An Empirical Study On:
The Influence Of Oil Reserves And Other Key Performance Measures On Corporate Performance Of Canadian Oil And Gas Companies

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Project Submitted In Partial Fulfillment Of

The Requirements For The Degree Of

Master Of Business Administration

The University Of Northern British Columbia

April 2006

Abstract

This empirical study examines the influence of proved and probable reserves on corporate performance of Canadian oil and gas companies. The disclosure is considered value-relevant if the change in proved and probable oil reserves disclosure accounts for relative changes in common stock prices. This study is motivated by the fact that the Securities Exchange Commission (SEC) does not require oil and gas companies to disclose probable reserves. The paper addresses two research questions: (1) Is the disclosure of information regarding changes in proved and probable reserves value-relevant to the share price of oil and gas producers? (2) Are the current SEC standards on disclosure of oil and gas reserve quantities adequate for equity investors (probable reserves not disclosed)?

The annual reports of 30 oil and gas companies were used to gather the data for each of the years 2002, 2003, and 2004. A cross-sectional model methodology was used and the results indicate that changes in proved and probable reserves are positively and significantly related to abnormal returns. In addition, proved and probable reserves are jointly more significant than earnings of a company when explaining abnormal returns of oil and gas companies in Canada. The study also concludes by recommending that the SEC make it mandatory for publicly traded oil and gas companies to disclose probable oil reserves information.

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ACKNOWLEDGMENTS

First of all, I would like to take this opportunity to express my sincerest appreciation to Dr. Han Donker, my supervisor, for his help in constructing and completing this mba project. It was a really wonderful opportunity to work with him. His guidance through the discussions and through the statistical processes helped me to a great deal on completing this project.

I wish to take this opportunity to thank and acknowledge Charles Schell, MBA Director, for his involvement in getting the MBA program started in Prince George and his huge involvement in the program from day one of our studies.

I thank the University of Northern BC faculty and staff for providing me high quality education and in preparing us with education that is applicable to the outside world. Also, a special thanks to the supervisory committee for reviewing the entire project. I am going to remember these two years of studies with great pleasure as it will help me in my professional growth.

Finally, many thanks go out to my family, who have supported me along every step of this program. Without their support, this lifelong dream of obtaining the MBA would not have been possible.

CHAPTER ONE: INTRODUCTION AND BACKGROUND

Introduction

Current methods of oil reserves disclosure have created many accounting controversies at major oil companies in the past few years. Accounting guidelines for reserve disclosures are not black and white and leave this field of accounting in a somewhat of a gray area. As discretion is left for companies to come up with their oil reserves estimates, it is impossible for investors to compare two oil companies on same basis as they both could be measuring oil reserves in different manners. Oil reserves form an important element in an investor's decision on whether or not to invest in oil and gas companies and what the fair price should be for these company's shares. In addition, there have been many downward revisions on oil reserves done by many oil companies lately and a further study is needed to explain why such events are occurring even after management of these companies are being more liable with the new Sarbanes-Oxley act.

Background Information

As per FASB Standard 69 paragraph 7, Publicly traded companies with significant oil and gas activities are to disclose the following information as supplementary but not part of the financial statements:

a.) Proved oil and gas reserve quantities
b.) Capitalized costs relating to oil and gas producing activities
c.) Costs incurred in oil and gas property acquisition, exploration, and development activities.
d.) Results of operations for oil and gas producing activities
e.) A standardized measure of discounted future net cash flows relating to proved oil and gas reserve quantities.

The public has an incomplete understanding of the way oil reserves are measured. There is a dilemma in that oil and gas in the subsurface cannot be evaluated precisely. This leads to complexity in reserves accounting. The SEC and FASB have a requirement that publicly traded companies show proved reserve volumes and values but there is no requirement for disclosure of probable reserves. Many investors make a quick decision that Royal Dutch Shell's write-down of proved reserves by 20% in 2004 was a big scandal but a better understanding of oil reserves will show that it is hard for companies to be 100% accurate on values and volumes of oil reserves using current SEC guidelines. In addition, the write-down at Royal Dutch was more of a reclassification of oil reserves from proved reserves to probable reserves but does not show that way in the statements due to the guidelines set by the SEC. With many write-downs of reserves by companies, the current rules on disclosure are not comforting and reliable to users of the data. It is even more discouraging to see companies such as Shell having huge write-downs in reserve numbers when the rules set by SEC are conservative so any changes should add to the reserve numbers and not take away reserve numbers. SEC rules are as follows:

- Use Proved Reserves
- Year end Prices used for Calculation
- Disclosure of Reserve Quantities and standardized measure of value
- Extremely conservative approach

Scope of Paper

The scope of the paper will be to see whether or not probable reserves should be included in SEC standards for disclosure of oil and gas reserve quantities. Also, the paper will test whether or not share prices are influenced by changes in quantities of oil reserves, both proved and probable. The purpose of the study will be to answer the hypothesis question provided below:

Hypothesis:

This paper evaluates the following two hypotheses:

1. Is disclosure of information regarding changes in proved and probable reserves value-relevant to share price of oil and gas producers?
2. Are the current SEC standards on disclosure of oil and gas reserve quantities adequate for equity investors (probable reserves not disclosed)?

Adequate for this study means information with which an investor can make an informed decision.

(a) Literature Review

The first part of this paper analyzes the current SEC standards for oil and gas reserve quantities. The first part of the literature reviewed for the purpose of this paper covers:

- Proved versus Probable Reserves
- Should Probable reserves be disclosed?

It encompasses various reports done by accounting companies such as Deloitte and Touche and articles from many journals, newspapers and Internet sites. A significant part of the literature review was done online looking at oil and gas journals, wall street journal, websites for major oil companies such as Royal Dutch/Shell, Investment house newsletters, CGA/CA/CPA articles, and many newspaper articles from sources such as the Calgary Herald. Also looked at was a report done by CERA and also financial accounting standards board guidelines and petroleum accounting books. The references show the complete listing of the literature reviewed.

The second part of the literature review looks at previous studies done around oil and gas reserves and how this study will build on those previous studies. Previous studies reviewed include empirical research studies related to oil and gas reserves. Also, empirical research studies related to disclosure and value-relevance to market prices of oil and gas companies.

(b) Methodology

The next chapter on methodology will discuss the following points in detail:

(a) Research methodology – this section will look at the model used to test the hypothesis.

(b) Explanation of Variables – the five independent variables in this study will be defined and description of what each measure. Also, an explanation of how each of the variables is calculated.

(c) Sample selection – This part of the paper will show in detail how the sample was selected for this study.

(d) Collection of data – Sources from where the data was collected for the sample that was selected will be described in detail.

Structure of Paper

The rest of the paper proceeds as follows: Chapter 2 reviews the literature, Chapter 3 provides the methodology, Chapter 4 provides the discussions and findings and Chapter 5 provides the conclusion.

CHAPTER TWO: LITERATURE REVIEW

Proved versus Probable Reserves

The Society of Petroleum Engineers defines Oil and Gas Proved and Probable reserves as the following:

Proved Reserves are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under current economic conditions, operating methods and government regulations.

Probable Reserves are those unproved reserves which analysis of geological and engineering data suggests are more likely than not to be recoverable. In this context, when probabilistic methods are used, there should be at least a 50% probability that the quantities actually recovered will equal or exceed the sum of estimated proved plus probable reserves.

The definition of proved reserves has changed little since 1978. The reserves disclosure number differs greatly from the reserves number that the company uses for its decision-making purposes. Many include probable and possible reserves and change the definition of "proved" to include the technological changes that have taken place in the last quarter century (Dittrick 2005).

Where the difference between proven and probable reserves is meaningful lays in how much certainty the oil and gas quantities are recoverable. Proven reserves are more than 90 percent probable of recovering while Probable reserves have greater than 50 percent probability of recovery. Because recovery of oil and gas is based on current economic conditions, there is the situation that reserves can be understated. When world oil prices are high, it is economically feasible to recover

more oil. This implies greater proved and probable reserves, as there is more certainty in recovering oil and gas.

Should Probable Reserves be disclosed?

Under US Securities Exchange Commission (SEC) rules, probable reserves are not reportable. The SEC uses a strict definition for reserves that are disclosed and essentially does not include oil and gas volumes that are not producible through the existing wells. Estimated probable and possible reserves (estimates of recoverable reserves that are less well defined than proved reserves) are not considered in SEC's restrictive definition of reserves even though they may eventually be reclassified to proved reserves category (Adams et al. 1994).

From SEC's perspective, reserve definitions and reporting standards are designed to help protect investors. SEC's definition helps establish a standardized criteria to evaluate something that would otherwise be very subjective. SEC rules are deliberately conservative and intended to prevent companies from overstating their reserves. Although this could be best solution for the average investor and for the protection of public, the conservatism and the need for standardization results in significant loss of information that could be really valuable to an investor.

A broader and more crucial implication, particularly to regulatory institutions, is whether disclosing probable reserves contributes to more market efficiency. Management and reservoir engineers generally believe total reserves, including

those classified as possible and probable, are a better measure of an exploration company's ultimate results (Adams et al. 1994). Adams et al (1994) state that companies acquiring oil and gas reserves attribute value to probable and possible reserves. Rob Arnott, a senior researcher at Oxford Institute, states, "Consideration should be given to how investors use this reserves information and how its disclosure in financial reports should be tailored accordingly. Arnott (2004) mentions that a reserves report that focuses solely on the "proven reserves" does not fully and fairly reflect the true value of the company. Bergin (2005) states that many people in the oil industry believe that the SEC rules are too strict and underestimate the actual volume of oil reserves. A study done by Cambridge Energy Research Associates (CERA) calls the SEC's 27-year-old accounting rules archaic and overly conservative. There is real case for companies to provide additional information beyond the proven reserves definition.

In contrast to the US SEC rules, oil and gas companies disclose both proven reserves and probable reserves in the United Kingdom and in Canada. In other countries like Australia, all categories of reserves are considered in the market valuation of an oil and gas firm based on expected value method. This is usually done by taking all of the proved reserves, 60% of the probable reserves, and 30% of the possible reserves. Perhaps it is time for the SEC requirements to take this into account (Fletcher 2004).

Consistency in reporting is important so that everyone is reporting on the same basis with a clearly understood framework with maximum objectivity. The purpose of reserves reporting allows the public at large to put a value on the assets of an exploration and production company and also to make comparative analysis between the companies. However, this only works if all companies report on same standards and this is not the case as US has different rules for reserves reporting as probable reserves are not disclosed. Reserves information should reflect consistency, transparency, and utility (Fletcher 2004).

Previous Empirical Studies

Table 1 Previous Empirical Studies Summary

Author	Country	Year	No. of observations	Comments/Type of Study
Nasser A. Spear	United States	1984-1988	459 observations	Two-factor security market model was used. Unexpected security returns are accumulated over a one-week period starting two days prior to release of Annual report or form 10-K
Howard Douglas Teall	Canada	1982 – 1984	67 Cdn Oil and Gas companies	Multiple Correlation/Regression analysis used to evaluate extent that each of three alternate reserves disclosures account for common stock returns
Charlotte Wright	United States	1982	Oil companies in United States	Regression analysis used to determine the significance of the announcement types. Study was to test extent to which news announcements affect the performance of common equity securities of oil and gas producing companies
Greg Clinch & Joseph Magliolo	United States	1984 – 1987	86 Companies	Study done by doing cross sectional multiple regression analysis of yearly estimated oil price response coefficients on production, proved reserves and proved developed reserves
Berry & Wright	United States	1990 – 1993	399 observations	Three regression models are used to test the hypotheses on the value relevance of oil and gas disclosures
Thornton & Welker	United States	1998 – 1999	44 companies	Regression model used to test the effect of oil and gas producers' FRR NO. 48 Disclosures on Investors' Risk Assessments

Several previous empirical studies on reserves disclosure and return performance of oil and gas corporations have been examined.

Spear (1994) examines information content of components of annual change in quantity of proved reserves reported by US oil and gas producers. The study investigated the association between unexpected portions of discoveries, production, and revisions of prior quantity proved reserve estimates and unexpected security returns during release week of annual reports of 1984 to 1988. The conclusion from the study was that disaggregating net change in quantity of proved reserves into its components conveys additional information beyond that contained in net change in total proved reserves itself. Spear (1994) results also indicate that discoveries are highly associated with security returns even after controlling for production, and that revisions, net purchases, and production have a modest influence on security returns.

In 1996, Spear examines the incremental effect on market returns of alternative reserve-based value replacement measures over historical cost income of oil and gas producing companies. He finds a positive market reaction to oil and gas companies that are successful in replacing their oil and gas reserves via discoveries.

Teall (1987) had a study examining which of the alternate annual report disclosures of oil and gas reserves, namely historic capitalized costs, quantities, and discounted cash flows, contributed the most information content. Multiple regression analysis was used to evaluate the extent to which of the 3 alternative reserves disclosure account for common stock returns after recognizing information provided

by the EPS variable. The study concludes by stating that quantities and discounted cash flows are more informative to users when accounting for changes in a corporation's common stock prices.

Wright (1982) did an empirical study on how news announcements affect the performance of common stock returns of oil and gas producing companies. She looked at 2 questions: (1) Do news announcements concerning activities of oil and gas producing companies affect common stock returns; (2) Are announcements concerning financial, personnel, explorational, and operational activities used equally by investors in their decision making? Regression analysis was used to determine the significant difference that might exist between the returns. The study concluded as follows: (1) news announcements concerning explorational and operational activities are rapidly reflected in companies' securities prices and (2) since security prices do appear to respond to news announcements, researchers should expand their research to include examination of the company-related news announcements appearing during their research period.

This article by Clinch and Magliolo (1992) states that prior research has shown weak association between security prices and oil and gas valuation disclosures required by SFAS No. 69. Authors state that there could be two reasons that explain this: (1) reserves quantity estimates underlying the valuation disclosures are unreliable, and (2) the valuation model used to attach value to reserves quantity is flawed. Clinch and Magliolo (1992) narrow their research and specifically examine

the value-relevance of reserve quantity disclosures required by Statement of Financial Account Standards (SFAS) No. 69 (FASB 1982). The article explores two empirical questions: (1) examine the required disclosure for proved reserves and ask whether these reserve estimates are value-relevant based on current oil production levels, (2) whether the association between market valuation and firms' reserve disclosures differs across firms according to characteristics of disclosed data. They conclude from the study that proved reserves do not provide any value-relevant information to market participants once production is known. However, they find that proved reserves information is informative for certain firms whose quantity estimates appear more reliable. In summary, Clinch and Magliolo (1992) reported that production quantities dominate FASB Statement No. 69 disclosures as a source of value-relevant information.

Berry and Wright (2001) study whether supplemental reserve disclosures contain value-relevant information. They examine the extent to which they convey information regarding firms' effort and ability to discover reserves. They conclude that both effort and ability to discover reserves are significant in explaining the market value of full cost firms.

Thornton and Welker (2004) find support for their hypothesis that oil and gas producers' sensitivity and value-at-risk (VAR) disclosures, mandated by SEC Financial Reporting Release No. 48, convey useful information to investors about market price risk (commodity betas).

Overall, the existing literature demonstrates that disclosure is value-relevant to market prices of oil and gas producers. One of the previous studies has shown weak association between reserves and security prices and therefore the literature is somewhat mixed but majority of literature shows the value-relevance of oil reserves. Most of the data to date relies solely on proved reserves in existing literature studies. However, the literature has yet to offer guidance on the value-relevance of the disclosure of probable reserves in oil and gas firms.

Aim of Study

The aim of this study will be to extend on the previous studies and examine the information content of the key performance measures from the annual report. None of the previous studies have examined the information content of probable reserves and this study is mainly focused on the information content that proved and probable reserves provide. Also, to test how important proved and probable reserves are in comparison to other key measures, this study will have three other variables. The study is motivated by the literature review that companies that acquire oil companies place value on both probable and proved reserves. Therefore, this study tests how valuable oil reserves are for investors and share prices of companies. To test the importance, the information content provided by oil reserves is compared to the information content provided by other key performance indicators used by many companies. Also, each of these variables that is used in this study could convey different signals to the market and also offset one another. The methodology used for this study will provide us with an answer on whether the current SEC standards are adequate for reserves disclosure. If probable reserves

are shown to provide high information content, then this study will conclude by stating that the current SEC standards are inadequate.

CHAPTER THREE: METHODOLOGY

(a) Research methodology

The research addresses the following two questions:

1. Do Probable and Proved reserves contribute information content incremental to that provided by other key performance measures (Earnings, Size, and Leverage)?

2. Are the current SEC standards on disclosure of oil and gas reserves quantities adequate for equity investors?

Following the specification of the model, the research sample will be defined and a more detailed description of the research variables will be provided. The model used in this paper is:

The annual abnormal returns are modeled as follows:

$$AR_{it} = R_{it} - R_{mt} ,$$

where AR_{it} (market adjusted returns) are the annual abnormal returns of an individual firm *i* over the market return R_{mt} . In order to measure the market-adjusted returns, the *TSX* Oil and Gas Sub-Index were used.

The relationship between abnormal returns, proved and probable reserves, firm size, leverage and earnings is examined in the following cross-sectional regression model:

$$AR_{it} = \alpha + \beta_1 \Delta PROV_{it} + \beta_2 \Delta PROB_{it} + \beta_3 SIZE_{it} + \beta_4 \Delta LEV_{it} + \beta_5 \Delta EPS_{it}$$

The dependent variable is the annual abnormal returns of an individual firm *i* over the market return R_{mt} using the end-of-the year returns.

$PROV_{it}$ = Percentage change in Proved oil and gas Reserves for Company i in period t
$PROB_{it}$ = Percentage change in Probable oil and gas Reserves for Company i in period t
$SIZE_{it}$ = Firm size is measured by the log of the market capitalization for Company i at end of period t in Canadian dollars.
LEV_{it} = Percentage change in Debt/Assets for Company i in period t
EPS_{it}= Percentage change in Earnings per share for company i in period t

The analysis for this study is to primarily focus on the Reserves and therefore on the parameters B1 and B2 representing proven and probable reserves respectively. Therefore, a cross-sectional model was estimated in which firm performance, measured by annual abnormal returns, is regressed on proved reserves, probable reserves, firm size (control variable), leverage and earnings.

(b) Explanation of the independent variables

Proved Reserves

Proved reserves are estimates of quantities of crude oil, liquids, and natural gas that are reasonably certain to be recoverable in future years under existing operating and economic conditions.

The variable is defined as the percentage change of total proved reserves from one year to the next.

$$PROV_{it} = \frac{TPROV_{it} - TPROV_{it-1}}{TPROV_{it-1}}$$

$PROV_{it}$= percentage change in proved oil and gas reserves for company I during period t
$TPROV_{it}$ = Total proved oil and gas reserves for company I at end of period t
$TPROV_{it-1}$ = Total proved oil and gas reserves for company I at beginning of period t

Probable Reserves

Probable Reserves are estimates of quantities of crude oil, liquids, and natural gas that have 50% change of being recoverable in future years. The variable is defined as the percentage change of total probable reserves from one year to the next.

$$PROB_{it} = \frac{TPROB_{it} - TPROB_{it-1}}{TPROB_{it-1}}$$

$PROB_{it}$= % change in probable oil and gas reserves for company i during period t
$TPROB_{it}$ = Total probable oil and gas reserves for company i at end of period t
$TPROB_{it-1}$=Total probable oil and gas reserves for company i at beginning of period t

Company Size

Company size is measured by the market capitalization of each of the companies, which is calculated as share price multiplied by total number of outstanding shares. The variable is defined as log of the market capitalization of the company in Canadian dollars. This variable is a control variable.

$SIZE_{it}$= log (market capitalization of company at end of period t)

Earnings Per Share (EPS)

Diluted Earnings per share is a financial measure used and is the company's profit allocated to each outstanding share of common stock and serves as an indicator of a company's profitability. Diluted expands the definition and includes shares of convertibles or warrants in outstanding shares number. The variable is defined as the percentage change in diluted EPS from one year to the next with the denominator being the absolute value (ABS) as in certain companies EPS is a negative number for certain years.

$$EPS_{it} = \frac{TEPS_{it} - TEPS_{it-1}}{(ABS)TEPS_{it-1}}$$

EPS_{it}= percentage change in EPS for company i during period t
$TEPS_{it}$ = Total EPS for company i at end of period t
$TEPS_{it-1}$ = Total EPS For company i at beginning of period t
ABS = Absolute Value

Leverage

Total Debt/Total Assets is used to measure a company's financial risk by determining how much of the company's assets have been financed by debt. This is a very broad ratio as it includes both short and long term debt and all types of assets whether tangible or not. The variable is defined as the percentage change of the Total Debt/Total Assets ratio from one year to the next.

$$LEV_{it} = \frac{TLEV_{it} - TLEV_{it-1}}{TLEV_{it-1}}$$

LEV_{it}= percentage change in Debt/Assets level for company i during period t
$TLEV_{it}$ = Debt/Assets level for company i at end of period t
$TLEV_{it-1}$ = Debt/Assets level for company i at beginning of period t

(c) Sample selection

First of all, the sample to be selected had to have companies that disclosed probable reserves. As US companies do not have to disclose probable reserves, the sample was selected from Canada as Canadian oil and gas companies trading publicly do disclose probable reserves. The Toronto Stock Exchange (TSX) and Canadian venture exchange were chosen as the stock exchanges and the companies trading on one of these two stock exchanges were chosen for the sample. Secondly, the sample of companies should have the production and discovery of oil and gas reserves as their primary activity. Thirdly, companies with a December 31st year-end were chosen so that the share price returns were computed over the same time period and also made it easier to compute abnormal returns. This also ensured the uniform disclosure of reserve, earnings, and leverage data. In addition, it made it easier to control for cross-temporal differences in security market and industry factors such as inflationary expectations and oil and gas prices. Finally, firms that failed to report sufficient data to calculate the dependent and independent variables were omitted. A research sample of 30 companies was selected for the years 2002 to 2004. Although, change in the variables is only done for 3 years, 4 years of data is required to do all the computations and therefore data from 2001 was also required for all these companies. The sample consisted of 81 observations (26 in 2002, 27 in 2003, and 28 in 2004).

Because the production and financial numbers are disclosed on a quarterly basis, examining the contemporaneous association during the year should provide a

better indication of whether market participants find the components useful. To test the hypothesis, the analysis was done on a pooled basis for the 3 years and then on a nonpooled basis to provide an insight to changes over time. The pooled analysis provides an assessment of the information content over a longer period of time (over 3 years). This also eliminates volatility that might have happened in one single year due to an industry event. Due to the fact that there is a huge variance in stock returns from year to year while other variables not changing in same measure, the study was also done on a year-to-year basis (nonpooled basis).

(d) Collection of data

All of the data for the sample selected was collected from a variety of sources. The source of data collection came from DataStream database published by Thomson Financial and annual reports of companies. Sedar filings also provided some data that was required to be collected for this study. This site contains all the public company documents filed with the securities exchange. Information from Form 51-1 of oil and gas companies also provided data on disclosure of proved and probable reserves. See Appendix A,B,C, and D for sample of data collected for this study.

CHAPTER 4: DISCUSSION AND FINDINGS

Multicollinearity analysis

Most researchers pick usually a number for correlation coefficient, such as 0.80 and then become concerned for multicollinearity when the absolute value exceeds this (Studenmund 2001). To assess the potential problem of multicollinearity in our empirical results, the diagnostic procedure used by Belsley, Kuh, and Welsch (1980) was used. Multicollinearity is considered potentially serious if the correlation coefficient is 50% or higher. To correct multicollinearity, there are few options to remedy the solution. The four basic options are: (1) Do nothing, (2) drop a redundant variable, (3) transfer the multicollinear variables, and (4) increase the size of the sample.

In addition, to control for potential heteroskedasticy, generalized least squares estimation was used.

Empirical Results on Nonpooled Basis – 2002

The analysis is based on 30 observations for 2002. The mean annualized abnormal returns are 25.5% for the year 2002 for these 30 companies. This is excess return, over and above the TSX Oil and Gas Sub index. Table 2 displays the summary statistics and correlation between the independent variables. The correlation between the independent variables is weak except for proved reserves and earnings per share. The correlation coefficient is 0.64 between EPS and proved reserves. The solution to correct this problem was to run the regression twice, once without proved reserves as independent variable and then second time,

without EPS as an independent variable. The only significant change that resulted was that proved reserves coefficient became positive (0.023) but p-value (.342) still indicates it is still statistically insignificant. Table 3 shows the results of the regression model. The empirical results demonstrate that changes in probable reserves (PROB) are positively and significantly related to abnormal returns (p=0.004). Other results for 2002 were as follows:

- An increase in debt ratio (LEV) decreases abnormal returns and it is significantly related (p=0.061).
- An increase in the size of the company decreases abnormal returns and that is consistent with risk of a smaller company, which then requires higher returns to offset this.
- As per Table 3, EPS and proved reserves (after multicollinearity problem corrected) are positively related but statistically insignificant (p=0.342 and .341 respectively).

Table 2. Descriptive Analysis and Correlation Matrix of 30 Observations of Oil and Gas Companies from 2002

Variable	MEAN	MIN	MAX	PROV	PROB	MV	LEV
PROV millions bbl	336.0	.104	1,747.0	**X**			
PROB millions bbl	210.0	0.071	1,563.0	0.048	**x**		
MV millions $	4,935.0	1.27	44,705.0	-0.10	-0.356	**X**	
LEV (%)	56.48	13.42	180.24	-0.031	-0.416	-0.169	**x**
EPS	1.05	-0.96	4.74	0.642	0.014	-0.066	-0.235

bbl = barrels of oil

Table 3: Regression Analysis

Dependent variable is the annual abnormal returns of Canadian oil and gas companies for 2002.

Explanatory variable	**Coefficient**	***p-value***
Intercept	0.488	*(0.127)*
Proved Reserves (PROV)	-0.003	*(0.479)*
Proved Reserves (after Eliminating multicollinearity)	0.023	*(0.342)*
Probable Reserves (PROB)	0.017***	*(0.004)*
Log Market Value (SIZE)	-0.044	*(0.128)*
Debt Ratio (LEV)	-0.152*	*(0.061)*
Earnings Per Share (EPS)	0.0383	*(0.341)*
Adjusted R^2	*24.2%*	
Number of Observations	*26*	
F-statistic	*2.59***	*(0.0289)*

Notes: The number in italics is the *p*-value, calculated using *White's heteroscedasticity-consistent covariance estimator.* Asterisks indicate significance at the 0.10 levels (*), 0.05 levels (**), or 0.01 levels (***).

Empirical Results on Nonpooled Basis – 2003

The analysis is based on 30 observations for 2003. The mean annualized abnormal returns are 70.9% for the year 2003 for these 30 companies. However, this return was highly skewed by two companies, Delphi Energy (751%) and Oilexco (504%) as otherwise the abnormal returns would have been 26.4%. Table 4

displays the summary statistics and correlation between the independent variables. The correlation between the independent variables is weak except for proved reserves and probable reserves. The correlation coefficient is 0.56 between probable and proved reserves. To correct multicollinearity, regression was run twice, once without proved reserves as independent variable and then second time, without probable reserves as an independent variable. The only significant change that resulted was that probable reserves coefficient became positive (0.481) with p-value of 0.057, which makes it statistically significant. Table 5 shows the results of the regression model. Changes in proved reserves (PROV) are positively and significantly related to abnormal returns (p=0.037). Other results for 2003 were as follows:

- An increase in debt ratio (LEV) increases abnormal returns and it is significantly related (p=0.000).
- An increase in the size of the company decreases abnormal returns and that is statistically significant (p=0.037).
- As per Table 5, EPS is positively related and statistically significant (p=0.089).

Table 4. Descriptive Analysis and Correlation Matrix of 30 Observations of Oil and Gas Companies from 2003

Variable	MEAN	MIN	MAX	PROV	PROB	MV	LEV
PROV millions bbl	350.26	0.16	1,670	x			
PROB millions bbl	174	0.076	952.0	0.562	x		
MV millions $	6,562.0	2.36	61,768	-0.17	-0.255	X	
LEV (%)	46.1	7.0	66.0	-0.146	-0.179	-0.029	x
EPS	1.83	-0.66	10.48	-0.000	0.209	0.092	-0.259

Table 5: Regression Analysis
Dependent variable is the annual abnormal returns of Canadian oil and gas companies for 2003.

Explanatory variable	**Coefficient**	***p-value***
Intercept	0.599**	*(0.037)*
Proved Reserves (PROV)	0.208***	*(0.000)*
Probable Reserves (PROB)	-0.031	*(0.451)*
Probable Reserves (eliminating multicollinearity)	0.481*	*(0.057)*
Log Market Value (SIZE)	-0.000**	*(0.037)*
Debt Ratio (LEV)	2.24***	*(0.000)*
Earnings Per Share (EPS)	0.034*	*(0.089)*
Adjusted R^2	*71.9%*	
Number of Observations	*27*	
F-statistic	*14.33****	*(0.000)*

Notes: The number in italics is the *p*-value, calculated using *White's heteroscedasticity-consistent covariance estimator*. Asterisks indicate significance at the 0.10 levels (*), 0.05 levels (**), or 0.01 levels (***).

Empirical Results on Nonpooled Basis – 2004

The analysis is based on 30 observations for 2004. The mean annualized abnormal returns are 41.5% for the year 2004 for these 30 companies. Table 6 displays the summary statistics and correlation between the independent variables. The correlation between the independent variables is weak implying low chances of

multicollinearity. Table 7 shows the results of the regression model. The empirical results show that changes in proved reserves (PROV) are positively and significantly related to abnormal returns (p=0.024) whereas probable reserves are negatively related to abnormal returns but are not statistically significant. Other results for 2004 were as follows:

- A decrease in debt ratio (LEV) increases abnormal returns although it is not significantly related (p=0.164).
- An increase in the size of the company increases abnormal returns and that is not statistically significant as p=0.244.
- As per Table 7, EPS is positively related and statistically significant (p=0.084).

Table 6. Descriptive Analysis and Correlation Matrix of 30 Observations of Oil and Gas Companies from 2004

Variable	MEAN	MIN	MAX	PROV	PROB	MV	LEV
PROV millions bbl	331.2	0.234	1,514.0	**x**			
PROB millions bbl	168.0	0.109	807.0	0.129	**x**		
MV millions $	8,150.7	2.1	68,975.0	-0.253	-0.198	**X**	
LEV (%)	47.74	14.69	76.85	0.46	-0.155	-0.427	**X**
EPS	1.75	-0.16	6.55	-0.005	0.358	0.043	-0.092

Table 7: Regression Analysis
Dependent variable is the annual abnormal returns of Canadian oil and gas companies for 2004.

Explanatory variable	Coefficient	*p-value*
Intercept	-0.138	*(0.818)*
Proved Reserves (PROV)	1.072**	*(0.024)*
Probable Reserves (PROB)	-0.196	*(0.363)*
Log Market Value (SIZE)	0.041	*(0.244)*
Debt Ratio (LEV)	-0.705	*(0.164)*
Earnings Per Share (EPS)	0.029*	*(0.084)*
Adjusted R^2	*19.6%*	
Number of Observations	*28*	
F-statistic	*2.32**	*(0.078)*

Notes: The number in italics is the *p*-value, calculated using *White's heteroscedasticity-consistent covariance estimator*. Asterisks indicate significance at the 0.10 levels (*), 0.05 levels (**), or 0.01 levels (***).

Empirical Results from Pooled Study

The analysis is based on annual data from 2002 through 2004 yielding a total of 90 observations spanning 3 years. The average abnormal market-adjusted returns of Canadian oil and gas companies during the period 2002 through 2004 are 42.98 percent (*p-value = 0.001*). This annualized abnormal return of 42.98 percent is *excess* market return value over and above the *TSX* Oil and Gas Sub-Index. It is a very high market return consistent with the oil and gas market. Table 8 displays

the summary statistics and correlation between the independent variables. The correlation between the various independent variables is weak implying low chance of multicollinearity problems. One observation has a particularly high leverage ratio with 180.23%. The reason why this firm, Rider Resources, has such a high leverage ratio is because it reported negative shareholders equity in 2002.

Table 8. Descriptive Analysis and Correlation Matrix of 90 Observations of Oil and Gas Companies from 2002 to 2004

Variable	MEAN	MIN	MAX	PROV	PROB	MV	LEV
PROV millions bbl	339.3	104.0	1,747.0	x			
PROB millions bbl	183.7	71.0	1,563.0	0.058	x		
MV millions $	6,549.0	1.3	68,975.0	-0.087	-0.074	x	
LEV (%)	50.09	7.13	180.23	-0.079	-0.246	-0.106	x
EPS	1.54	-0.96	10.48	0.017	0.022	-0.012	-0.177

Table 9 shows the results of the regression model. The empirical results demonstrate that changes in the proved (PROV) and probable (PROB) reserves are positively and significantly related to abnormal returns (*p= 0.00* respectively *p=0.048*). A *Wald-test* was used to investigate whether the variables proved (PROV) and probable (PROB) reserves are jointly significant or not (H_0: $\beta_1 = \beta_2 = 0$). The outcome of the Wald-test demonstrates that the variables PROV and PROB are jointly significant (*F-statistic = 71.93*; *p=0.00*). This result shows that proved and probable reserves are significant key factors to explain abnormal returns of oil and gas companies in Canada. In fact, proved and probable reserves are jointly more significant than current earnings per share in explaining abnormal market returns.

This surprisingly result implies that the disclosure of probable and proven reserves is more value-relevant to market prices than even earnings is.

The variable firm size, measured by the logarithm of the market value, is a control variable and is negatively and significantly related to abnormal returns (*p=0.015*). Table 9 shows that the regression coefficient of leverage (LEV) is positive (predicted sign), but is not statistically significant.

Further, table 9 shows a positive relationship between abnormal returns and the change in earnings per share (EPS). The regression coefficient has the predicted sign (positive) and is statistically significant (p=0.038).

Table 9: Regression Analysis
Dependent variable is the annual abnormal returns of Canadian oil and gas companies from 2002 through 2004.

Explanatory variable	**Coefficient**	***p-value***
Intercept	0.852**	*(0.021)*
Proved Reserves (PROV)	0.171***	*(0.000)*
Probable Reserves (PROB)	0.023**	*(0.048)*
Log Market Value (SIZE)	-0.084**	*(0.015)*
Debt Ratio (LEV)	0.690	*(0.132)*
Earnings Per Share (EPS)	0.019**	*(0.038)*
Adjusted R^2	*30.1%*	
Number of Observations	*81*	
F-statistic	*7.90***	*(0.000)*

Notes: The number in italics is the *p*-value, calculated using *White's heteroscedasticity-consistent covariance estimator*. Asterisks indicate significance at the 0.10 levels (*), 0.05 levels (**), or 0.01 levels (***).

Discussion of Findings

Proved Reserves

As per Table 10, proved reserves were positively related to abnormal returns in all of the results. Except for year 2002, all of the other results showed that they were also statistically significant. Therefore, we can say convincingly that proved reserves do provide value-relevance to firm performance. Proved reserves was also the most statistical significant variable for all the studies that explained abnormal returns except for year 2002. Therefore, we can conclude from this study that this variable is the most value-relevant to investors of the five variables that were tested.

Probable Reserves

In the pooled and nonpooled results, probable reserves were positively related to abnormal returns in all of the results except for 2004 where they were negatively correlated. In 2004, the results were statistically insignificant ($p=0.36$). All of other years (2002 and 2003) and pooled study showed that results were statistically significant and positively related. Therefore, we can say that probable reserves do provide value-relevance to firm performance and discount the 2004 results due to statistical insignificance and one year anomaly.

Earnings per Share

All of the studies (pooled and nonpooled) showed that EPS and abnormal returns were positively and significantly related. As earnings increase, share prices of company rise to reflect the extra amount that the company will retain in

shareholders' equity or pay out as dividends to shareholders. When firms miss earnings expectations, share prices of companies in majority of cases come down. On the other hand, when companies beat quarterly expectations, share prices usually rise in most cases.

Leverage

Results for Leverage gave us mixed results as in certain years, the results showed that an increase in leverage increases abnormal returns whereas in other years, the opposite effect happens and tests were significant in most cases. Therefore the results are inconclusive for this variable.

Jensen (1986) argues that debt creation reduces the agency costs of free cash flow by reducing the free cash flow available for perquisites and low-return projects. If debt increases, the role of bondholders as monitors of incumbent management teams becomes more important. As a consequence, firms with high leverage will operate more efficiently (*monitoring hypothesis*). The threat caused by failure to make debt service payments serves as an effective motivating force to make such organizations more efficient (Jensen 1986). Increase in debt also has tax advantages as interest expense is tax deductible and therefore cost of capital could be lower in these companies that have higher debt, which would have a favorable impact on the market value of the company.

Increased leverage also has some costs associated with it. As leverage increases, costs of debt also increase including bankruptcy costs (Jensen 1986).

There is an optimal debt to equity ratio which will maximize firm value. Therefore, literature in this area is also mixed on whether increase in debt increases firm value.

Size of Firm

Except for year 2004, where results were statistically insignificant, we can conclude that the size of a firm is negatively correlated with abnormal returns.

Banz (1981) showed that the size of a firm and the return on its common stock are inversely related. This anomaly has been known as the *size effect (*or *small firm effect hypothesis)*. He stated that since small-cap stocks carried higher risk than large-cap stocks, it would only be logical for them to deliver higher returns.

Table 10: Summary of Significant Statistical Findings

Study	Variable	Coefficient	P-value
2002 Non Pooled	Probable	0.017	0.0004 ***
	Leverage	-0.152	0.061 *
2003 Non Pooled	Probable	0.481	0.057 *
	Leverage	2.24	0.000 ***
	Proved	0.208	0.0 ***
	Size	-0.000	0.037 **
	EPS	0.034	0.089 *
2004 Non Pooled	Proved	1.072	0.024 *
	EPS	0.029	0.084 *
Pooled Study	Probable	0.023	0.048 **
	Proved	0.171	0.0 ***
	Size	-0.084	0.015 **
	EPS	0.019	0.038 **

Asterisks indicate significance at the 0.10 levels (*), 0.05 levels (**), or 0.01 levels (***).

CHAPTER FIVE: CONCLUSION

The perceived limitations of traditional historical cost-based accounting measures for oil and gas firms prompted the SEC and FASB to issue requirements of supplemental disclosures in financial data in the late 1970's. However, probable reserves were never required to be disclosed as per the SEC. This study has helped to clarify questions that standard-setting bodies, analysts, and others may have regarding the usefulness of reserve quantity disclosures. The questions that were set out at the start were: (1) Does disclosure of information regarding changes in proved and probable reserves matter? (2) Are the current SEC standards on disclosure of oil and gas reserve quantities adequate for equity investors (probable reserves not disclosed)?

The results of this analysis indicate that proved and probable reserves jointly and individually explain market returns for the period 2002 - 2004, and therefore are value-relevant to the market. The definition of proved reserves inherently implies a past and present looking perspective on the value of oil and gas firms because reserves must be recoverable with certainty at a given date. Hence, reporting proved reserves by itself, as required by SEC, gives only past and present information on reserves that markets can use in valuing an oil company. It contributes to understating firm value because proved reserves do not give future information about oil and gas reserves. Future or potential oil reserves are captured in probable reserves because it represents unproved reserves that are more likely than not to be recoverable. The likelihood that a firm will generate positive cash

flows in the future depends on the quality of a firm's current reserves and its ability to efficiently produce and replace its reserves. Therefore, since the SEC does not permit probable reserves reporting, the future valuation of oil and gas companies is missing for the market. Because probable reserves are a key performance indicator of market returns, this study concludes that the SEC should make the reporting of probable reserves mandatory. These results provide helpful insights to those involved with standard setting where the goal is to require disclosure of information with maximum decision usefulness. These results indicate that the disclosure of probable reserves will enhance an investor's ability to make informed decisions. Additionally, in mandating disclosure of reserve quantities, information regarding proved and probable reserves is more useful than information regarding total proved reserves alone.

Limitations of the study and directions for further research

The model used in this paper is based on some restrictive hypotheses, but its simplicity and its value added in terms of empirical performances might constitute a promising basis for further developments.

The sample size may be criticized in this study. The sample size is 30 companies for each year and the pooled study provided a bigger sample as it is based on 90 observations. A large more diverse sample could provide some additional insight into the study. As in any capital markets study, there could also be

correlated omitted variables. Magliolo's (1986) results suggested that there were additional relevant explanatory variables omitted from the model he tested.

Another concern in this study is that only Canadian oil and gas companies were selected but the SEC is regulatory body for US companies. This study could not be done with US companies as they do not disclose probable reserves. A logical extension of this research could be to replicate this study to other countries that do disclose probable reserves such as companies in United Kingdom or Australia.

Although this study was conclusive in proving that probable oil reserves are value-relevant to firm's performance, it did not test the accuracy of the reserves disclosed. Oil reserves still do not need to be audited and there has been a lot of concern here as there is a lot of subjectivity involved when oil reserves numbers are disclosed.

Brooks (2005) in his article Attention to accounting mentions that reserve accounting and reporting will not be done now by reservoir engineers in the back room as there is a lot of spotlight on it and this spotlight will remain for many years to come. Dittrick (2005) states recommendations from a report done by Deloitte and Touche which reinforce the idea that reserve estimates disclosed in annual reports and accounts should be prepared only by "certified" engineers. More accurate reserves numbers could even be more value relevant to a firm's performance.

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Appendix A
Percentage changes in Variables from year to year

Company	Year	Proved Reserves	Probable Reserves	EPS	Leverage	Abnormal Returns
Canadian Natural Resources						
	2002	20.43%	24.58%	-15.85%	11.81%	11.61%
	2003	1.94%	101.36%	134.98%	-8.39%	16.00%
	2004	-0.79%	1.52%	-50.38%	2.03%	-44.75%
Compton						
	2002	14.50%	79.05%	-66.67%	2.16%	10.31%
	2003	3.01%	59.93%	506.25%	-6.21%	-6.12%
	2004	-7.17%	14.58%	-47.42%	2.41%	51.41%
Nexen						
	2002	0.47%	-4.34%	-2.94%	1.74%	-0.20%
	2003	-4.92%	118.73%	40.30%	-3.94%	13.43%
	2004	3.95%	11.46%	31.53%	5.06%	-25.20%
Baytex Energy Trust						
	2002	-11.67%	-5.89%	130.69%	-5.60%	83.22%
	2003	-37.68%	9.38%	-27.06%	-8.59%	11.02%
	2004	15.62%	15.20%	-66.13%	11.79%	4.88%
Suncor Energy						
	2002	-4.79%	-22.97%	110.67%	-8.06%	-15.96%
	2003	145.25%	-39.09%	41.77%	-5.03%	8.36%
	2004	6.95%	-11.03%	5.36%	0.00%	1.75%
Talisman Energy						
	2002	-0.13%	80.23%	-28.33%	-1.26%	-16.58%
	2003	-8.28%	2.95%	98.45%	-8.16%	5.73%
	2004	-11.38%	-27.38%	-30.86%	6.45%	2.99%
Paramount Resources						
	2002	176.78%	225.61%	-92.00%	18.35%	-4.50%
	2003	190.01%	211.83%	-87.50%	-10.23%	-54.33%
	2004	43.29%	156.01%	3250.00%	2.76%	128.00%
Pan Ocean Energy						
	2002	27.43%	22.49%	21.31%	24.94%	91.98%
	2003	-9.26%	-82.55%	158.33%	-31.98%	132.34%
	2004	-11.71%	211.46%	-48.21%	-5.41%	134.76%

Company	Year	Proved Reserves	Probable Reserves	EPS	Leverage	Abnormal Returns
Delphi Energy	2002	N/A	N/A	-3000.00%	-90.41%	-10.88%
	2003	157.41%	103.49%	132.26%	238.17%	751.00%
	2004	111.48%	149.07%	-30.00%	8.80%	80.87%
Rider Resources						
	2002	-15.13%	-27.33%	-120.00%	225.86%	-2.88%
	2003	83.63%	396.96%	2050.00%	-88.57%	3.78%
	2004	124.65%	39.02%	-33.33%	90.78%	116.96%
Centurion Energy						
	2002	-7.81%	4.98%	100.00%	-6.49%	61.62%
	2003	-12.30%	8.97%	60.00%	-12.72%	209.33%
	2004	108.20%	-13.50%	0.00%	-10.93%	509.71%
Find Energy						
	2002	27.29%	387.37%	-18.75%	-3.35%	-21.41%
	2003	9.60%	-11.95%	-161.54%	-36.63%	28.94%
	2004	-1.52%	6.49%	225.00%	-7.55%	27.89%
Husky Energy						
	2002	-0.97%	20.42%	16.56%	-0.19%	-8.69%
	2003	-3.38%	-1.73%	71.05%	-2.32%	26.88%
	2004	-10.82%	-11.18%	-27.38%	1.19%	20.77%
Imperial Oil						
	2002	-2.57%	N/A	2.89%	-13.55%	-7.74%
	2003	-4.41%	N/A	43.13%	-0.72%	6.18%
	2004	-33.89%	N/A	25.33%	-0.36%	-4.22%
Petro-Canada						
	2002	3.18%	-10.30%	13.61%	15.38%	14.56%
	2003	16.25%	N/A	71.59%	-14.74%	7.49%
	2004	1.94%	N/A	6.33%	6.38%	-32.77%
Shell Canada						
	2002	-26.64%	37.31%	-45.21%	29.78%	-1.59%
	2003	-8.61%	-54.50%	46.00%	-10.74%	2.16%
	2004	-17.47%	22.26%	58.90%	-5.42%	2.71%
Nelson Resources						
	2002	N/A	N/A	-33.33%	44.59%	64.12%
	2003	55.19%	59.54%	50.00%	-15.42%	49.02%
	2004	32.45%	11.98%	100.00%	-17.97%	77.00%

Company	Year	Proved Reserves	Probable Reserves	EPS	Leverage	Abnormal Returns
Oilexco	2002	4.00%	5658.33%	-12.50%	-94.99%	155.79%
	2003	2773.08%	339.40%	0.00%	-54.42%	504.00%
	2004	289.36%	-23.20%	-22.22%	107.14%	203.91%
Viking Energy						
	2002	-6.66%	1.14%	-58.11%	10.90%	17.31%
	2003	26.45%	52.55%	-312.90%	17.03%	-25.98%
	2004	-14.85%	-3.10%	210.61%	-26.23%	7.04%
Provident Energy Trust						
	2002	143.35%	74.99%	106.49%	2.29%	45.16%
	2003	-24.08%	39.24%	54.55%	13.20%	1.49%
	2004	136.69%	138.43%	-44.12%	-16.21%	-17.35%
Petrobank Energy & Resources						
	2002	13.15%	89.00%	-200.00%	14.68%	137.27%
	2003	10.97%	-11.83%	-4800.00%	69.20%	-40.42%
	2004	-4.26%	22.25%	104.08%	-39.24%	-46.56%
Antrim Energy						
	2002	-10.25%	-14.88%	126.32%	-29.10%	-6.23%
	2003	-21.22%	41.91%	-400.00%	-47.01%	-1.78%
	2004	25.60%	-38.54%	-6.67%	107.04%	-42.15%
Emerald Bay Inc.						
	2002	-1.74%	-33.02%	-180.00%	84.33%	-30.88%
	2003	-27.88%	7.04%	-22.22%	-40.82%	51.00%
	2004	43.56%	43.42%	-90.91%	145.69%	-77.99%
Exall Energy						
	2002	N/A	N/A	92.31%	6.13%	-33.10%
	2003	N/A	N/A	210.00%	-67.67%	140.29%
	2004	-21.59%	21.93%	-72.73%	-24.40%	-61.85%
Bison Resources						
	2002	45.68%	70.12%	420.00%	-1.79%	67.12%
	2003	-38.23%	52.10%	-11.54%	3.64%	23.19%
	2004	100.51%	93.18%	17.39%	-1.17%	34.70%
Acclaim Energy Trust						
	2002	74.03%	48.87%	-105.71%	-30.95%	8.51%
	2003	18.01%	-13.64%	3600.00%	0.92%	17.62%
	2004	27.41%	45.85%	-41.43%	1.14%	6.83%

Company	Year	Proved Reserves	Probable Reserves	EPS	Leverage	Abnormal Returns
Crescent Point Energy Trust	2002	739.52%	602.75%	566.67%	10.77%	54.12%
	2003	101.45%	71.48%	257.14%	-5.40%	157.41%
	2004	39.67%	50.88%	118.00%	2.74%	13.15%
Penn West Petroleum						
	2002	3.68%	-0.18%	-36.12%	0.37%	4.94%
	2003	-15.11%	-9.31%	182.41%	-6.89%	-2.54%
	2004	0.72%	12.21%	-39.44%	1.20%	36.14%
Canadian Oil Sands Trust						
	2002	-2.59%	0.36%	83.72%	-6.58%	-6.58%
	2003	58.28%	-30.32%	-17.93%	4.76%	1.34%
	2004	-2.80%	-0.51%	47.04%	-5.14%	22.93%
Enerplus Resources Fund						
	2002	6.94%	-1.75%	-50.91%	-9.77%	15.87%
	2003	-13.53%	-6.41%	78.88%	-14.44%	31.69%
	2004	12.00%	61.09%	-9.72%	21.10%	-7.95%

Appendix B: 2002 Company Data

	Market Cap $	Proved Boe	Probable Boe	Total Debt $	Total Assets $	EPS
Canadian Natural Resources	5,985,000,000	1,497,000,000	294,000,000	8,605,000,000	13,359,000,000	4.46
Compton	591,819,000	82,156,000	21,345,000	583,741,000	823,859,000	0.16
Nexen Inc.	4,211,585,500	853,000,000	331,000,000	5,075,000,000	6,665,000,000	3.30
Baytex Energy Trust	491,373,600	117,180,000	27,981,000	638,073,000	997,760,000	0.85
Suncor Energy	11,086,323,300	358,000,000	1,563,000,000	5,553,000,000	9,011,000,000	1.58
Talisman Energy	22,342,050,000	1,485,000,000	848,000,000	7,515,000,000	12,017,000,000	1.29
Paramount Resources	891,885,000	17,545,000	5,301,000	990,279,000	1,536,384,000	0.16
Pan Ocean Energy	50,907,000	36,700,000	55,000,000	49,197,000	95,351,000	-0.96
Delphi Energy	3,646,400	1,242,000	631,000	2,828,000	21,584,000	-0.31
Rider Resources	21,289,500	2,675,000	460,000	7,215,000	4,003,000	-0.02
Centurion Energy	42,995,970	17,240,000	21,080,000	48,725,000	140,644,000	0.10
Find Energy	29,003,700	5,886,000	2,276,000	48,418,000	79,871,000	0.13
Husky Energy	6,906,430,980	918,000,000	519,000,000	5,497,000,000	10,633,000,000	1.90
Imperial Oil	16,996,332,500	1,747,000,000	N/A	6,656,000,000	12,003,000,000	3.20
Petro-Canada	12,853,548,000	843,000,000	723,000,000	7,663,000,000	13,439,000,000	3.59
Shell Canada	13,579,200,000	197,333,333	103,666,670	4,519,000,000	9,517,000,000	2.00
Nelson Resources	281,395,170	79,499,000	40,000,000	61,346,000	68,560,000	-0.04
Oilexco	4,460,500	104,000	2,764,000	427,000	1,983,000	-0.09
Viking Energy	386,835,050	37,555,000	7,833,000	163,938,000	393,100,000	0.31
Provident Energy Trust	577,586,750	55,146,000	9,355,000	382,506,000	855,285,000	0.22
Petrobank Energy & Resources	168,461,450	9,973,000	7,441,000	37,606,000	150,618,000	-0.01
Antrim Energy	18,044,100	1,051,000	618,000	2,753,000	20,513,000	0.05
Emerald Bay Inc.	1,271,245	226,000	71,000	811,287	1,379,800	-0.036
Exall Energy	6,243,984	N/A	N/A	2,002,870	2,226,553	-0.010
Bison Resources Ltd.	22,283,820	1,920,000	1,002,000	12,399,000	18,777,000	0.26
Acclaim Energy Trust	1,145,870,200	58,300,000	19,800,000	286,652,000	658,411,000	-0.02
Crescent Point Energy Trust	122,695,650	9,134,000	3,324,000	34,576,000	74,669,000	0.14
Penn West Petroleum	2,202,930,000	360,800,000	56,900,000	1,499,400,000	2,792,400,000	2.90
Canadian Oil Sands Trust	44,705,100,000	676,000,000	1,118,000,000	895,000,000	1,852,000,000	4.74
Enerplus Resources Fund	2,325,288,900	288,200,000	84,300,000	889,529,000	2,471,361,000	1.61

Boe = barrel of oil equivalent

Appendix C: 2003 Company Data

	Market Cap $	Proved Boe	Probable Boe	Total Debt $	Total Assets $	EPS
Canadian Natural Resources	8,742,000,000	1,526,000,000	592,000,000	8,637,000,000	14,643,000,000	10.48
Compton	698,535,000	84,627,000	34,136,000	707,414,000	1,064,320,000	0.97
Nexen Inc.	5,893,433,520	811,000,000	724,000,000	5,642,000,000	7,717,000,000	4.63
Baytex Energy Trust	702,146,900	73,030,000	30,606,000	574,464,000	982,640,000	0.62
Suncor Energy	14,663,480,000	878,000,000	952,000,000	6,146,000,000	10,501,000,000	2.24
Talisman Energy	28,231,680,000	1,362,000,000	873,000,000	6,762,000,000	11,780,000,000	2.56
Paramount Resources	628,024,100	50,883,000	16,530,000	681,077,000	1,177,130,000	0.02
Pan Ocean Energy	160,833,400	33,300,000	9,600,000	33,100,000	94,253,000	0.56
Delphi Energy	47,628,000	3,197,000	1,284,000	22,816,000	51,468,000	0.10
Rider Resources	159,172,650	4,912,000	2,286,000	17,191,000	83,506,000	0.39
Centurion Energy	171,007,300	15,120,000	22,970,000	44,917,000	148,744,000	0.16
Find Energy	67,446,600	6,451,000	2,004,000	30,403,000	79,269,000	-0.08
Husky Energy	9,622,700,000	887,000,000	510,000,000	6,035,000,000	11,946,000,000	3.25
Imperial Oil	21,401,792,830	1,670,000,000	N/A	6,792,000,000	12,337,000,000	4.58
Petro-Canada	16,973,601,260	980,000,000	N/A	7,186,000,000	14,774,000,000	6.16
Shell Canada	16,843,750,000	180,333,333	47,166,667	4,075,000,000	9,613,000,000	2.92
Nelson Resources	805,685,490	123,371,000	63,815,000	158,536,000	209,449,000	-0.02
Oilexco	78,244,320	2,988,000	12,145,000	3,304,000	33,823,000	-0.09
Viking Energy	547,253,350	47,488,000	11,949,000	321,253,000	658,474,000	-0.66
Provident Energy Trust	946,689,750	41,868,000	13,026,000	578,781,000	1,142,955,000	0.34
Petrobank Energy & Resources	166,877,200	11,067,000	6,561,000	108,750,000	257,004,000	-0.49
Antrim Energy	34,432,200	828,000	877,000	1,853,000	25,988,000	-0.15
Emerald Bay Inc.	2,354,557	163,000	76,000	739,975	2,126,761	-0.044
Exall Energy	18,309,143	173,800	97,600	1,069,678	3,673,688	0.011
Bison Resources Ltd.	32,799,780	1,186,000	1,524,000	20,120,000	29,410,000	0.23
Acclaim Energy Trust	895,212,000	68,800,000	17,100,000	478,843,000	1,089,700,000	0.70
Crescent Point Energy Trust	255,725,000	18,400,000	5,700,000	91,418,000	208,855,000	0.50
Penn West Petroleum	2,586,729,000	306,300,000	51,600,000	1,655,300,000	3,309,600,000	8.19
Canadian Oil Sands Trust	61,767,500,000	1,070,000,000	779,000,000	2,157,100,000	4,260,000,000	3.89
Enerplus Resources Fund	3,712,633,150	249,200,000	78,900,000	820,758,000	2,661,765,000	2.88

Boe = barrel of oil equivalent

Appendix D: 2004 Company Data

	Market Cap $	Proved Boe	Probable Boe	Total Debt $	Total Assets $	EPS
Canadian Natural Resources	13,744,000,000	1,514,000,000	601,000,000	11,086,000,000	18,410,000,000	5.20
Compton	1,273,282,000	78,558,000	39,114,000	906,533,000	1,330,611,000	0.51
Nexen Inc.	6,292,040,000	843,000,000	807,000,000	9,516,000,000	12,383,000,000	6.09
Baytex Energy Trust	878,793,090	84,439,000	35,258,000	721,665,000	1,104,136,000	0.21
Suncor Energy	19,259,945,600	939,000,000	847,000,000	6,907,000,000	11,804,000,000	2.36
Talisman Energy	36,393,750,000	1,207,000,000	634,000,000	7,577,000,000	12,408,000,000	1.77
Paramount Resources	1,607,409,500	72,910,000	42,319,000	917,747,000	1,542,786,000	0.67
Pan Ocean Energy	544,193,480	29,400,000	29,900,000	45,719,000	137,506,000	0.29
Delphi Energy	182,524,320	6,761,000	3,198,000	82,797,000	171,947,000	0.07
Rider Resources	414,213,500	11,035,000	3,178,000	56,536,000	143,975,000	0.26
Centurion Energy	1,247,383,200	31,480,000	19,870,000	48,554,000	180,657,000	0.16
Find Energy	137,186,780	6,353,000	2,134,000	41,187,000	116,054,000	0.10
Husky Energy	14,590,500,000	791,000,000	453,000,000	6,760,000,000	13,238,000,000	2.36
Imperial Oil	25,388,739,100	1,104,000,000	N/A	7,705,000,000	14,027,000,000	5.74
Petro-Canada	15,901,997,880	999,000,000	N/A	9,361,000,000	18,100,000,000	6.55
Shell Canada	21,997,250,000	148,833,333	57,666,667	4,377,000,000	10,906,000,000	4.64
Nelson Resources	1,939,581,000	163,400,000	71,458,000	302,463,000	487,228,000	0.00
Oilexco	341,230,120	11,634,000	9,327,000	29,836,000	147,112,000	-0.11
Viking Energy	750,046,500	40,437,000	11,578,000	221,153,000	614,118,000	0.73
Provident Energy Trust	1,617,109,620	99,097,000	31,058,000	768,613,000	1,813,582,000	0.19
Petrobank Energy & Resources	138,638,560	10,595,000	8,021,000	52,732,000	205,392,000	0.02
Antrim Energy	37,907,520	1,040,000	539,000	5,160,000	35,124,000	-0.16
Emerald Bay Inc.	2,107,495	234,000	109,000	2,526,351	2,954,212	-0.084
Exall Energy	13,568,301	136,280	119,000	1,093,719	4,967,446	0.003
Bison Resources Ltd.	54,476,700	2,378,000	2,944,000	26,770,000	39,576,000	0.27
Acclaim Energy Trust	1,491,552,000	87,660,000	24,940,000	690,930,000	1,555,900,000	0.41
Crescent Point Energy Trust	493,705,000	25,700,000	8,600,000	178,770,000	397,318,000	1.09
Penn West Petroleum	4,271,575,000	308,500,000	57,900,000	1,958,500,000	3,867,400,000	4.96
Canadian Oil Sands Trust	68,975,000,000	1,040,000,000	775,000,000	2,431,800,000	5,068,000,000	5.72
Enerplus Resources Fund	4,539,806,400	279,100,000	127,100,000	1,184,834,000	3,180,748,000	2.60

Boe = barrel of oil equivalent