accurately represented the true sentiments of corporate America.

The researchers used a long term aggregate trend analysis to draw conclusions from their expansive data set. For the unregulated firms from 1920 to 1945, leverage among unregulated was fairly stable and relatively low, with total debt-to capital falling from 17% to 11% during this quarter century. From 1946 to 1970, leverage increased steadily and significantly, more than tripling, from approximately 11% in 1945 to almost 35% in 1970. Since 1970, leverage has remained fairly stable, but for an increase during the 1980s that gradually reversed over the next two decades.

Next the researchers attempted to identify the cause for this apparent shift in corporate use of leverage. The first theory tested was that it was due to certain firm characteristics. The characteristics they chose to focus on were: profitability, asset tangibility, market to book, and earnings volatility using a trend analysis.

From a profitability standpoint it was concluded that thought there was some correlation specifically following WW2 which held a steady decline in profitability, but this was small and insignificant compared ott he fac that profitability at the beginning of the period was nearly identical to it at the end while leverage trended upwards. Even though there were large fluctuations in asset tangibility it does generally deplete over time, however there is little theoretical evidence that supports this relationship. Specifically (Frank and Goyal 2009) which

suggests that decreasing asset tangibility would lead to less leverage due to there being less collateral to secure debt obligations.

Market to book ratio flatly shows almost no relationship at any period of time with leverage as it remains mostly flat contrary to the excessive movement of capital structure. Lastly, earnings volatility declined between 1950 and 1970, the period over which the bulk of the leverage increase occurred. However, it has increased somewhat since then, and dramatically so for Amex and Nasdaq firms. Overall analysis of firm characteristics did not yield a meaningful relationship to explain the increase in corporate leverage.

Next the authors chose to examine the effect of macroeconomic facts to see if a substantive relationship could be determined. The macro economic environment factors they chose to test were: taxes, distress costs, information and agency frictions, and supply of competing securities.

First in the case of taxes, rates were relatively low at the start of the sample period, staying below 15% from 1920 until the late 1930s. However by the middle of the 1950's the corporate income tax rate exceeded 50%. Tax rates remained near 50% until the middle of the 1980s, and have been steady near 35% since. The plot suggests a positive relation between corporate tax rates and leverage, particularly in the mid-20th century, through the net tax incentive. Other authors doing similar studies albeit with smaller sample sizes also picked up on this relationship and even went as far as to describe it as causal (Hickman 1953), (Sametz 1964). Next graphed beside the corporate leverage trend is the average of within firms' standard deviation of return on assets which is used as the metric for measuring supposed financial distress costs. After the initial increase the level stays relatively stable showing little correlation.

The next factor measured is the Financial sector output which measures the informational friction in place at the time. The graph shows that corporate leverage and the movement of financial sector output followed largely similar patterns until more recently where the financial sector out put leveled off slightly possibly due to the ‘08 recession. Lastly measured was the effect of competing securities. The competing securities would primarily be US government debt so US government leverage would be an accurate metric to measure competing securities. There was a dramatic increase in public debt around the late 1940’s due to the start of WW2 this steadily fell until 1972 when there started an increase in public sector leverage that lasted until the mid 90’s. During this expansion of public debt there was a negative relationship to corporate leverage, this is very clearly evidenced in the 2008 crisis where public debt once again increased leading to a dip in corporate leverage.

This general trend of increasing capital structure, and the reasoning for it could be used to explain the changes in capital structure in the U.S E&P Energy industry due to the increase in public debt recovering from the ‘08 recession, as well as economic recovery front he Covid-19 pandemic.

Commodity Prices

When considering the income statement and balance sheet of an Oil or Natural gas company secondary to the company operations and assets the next most important variable is the price of the commodity they choose to deal in. The supply and demand forces that create a market for these commodities are integral in determining and forecasting the potential value of a firm.

The study performed by addresses this particular factor very well. The relevant hypotheses they are trying to test are: (1) observing the asymmetric change of oil price change on Oil company beta (2) asymmetric effects of oil prices on trading volumes (3) A higher percentage change in daily oil price is likely to have a greater effect on stock returns, risks, return volatility, and trading volumes than a lower percentage change in daily price (Mohanty, Akhigbe, Al-Khyal, Bugshan 2012).

In its data collection this study importantly considers that the oil industry as a whole is too large and widely diversified to be studied as a whole so it is broken down into 4 sub sectors. The sample is 18 Exploration and Production firms , 10 integrated Oil and Gas firms, 17 Oil equipment and services firms, and 4 pipeline firms. The oil price used is the monthly return of West Texas Intermediate (WTI) expressed in U.S dollars per barrel. The WTI was chosen over other oil price indexes for several reasons; mainly it is the most widely used price benchmark in North America and many of the sample companies are North American based, secondly the vast majority of sample and population firms use hedging instruments in the form of futures, forwards, and other over the counter derivatives with the underlying being the WTI price benchmark.

Using previous methodologies the researchers identified ‘events’ which were defined as changes in the WTI benchmark price by more than 5% in either direction. The researchers also use a past study (Jegadeesh and Titman ‘93) to account for control variables and isolate the effect of the change in oil price on returns. At the firm-level, it was reported that 4,359 observations of decreases in oil price (number of events attributed to negative change in oil prices) and 3,290 observations of increases in oil prices (number of events attributed to positive change in oil prices).

A number of general conclusions can be drawn from the results presented above. First, oil and gas firm returns are positively associated with oil price changes. Second, the effects of oil price changes on returns for oil and gas firms and risk exposures of oil and gas companies to oil price changes are asymmetric. For example, returns and risks (market beta and return variance) are influenced significantly by oil price decreases. The results also show that investors more opposed to risk, understandably, tend to place a higher weight on losses than on gains.

The last study to discuss is a Canadian research paper that discusses the 'Common and fundamental factors in stock returns of Canadian Oil and Gas companies'. The fundamental factors discussed are: (1) Interest Rates (2) Canadian Exchange rate to the US (3) Market Return (4) Oil prices (5) Natural Gas prices. The researchers (Boyer and Filion 2004) also analyze the different price environments and operational activities effect on valuation models with the purpose of identifying structural changes associated with significant shifts in oil and natural gas prices. Next the researcher's goal is to determine whether the results hold true regardless of resource produced (oil/natural gas) or level of integration (involved in midstream/downstream activities)

The sample used was 105 oil and gas companies 99 of which were pure play producers meaning they produced only one resource, but 6 were included that were multi resource. The researchers then obtained the relevant data from bloomberg to calculate returns adjusted for the common factors described above. The researchers immediately noted that there is a strong positive correlation between the price of natural gas and crude oil which makes sense when looking at the macro-economic theory of energy. There was also a distinct negative correlation between the commodity prices and the foreign exchange rate with the US dollar. That relationship was discussed and analyzed in a prior paper by Lafrance and Van Norden in 1995

who argue that an increase of energy prices in Canada leads to a real depreciation of the Canadian dollar.

The data showed that oil prices had a greater impact on stock return relative to natural gas prices, the researchers theorized that production of crude oil is on average greater than the production of natural gas, crude oil prices should have a more important impact on the revenues and the profits of Canadian energy firms (and on their stock price) than natural gas prices. Relating to FX rates beta (βer) is negative and close to one in absolute terms. This means that a depreciation of the Canadian dollar against the U.S. dollar leads, on average, to negative returns for Canadian oil and gas stocks.

With sole producers (E&P) vs integrated firms (involved in mid and downstream activities) there are two primary factors that can be used to explain the returns in producers which are interest rate and exchange rate, not so much a factor as for integrated companies. The data also shows that integrated firms tend to be more responsive to changes in commodity prices, but producers tend to be much more significantly impacted if not as consistently.

With Oil vs Gas the distinction is made by which resource accounts for the majority of the revenue, in this case either oil or gas representing more than 60% of the operating activities. It is apparent from the data that stock return variation tends to be larger in oil companies as opposed to gas companies; a possible explanation being the price effect of oil is greater than the volume effect of gas.

II. Hypotheses

There are eight hypotheses being tested for this study relating to firm characteristics affecting the responsiveness of firms to Capital Discipline Policies using market cap as the response variable. The hypothesis can be stated in their alternative forms as shown

Firm size:

$H_{1:}$ Larger market cap firms will have a stronger relationship between capital structure and market cap

$H_{2:}$ Larger market cap firms will have a stronger relationship between capital expenditures and market cap

The firm size hypotheses comes from the Indonesian Palm oil study where the researchers attempted to find the relationship between capital structure and firm value/growth. They specified in the paper that one of the shortcomings of the industry and therefore the paper was the small sample size and that they would have liked to see if different firm characteristics such as market cap had any bearing on the strength of the relationship

Resources Produced:

H_{3}: More operationally diverse firms (Oil and Natural Gas) will have a stronger relationship between capital structure and market cap

H_4: More operationally diverse firms (Oil and Natural Gas) will have a stronger relationship between capital expenditures and market cap

The resources produced hypothesis comes from the Canadian oil and gas equity study where the researchers looked at fundamental factors affecting oil and gas companies and then further dissected the question by seeing if the type of resource they produced had a bearing on the result.

Geographic Diversity

H_5: More geographically diverse firms (multinational) will have a stronger relationship between capital structure and market cap.

H_6: More geographically diverse firms (multinational) will have a stronger relationship between capital expenditures and market cap.

The geographical diversity hypotheses comes from the Indonesian Palm oil study where the researchers attempted to find the relationship between capital structure and firm value/growth. They specified in the paper that one of the shortcomings of the industry and therefore the paper was the small sample size and that they would have liked to see if different firm characteristics such as being multinational had any bearing on the strength of the relationship

Mid and Down stream assets

H_7: Firms that are more operationally diverse (Integrated), and involved in either mid or down stream or both will have a stronger relationship between capital structure and market cap.

H_8: Firms that are more operationally diverse (Integrated), and involved in either mid or down stream or both will have a stronger relationship between capital expenditures and market cap.

The Integration hypotheses also comes from the Canadian oil and gas equity study where the researchers looked at fundamental factors affecting oil and gas companies and then further dissected the question by seeing if the company being integrated further on the energy chain had a bearing on the result.

III. Data and Methodology

The data and methodology for this study are described below.

Data

When looking at the U.S E&P Oil and Natural Gas companies there were simply too many to look at the entire population, so a sample had to be picked. The sample used in this study is the S&P United States Exploration and Production index. This particular index was chosen for its comprehensive coverage of the whole sector, and accurate representation of the population. There are 60 companies in the index broken down as follows: 22 small caps, 20 mid caps, 16 large caps, and 2 mega caps. It can be assumed that this is a good representation of the population because of the mean market cap approximated at $2,904,036,000 compared to the population approximated mean market cap of $2,816,641,000.

For each of the 60 firms within the index 4 metrics were measured quarterly going back 8 years for 32 observations per firm pursuant to data collected in the Canadian Oil and Gas company study (Boyer and Filion, 2004). The 4 metrics collected: Debt to Equity Ratio, Capital Expenditures (expressed as an expense), Dividend per share, and Market Cap (Period Average).

Debt to Equity ratio will be used as a measure for capital structure following the Indonesian Palm Oil study who used the same metric also measuring capital structure (Paminto Setyadi Sinaga, 2016). Capital Expenditures will be used as a measure for capital expenditures, but when data was originally obtained it was expressed as an expense (negative) so for consistency the absolute value of Capital Expenditures was taken. Dividend per share was taken as a measure for dividend policy, but upon further examination about half of the companies had no dividend at all so the dividend payment capital discipline policy was removed from the objectives of this paper. Lastly market cap is used as the responsive variable to which the others will be measured against to test firm responsiveness.

All the data was examined to check for consistency and reasonability immediately two companies stood out plainly for not having a reported debt to equity ratio so they were removed from the capital structure section of the study.

The firm characteristics chosen to possibly have an effect on responsiveness of market cap to capital discipline policies are as follows: Firm Size (Market Cap), Resource Produced (Oil/Natural Gas), Geographically diversity (Multinational), and Mid and Downstream assets (Integrated).

The market cap segmentation was done by taking whichever grouping more observations fit in from the first data set for each firm. The rest were determined by manually looking up each of the companies investor relations pages and looking at asset maps or operations listings. An important note for determining integration is the ownership of MLPs or Master Limited Partnerships. Many companies have a sister firm set up as an MLP to run midstream assets, this is primarily the case to take advantage of tax benefits associated with MLPs. In order for a

company to be considered integrated in the midstream it was required to own at least 50% of a midstream MLP and record the partnerships revenue as its own for at least half the observations.

Methodology

The first step in the analysis is to conduct a regression analysis between the prescribed variables. Using the Microsoft Excel regression analysis tool 2 groups of regression were run. Capital Structure (Debt to Equity) vs Market Cap this was done with 58 of the 60 companies in the index 2 had to be eliminated due to lack of significant portions of data. The next was Capital Expenditures vs Market Cap this was done with all 60 of the sample companies. From the regression summary output the Multiple R statistic that represents the strength of correlation between the two variables was used as the regression statistic. Next all the Multiple R statistics were grouped into categories representing correlation strengths: Weak: (0.0-0.4), Medium: [0.4-0.6], Strong: (0.6-1.0).

Next the data was organized in a table organized as follows (by column). (1) sample company ticker symbol, (2) Multiple R regression statistic, (3) Correlation Strength, (4) Market Cap, (5) Resource Produced, (6) Geographical Diversity, (7) Integration Level (Tables 1&2).

The next step was to analyze the data in the table to find relationships between the strength of correlation and the different firm characteristics chosen. Using the Excel Pivot table function smaller analytical tables were constructed from the larger table.

For each of the following pivot tables, note that they were done twice for both capital structure and capital expenditure, and each was expressed three times as: a count, % of grand total, and an average of the populators(Fig.2). The first set of tables had rows: weak, medium, strong measuring correlation strength and columns: small, mid, large, and mega measuring market cap. The second set of tables had rows: weak, medium, strong measuring correlation strength and columns: Oil, Natural Gas, Oil and Natural Gas to account for the resource produced. The third set of tables had rows: weak, medium, strong measuring correlation strength and columns: US exclusive, multinational to account for geographic diversity. The last set of tables had rows: weak, medium, strong measuring correlation strength and columns: Integrated, Not Integrated to account for level of integration.

IV. Empirical Results

This section will finalize and describe a relationship between the correlations and firm characteristics described above. This section will also address the hypotheses detailed in the named section to determine their validity. With regards to all of the firm characteristics studied it seems that there is no relationship between those characteristics and the strength of the correlation between the capital discipline policy and market cap.

Regarding the firm characteristic of market cap it can be seen in tables 1, 2, and 3 that there is no significant difference between the population of those firms in small, mid, large and mega in relation to the correlation strength. The expected outcome would have been a greater grouping of firms in the strong-Large/Mega and a similar skew in the other direction with weak-small/mid. No such groupings appear meaning that market cap cannot be used as an explanatory variable.

In the case of resource produced it can be concluded that there is again no relationship between this firm characteristic and market responsiveness to capital discipline policies. This is evidenced by examining tables 4,5,6 which show an even distribution of the largest of the firm characteristic categories, both oil and natural gas, showing that a company producing both one or the other of those resources is essentially irrelevant in this case.

The next firm characteristic examined is geographical diversification which can be observed in tables 7,8,9. The expected outcome would again have been a higher concentration of sample firms in multinational-strong relative to multinational weak, and a higher concentration in US exclusive weak relative to US exclusive strong, but there is a pretty even distribution which once again lends to the conclusion of no significance of this variable.

The last firm characteristic examined is level of integration whose corresponding tables are 10,11,12. The hypothesized outcome would have been a great concentration in strong-integrated relative to medium/weak integrated and a higher concentration in weak-not integrated relative to strong-not integrated, unfortunately there is once again a largely even distribution suggesting no relationship between this firm characteristic and the strength of correlation between capital discipline policies and market cap.

IV. Conclusion

This paper presents the relationship between specified firm characteristics and their effect on the strength of correlation between capital discipline policies and market cap. Using the SPSIOP, the S&P's U.S upstream energy production index, this paper expands the current body

of knowledge ruling out the examined characteristics as explanatory variables for this relationship.

One of the primary limitations of this study was the sample size relating to the last capital discipline policy not studied here: dividend policy. Due to a significant portion of the sample size not declaring a dividend this led to the exclusion of dividend policy as one of the studied capital discipline components. Another limitation this study suffered from was the exclusion of event based research. This would require a change in the analysis methodology where the researcher would identify specific time periods of capital discipline usage through quantitative or qualitative methods and compare accordingly.

As for future research the recommended path would be implementing the sample and methodology changes described above as well as the inclusion of new firm characteristics. From the firm specific research conducted in this study an interesting unexplored characteristic could be the ‘reserve success rate’ of firms. This metric measures the success rate of firms when moving classification of reserves from unproven to proven (meaning a material amount of proven resource). A future study incorporating these described features would be very impactful to the body of knowledge in this space.

Appendix:

Company Ticker	Debt to Equity vs Market	Market Cap	Resources Produced	US Exclusive or Multi National	Mid and Down Stream Integration	Correlation Strength
ESTE UN Equity	0.5241	Small	Oil and Natural Gas	Exclusive	Not integrated	medium
OXY UN Equity	0.8159	Large	Oil and Natural Gas	Multinational	Integrated	strong
CVX UN Equity	0.3804	Mega	Oil and Natural Gas	Multinational	Integrated	weak
COP UN Equity	0.5898	Large	Oil and Natural Gas	Multinational	Not integrated	medium
XOM UN Equity	0.8344	Mega	Oil and Natural Gas	Multinational	Not integrated	strong
PXD UN Equity	0.0002	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
CRGY UN Equity	0.7804	Mid	Oil and Natural Gas	Exclusive	Integrated	strong
VLO UN Equity	0.2189	Large	Oil and Natural Gas	Multinational	Integrated	weak
TELL UA Equity	0.7293	Small	Natural Gas	Exclusive	Integrated	strong
CLNE UW Equity	0.3833	Small	Natural Gas	Exclusive	Not integrated	weak
MGY UN Equity	0.1556	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
CNX UN Equity	0.0945	Mid	Natural Gas	Exclusive	Integrated	weak
SWN UN Equity	0.7314	Mid	Natural Gas	Exclusive	Integrated	strong
CLR UN Equity	0.1120	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
DVN UN Equity	0.3204	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
HES UN Equity	0.1586	Large	Oil and Natural Gas	Multinational	Integrated	weak
CPE UN Equity	0.1377	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
INT UN Equity	0.0273	Small	Oil and Natural Gas	Multinational	Integrated	weak
GPRE UW Equity	0.0184	Small	Oil and Natural Gas	Multinational	Integrated	weak
MRO UN Equity	0.6192	Large	Oil and Natural Gas	Exclusive	Integrated	strong
BRY UW Equity	0.3528	Small	Oil	Exclusive	Not integrated	weak
DEN UN Equity	0.7887	Mid	Oil and Natural Gas	Exclusive	Integrated	strong
GEVO UR Equity	0.3994	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
CTRA UN Equity	0.3406	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
PDCE UW Equity	0.5617	Mid	Oil and Natural Gas	Exclusive	Not integrated	medium
MTDR UN Equity	0.1453	Mid	Oil and Natural Gas	Exclusive	Integrated	weak
KOS UN Equity	0.6406	Mid	Oil and Natural Gas	Multinational	Integrated	strong
NOG UN Equity	0.5546	Small	Oil and Natural Gas	Exclusive	Not integrated	medium
PSX UN Equity	0.6641	Large	Oil and Natural Gas	Exclusive	Integrated	strong
REX UN Equity	0.5531	Small	Oil and Natural Gas	Exclusive	Not integrated	medium
TPL UN Equity	0.6123	Mid	Oil and Natural Gas	Exclusive	Not integrated	strong
SBOW UN Equity	0.4566	Small	Oil	Exclusive	Not integrated	medium
PR UN Equity	0.9022	Small	Oil and Natural Gas	Exclusive	Not integrated	strong
CRC UN Equity	0.5971	Mid	Oil and Natural Gas	Exclusive	Not integrated	medium
APA UW Equity	0.5538	Large	Oil and Natural Gas	Multinational	Integrated	medium
DK UN Equity	0.5604	Small	Oil	Exclusive	Integrated	medium
EOG UN Equity	0.0483	Large	Oil and Natural Gas	Multinational	Not integrated	weak
CHRD UW Equity	0.5310	Mid	Oil and Natural Gas	Multinational	Not integrated	medium
EQT UN Equity	0.4135	Large	Natural Gas	Exclusive	Not integrated	medium
ROCC UW Equity	0.2859	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
MPC UN Equity	0.1044	Large	Oil and Natural Gas	Exclusive	Integrated	weak
RRC UN Equity	0.2577	Mid	Natural Gas	Exclusive	Not integrated	weak
AR UN Equity	0.0062	Mid	Oil and Natural Gas	Exclusive	Integrated	weak
VTNR UR Equity	0.1084	Small	Oil	Exclusive	Not integrated	weak
LPI UN Equity	0.4653	Small	Oil and Natural Gas	Exclusive	Integrated	medium
TALO UN Equity	0.0195	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
DINO UN Equity	0.4479	Mid	Oil and Natural Gas	Exclusive	Integrated	medium
CRK UN Equity	0.5109	Small	Oil and Natural Gas	Exclusive	Not integrated	medium
SM UN Equity	0.2380	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
CVI UN Equity	0.5724	Mid	Oil and Natural Gas	Exclusive	Not integrated	medium
PBF UN Equity	0.6756	Mid	Oil and Natural Gas	Exclusive	Integrated	strong
PARR UN Equity	0.0085	Small	Oil and Natural Gas	Exclusive	Integrated	weak
MUR UN Equity	0.6689	Mid	Oil and Natural Gas	Multinational	Integrated	strong
OVV UN Equity	0.4498	Large	Oil and Natural Gas	Multinational	Not integrated	medium
FANG UW Equity	0.2591	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
CIVI UN Equity	0.1946	Mid	Oil	Exclusive	Not integrated	weak
WTI UN Equity	0.7327	Small	Oil and Natural Gas	Exclusive	Not integrated	strong
MNRL UN Equity	0.8283	Small	Oil and Natural Gas	Exclusive	Not integrated	strong

Table 1: Organized regressions (Capital Structure) and firm characteristics

Company Name	Capital Expenditures vs Market Cap	Market Cap	Resources Produced	US Exclusive or Multi National	Mid Stream Assets	Correlation strength
APA UW Equity	0.740687155	Large	Oil and Natural Gas	Multinational	Integrated	strong
AR UN Equity	0.704591367	Mid	Oil and Natural Gas	Exclusive	Integrated	strong
BRY UW Equity	0.343214102	Small	Oil	Exclusive	Not integrated	weak
CHRD UW Equity	0.63613894	Mid	Oil and Natural Gas	Multinational	Not integrated	strong
CIVI UN Equity	0.745309963	Mid	Oil	Exclusive	Not integrated	strong
CLNE UW Equity	0.19080726	Small	Natural Gas	Exclusive	Not integrated	weak
CLR UN Equity	0.224042339	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
CNX UN Equity	0.310347978	Mid	Natural Gas	Exclusive	Integrated	weak
COP UN Equity	0.707828438	Large	Oil and Natural Gas	Multinational	Not integrated	strong
CPE UN Equity	0.336557271	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
CRC UN Equity	0.783099379	Mid	Oil and Natural Gas	Exclusive	Not integrated	strong
CRGY UN Equity	0.799044549	Mid	Oil and Natural Gas	Exclusive	Integrated	strong
CRK UN Equity	0.877605885	Small	Oil and Natural Gas	Exclusive	Not integrated	strong
CTRA UN Equity	0.552156568	Large	Oil and Natural Gas	Exclusive	Not integrated	medium
CVI UN Equity	0.111304984	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
CVX UN Equity	0.05382792	Mega	Oil and Natural Gas	Multinational	Integrated	weak
DEN UN Equity	0.74342189	Mid	Oil and Natural Gas	Exclusive	Integrated	strong
DINO UN Equity	0.100913275	Mid	Oil and Natural Gas	Exclusive	Integrated	weak
DK UN Equity	0.461042399	Small	Oil	Exclusive	Integrated	medium
DVN UN Equity	0.311532325	Large	Oil and Natural Gas	Exclusive	Not integrated	weak
EOG UN Equity	0.398027398	Large	Oil and Natural Gas	Multinational	Not integrated	weak
EQT UN Equity	0.447163113	Large	Natural Gas	Exclusive	Not integrated	medium
ESTE UN Equity	0.794725617	Small	Oil and Natural Gas	Exclusive	Not integrated	strong
FANG UW Equity	0.52834672	Large	Oil and Natural Gas	Exclusive	Not integrated	medium
GEVO UR Equity	0.628526263	Small	Oil and Natural Gas	Exclusive	Not integrated	strong
GPOR UN Equity	0.74617224	Small	Natural Gas	Exclusive	Not integrated	strong
GPRE UW Equity	0.452258684	Small	Oil and Natural Gas	Multinational	Integrated	medium
HES UN Equity	0.202216794	Large	Oil and Natural Gas	Multinational	Integrated	weak
INT UN Equity	0.304071956	Small	Oil and Natural Gas	Multinational	Integrated	weak
KOS UN Equity	0.15636071	Mid	Oil and Natural Gas	Multinational	Integrated	weak
LFG UN Equity	0.043117948	Small	Natural Gas	Exclusive	Not integrated	weak
LPI UN Equity	0.444618892	Small	Oil and Natural Gas	Exclusive	Integrated	medium
MGY UN Equity	0.287597651	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
MNRL UN Equity	0.228345011	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
MPC UN Equity	0.186346776	Large	Oil and Natural Gas	Exclusive	Integrated	weak
MRO UN Equity	0.641002258	Large	Oil and Natural Gas	Exclusive	Integrated	strong
MTDR UN Equity	0.350121261	Mid	Oil and Natural Gas	Exclusive	Integrated	weak
MUR UN Equity	0.461721214	Mid	Oil and Natural Gas	Multinational	Integrated	medium
NOG UN Equity	0.647942498	Small	Oil and Natural Gas	Exclusive	Not integrated	strong
OVV UN Equity	0.221050393	Large	Oil and Natural Gas	Multinational	Not integrated	weak
OXY UN Equity	0.527650297	Large	Oil and Natural Gas	Multinational	Integrated	medium
PARR UN Equity	0.104232699	Small	Oil and Natural Gas	Exclusive	Integrated	weak
PBF UN Equity	0.022193459	Mid	Oil and Natural Gas	Exclusive	Integrated	weak
PDCE UW Equity	0.197259504	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
PR UN Equity	0.48744636	Small	Oil and Natural Gas	Exclusive	Not integrated	medium
PSX UN Equity	0.154190938	Large	Oil and Natural Gas	Exclusive	Integrated	weak
PXD UN Equity	0.443571913	Large	Oil and Natural Gas	Exclusive	Not integrated	medium
REX UN Equity	0.060435612	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
ROCC UW Equity	0.482640715	Small	Oil and Natural Gas	Exclusive	Not integrated	medium
RRC UN Equity	0.347326594	Mid	Natural Gas	Exclusive	Not integrated	weak
SBOW UN Equity	0.478084316	Small	Oil	Exclusive	Not integrated	medium
SM UN Equity	0.332521132	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
SWN UN Equity	0.222800571	Mid	Natural Gas	Exclusive	Integrated	weak
TALO UN Equity	0.262981456	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
TELL UA Equity	0.696095819	Small	Natural Gas	Exclusive	Integrated	strong
TPL UN Equity	0.130730615	Mid	Oil and Natural Gas	Exclusive	Not integrated	weak
VLO UN Equity	0.050249232	Large	Oil and Natural Gas	Multinational	Integrated	weak
VTNR UR Equity	0.177569365	Small	Oil	Exclusive	Not integrated	weak
WTI UN Equity	0.390795209	Small	Oil and Natural Gas	Exclusive	Not integrated	weak
XOM UN Equity	0.397618668	Mega	Oil and Natural Gas	Multinational	Not integrated	weak

Table 2: Organized regressions (Capital Expenditures) and firm characteristics

Pivot Tables (Count): Capital Structure

Count of Market Cap					
	Mega	Large	Mid	Small	Grand Total
Medium		4	5	7	16
Strong	1	3	7	4	15
Weak	1	9	8	9	27
Grand Total	2	16	20	20	58

Table 3: Numerical count of Capital structure regression strength vs market cap

Count of Resources Produced				
	Natural Gas	Oil	Oil and Natur	Grand Total
Medium	1	2	13	16
Strong	2		13	15
Weak	3	3	21	27
Grand Total	6	5	47	58

Table 4: Numerical count of Capital structure regression strength vs resource produced

Count of US Exclusive or Multi National			
	Exclusive	Multinational	Grand Total
Medium	12	4	16
Strong	11	4	15
Weak	21	6	27
Grand Total	44	14	58

Table 5: Numerical count of Capital structure regression strength vs geographical diversity

Count of Mid and Down Stream Integration			
	Integrated	Not integrated	Grand Total
Medium	4	12	16
Strong	10	5	15
Weak	10	17	27
Grand Total	24	34	58

Table 6: Numerical count of Capital structure regression strength vs integration

Pivot Tables (Count): Capital Expenditures

Count of Market Cap					
	Mega	Large	Mid	Small	Grand Total
Medium		5	1	6	12
Strong		3	6	6	15
Weak	2	8	13	10	33
Grand Total	2	16	20	22	60

Table 7: Numerical count of Capital Expenditure regression strength vs market cap

Count of Resources Produced					
	Integrated	Natural Gas	Oil	Oil and Natural Gas	Grand Total
Medium		1	2	9	12
Strong	1	2	1	11	15
Weak		5	2	26	33
Grand Total	1	8	5	46	60

Table 8: Numerical count of Capital Expenditure regression strength vs resource produced

Count of US Exclusive or Multi National			
	Exclusive	Multinational	Grand Total
Medium	9	3	12
Strong	12	3	15
Weak	25	8	33
Grand Total	46	14	60

Table 9: Numerical count of Capital Expenditure regression strength vs geographical diversity

Count of Mid Stream Assets			
	Integrated	Not integrated	Grand Total
Medium	5	7	12
Strong	6	9	15
Weak	13	20	33
Grand Total	24	36	60

Table 10: Numerical count of Capital Expenditure regression strength vs integration

References

- Black, Scholes, (1974) The effects of dividend yield and dividend policy on common stock prices and returns, Journal of Financial Economics, Volume 1, Issue 1, 1974, Pages 1-22,ISSN 405X,https://www.sciencedirect.com/science/article/pii/0304405X74900063

- Boyer, Filion,2007,Common and fundamental factors in stock returns of Canadian oil and gas companies, Energy Economics, Volume 29, Issue 3, Pages 428-453, ISSN 0140-9883, https://doi.org/10.1016/j.eneco.2005.12.003.

- Graham, John Robert and Leary, Mark T. and Roberts, Michael R., A Century of Capital Structure: The Leveraging of Corporate America (June 27, 2014). Available at SSRN: https://ssrn.com/abstract=2223302 or http://dx.doi.org/10.2139/ssrn.2223302

- Hickman. (1954). [Review of *The Volume of Corporate Bond Financing since 1900.*, by W. B. Hickman]. *The Economic Journal*, *64*(255), 589–591. https://doi.org/10.2307/2227758

- Jankensgård. (2019). Does Managerial Power Increase Selective Hedging? Evidence from the Oil and Gas Industry. *Journal of Risk and Financial Management*, *12*(2), 71. MDPI AG. Retrieved from http://dx.doi.org/10.3390/jrfm12020071

- Lewis, H. G. (1941). [Review of *Price Research in the Steel and Petroleum Industries: Prepared for the Conference on Price Research*]. *Journal of Political Economy*, *49*(3), 469–471. http://www.jstor.org/stable/1824750

- Mohanty, S.K., Akhigbe, A., Al-Khyal, T.A. *et al.* Oil and stock market activity when prices go up and down: the case of the oil and gas industry. *Rev Quant Finan Acc* **41**, 253–272 (2013). https://doi.org/10.1007/s11156-012-0309-9

- Paminto, A., Setyadi, D., & Sinaga, J. (2016). The Effect of Capital Structure, Firm Growth and Dividend Policy on Profitability and Firm Value of the Oil Palm Plantation Companies in Indonesia. *European Journal of Business and Management*, *8*, 123-134.