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An Examination of the Effect of Financial Risk on the Manager's Choice of Accounting Methods.

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AN EXAMINATION OF THE EFFECT OF
FINANCIAL RISK ON THE MANAGER'S
CHOICE OF ACCOUNTING METHODS

A Dissertation

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ABSTRACT

This study examines the effect of the firm's level of
financial risk on management's preference for full-cost or
successful-efforts accounting in the oil and gas industry.
Agency theory predicts that firms with increasing levels of
financial risk have an incentive to switch to an accounting
method which tends to increase net tangible assets and
which creates more stable earnings in order to avoid
technical default on loan covenants. Therefore, it is
expected that successful-efforts firms with increasing
levels of financial risk will tend to switch to use the
full-cost accounting method.

Past studies have used leverage as a surrogate for
financial risk, but it is argued in this study that
leverage is not necessarily a good surrogate in the oil and
gas industry. Instead, a variable, debt beta, is developed
which represents a market assessment of financial risk. An
informationally efficient market considers other factors
besides leverage in assessing financial risk, and these
factors are reflected in the debt beta.

The empirical results indicate that firms switching to
the full-cost accounting method experience an increase in

financial risk prior to the change, while firms changing to the successful-efforts method have stable financial risk. Unlike previous studies that used leverage variables as surrogates for financial risk, it cannot be concluded from this study that the financial risk level of full-cost firms is greater than that of successful-efforts firms. Nor can it be generally concluded that the financial risk level of nonchange firms change over time.

More importantly, the results of this study indicate that the debt beta does not always behave in the same manner as leverage variables. These results provide evidence that leverage may not be a good surrogate for financial risk in the oil and gas industry.

CHAPTER 1

INTRODUCTION

This study analyzes the effect of the level of firm
financial risk on management's choice of accounting method
in an oil and gas environment.

Several empirical studies have examined the effect of
certain variables on management's choice of accounting
method [Watts and Zimmerman, 1978; Deakin, 1979; Dhaliwal
et al., 1980]. Variables examined include management
compensation plans, political costs, taxes, regulation, and
leverage on management's choice of accounting method.
However, no study has examined the effect of the level of
financial risk on accounting method choice.

Due to the existence of debt covenants based on
accounting figures, the level of firm financial risk can be
used to explain management's choice of accounting method.
This relationship is especially important to identify in
the context of oil and gas accounting where a strong lobby
exists against the abolition of the full-cost accounting
method.

This study examines the relationship between financial
risk and choice of oil and gas accounting method. Chapter
One provides an overview of the study. First, the oil and

gas environment is discussed. Second, the contribution of this research is considered. Third, the theoretical support for the study is examined. Fourth, the research questions are addressed, and finally, a summary of the research methodology which is used in answering the questions is presented.

The Oil and Gas Environment

The full-cost method of accounting was introduced in the mid-1950s. By 1970, this method had been adopted by approximately one half of all publicly held oil and gas producers, most of which were classified as independent producers [Dehne, 1983, p. 55]. The full-cost method capitalizes all pre-production exploration, acquisition, and development costs regardless of whether the activities result in a discovery. The successful-efforts method, on the other hand, capitalizes these costs only when there is a direct relationship between the costs incurred and specific oil and gas reserves discovered. Thus, the successful-efforts method expenses the cost of a dry hole, while the full-cost method capitalizes these costs and charges them against future production.

It is important to recognize that the amount of taxes paid is not affected by the choice of full-cost or successful-efforts accounting. In this vein, for tax purposes integrated oil companies may deduct 70 percent of their intangible drilling costs in the period inc rred (80

percent prior to the Tax Reform Act of 1986 (TRA '86)).
The remaining 30 percent (20 percent prior to TRA '86) must
be capitalized and amortized over 60 months (36 months
prior to TRA '86). Tangible costs are depreciated using
the accelerated cost recovery system (ACRS) [IRC : 168].

The Arab oil embargo of 1973 prompted Congress to pass
the Energy Policy and Conservation Act of 1975. This Act
required the Securities and Exchange Commission (SEC) to
establish standardized accounting practices for the oil and
gas industry by December 1977. The provisions of the Act
allowed the SEC to delegate its responsibility for the
development of uniform accounting standards to the
Financial Accounting Standards Board (FASB), provided that
the SEC was certain that oil and gas companies would comply
with FASB standards [Stanger, 1979, p. 154].

The FASB responded by issuing the Exposure Draft of the
Statement of Financial Accounting Standards Number 19 (SFAS
19) in July 1977 which mandated the use of the
successful-efforts method of accounting [FASB, 1977]. The
FASB reasoned that the successful-efforts method is
consistent with the conceptual framework project which
defines an asset as an economic resource that is expected
to provide future benefits [FASB, 1977]. Because a dry
hole would not provide future economic benefit, its costs
should not be capitalized.

Following issuance of the Exposure Draft of SFAS 19 in

July 1977, there was an outcry from small independent
producers who claimed that a switch to the successful-
efforts method of accounting would damage their ability to
raise capital. These producers received substantial
support for their position. One major public accounting
firm, Touche Ross and Company, concluded that a mandated
switch to successful-efforts accounting would impair the
ability of these firms to raise capital [Collins and Dent,
1983, p. 6]. Also, the Federal Trade Commission's Bureau
of Competition filed a comment with the SEC because it too
believed that a mandated change of accounting method would
limit the ability of affected independent producers to gain
financing. The FTC felt that the change would cause many
independent producers to eliminate high risk exploration
activities completely, which would be detrimental to the
development of our nation's resources [Randall, 1978,
p. 9].

In Accounting Series Release Number 253, issued in
August 1978, the SEC yielded to political pressure and
rejected mandatory use of the successful-efforts method of
accounting. Instead, it called for the development of a
new method of oil and gas accounting, reserve recognition
accounting (RRA), which was to be a type of value-based
accounting (SEC, 1978]. RRA was abandoned in February
1981, because of the inability of oil and gas companies to
predict the present value of their future reserves [Katz,

1985 p. 118]. The use of both full-cost and successful-efforts accounting continues to be allowed to date.

In opposing SFAS 19, independent oil and gas producers have contended that their ability to obtain financing for new projects would be impaired. If, in fact, these producers' ability to raise capital had been impaired, their stock prices should have been affected negatively following the issuance of SFAS 19. Several studies have tested for the existence of a negative stock price reaction for full-cost firms following the issuance of SFAS 19 [Collins et al., 1981; Larcker and Revsine, 1983; and Lys, 1984]. This negative stock price reaction has been referred to as a debt effect associated with a mandatory change to successful-efforts accounting. It is called a debt effect because of the belief by these firms that their ability to obtain debt financing in the future would be impaired. Both the Collins, Rozeff and Dhaliwal [1981] and the Lys [1984] studies provide evidence of the existence of such a debt effect. The possible presence of a debt effect suggests that managers of firms with high levels of financial risk choose to use the full-cost accounting method, and that the debt effect could be a reason for their doing so.

Several studies have attempted to identify the differentiating attributes of firms using full-cost and successful-efforts accounting. These studies generally

have found that full-cost firms tend to be smaller, more
highly levered, and more aggressive in their exploration
activities than successful-efforts firms [Deakin, 1979;
Dhaliwal, 1980; Foster, 1980; and Lilien and Pastena,
1982].   Attributes of successful-efforts firms that
switched to the use of full-cost accounting were examined
by Johnson and Ramanan [1988] who found that such firms
exhibit higher levels of financial leverage and exploration
activity than firms retaining the successful-efforts
method.

The Current State of Affairs

The debate concerning the need for a uniform method of
accounting in the oil and gas industry has continued to
date.   Clarence Sampson, former chief accountant of the SEC
and current member of the FASB, believes that the full-cost
method of accounting should be abolished.   He contends that
a uniform accounting method in the oil and gas industry
would make financial statements more comparable and would
eliminate periodic abuses of the full-cost method.
Independent producers once again are lobbying against such
a change.   They warn that the change would cause many
companies to go into technical default on their lending
agreements.   Even Congress, prompted by oil industry
lobbyists, has asked the SEC not to eliminate full-cost
accounting [Ingersoll, 1986].

The FASB has recognized the importance of comparability

to the decision usefulness of information in the <u>Statement</u>

<u>of Financial Accounting Concepts No. Two</u>:

> Information about an enterprise gains greatly
> in usefulness if it can be compared with similar
> information about other enterprises and with
> similar information about the same enterprise
> for some other period or some other point in
> time. Investing and lending decisions essentially
> involve evaluations of alternative opportunities,
> and they cannot be made rationally if comparative
> information is not available (FASB, 1980, par. 111).

Financial statements of firms using the full-cost and

successful-efforts methods are not directly comparable

because the net income, asset, and equity amounts differ

significantly due to the accounting method used.

Therefore, the usefulness of the information provided by

these statements is greatly reduced.

<div align="center">Significance of the Study</div>

Both the FASB and the SEC need to understand why so

many independent producers oppose the elimination of

full-cost accounting. To do this, they need to understand

why managers choose the accounting methods they use. In

particular, any definite relationship between financial

risk and choice of method needs to be brought to light.

Past studies have shown that full-cost firms tend to be

more highly levered than successful-efforts firms (Deakin,

1979; Dhaliwal, 1980; Foster, 1980; Lilien and Pastena,

1982; and Johnson and Ramanan, 1988). However, leverage is

not necessarily directly related to financial risk. For

example, firms with high amounts of leverage but stable

cash flows could have a lower level of financial risk than other firms. The market assesses the firm's level of financial risk based on other factors in addition to the amount of leverage. This study includes a variable which estimates financial risk based on stock market data. This variable reveals the true financial risk of the firm as perceived by an efficient market.

Theoretical Support

Agency Theory

Agency theory serves as a powerful explanation for the existence of complex financial contracts and optimal capital structures. An essential characteristic of the modern corporation is the delegation of decision-making authority from securityholders to professional managers. Agency problems arise when conflicts of interests occur between agents (managers) and principals (existing stockholders). The existence of agency problems is normally based on two fundamental behavioral assumptions. First, individuals are assumed to act so as to maximize their own personal welfare, and second, individuals are assumed to be rational and have unbiased expectations regarding the impact of agency on the future value of their wealth (Barnea et al., 1985, pp. 25-26).

There are five broad classes of agency problems in finance. These are on the job perquisite consumption, the risk incentive, the investment incentive, bankruptcy costs,

and informational asymmetry [Barnes et al., 1985, p. 3].

A. On the Job Perquisite Consumption - As the owner-manager sells equity shares and the fraction of his equity falls, his fractional claim on the outcomes also falls; and this, in turn, will encourage him to appropriate larger amounts of corporate resources in the form of perquisites. Prospective minority shareholders realize the owner-manager's incentive for perquisites and will, therefore, pay less for shares in order to reflect an increase in monitoring expenditures by them. This increases the cost to the owner of obtaining additional capital in the equity markets. The increase in the cost of new equity is an agency cost [Jensen and Meckling, 1976].

B. The Risk Incentive - In the option pricing framework of Black and Scholes [1973], equity can be considered a European-type call option to buy back the entire firm from the debtholders at maturity. Because the value of the call increases with the variance of the returns of the underlying assets, stockholders have an incentive to invest in high risk projects. Rational debtholders anticipate this risk shifting problem and raise the interest rates at which they will lend capital to the firm in order to compensate them for the risk that the firm will not be able to meet its fixed payments due to undertaking high risk projects. Consequently, the stockholders appear to bear this agency cost [Galai and

Masulis, 1976].

C. <u>Investment Incentive</u> - Stockholders may prefer
to reject positive net present value projects if the
benefits are enjoyed primarily by the debtholders. This
occurs when the market value of the project is not
significantly greater than the debt obligation.
Stockholders do not receive the full benefit of the
investment opportunities because they partially accrue to
debtholders in the form of a reduction in the probability
of default [Myers, 1977].

D. <u>Bankruptcy Costs</u> - Bankruptcy is not costless
and may contribute significantly to agency costs because
debtors will demand a higher interest rate for bearing
bankruptcy costs uncertainty. The increased cost of debt
is borne by equityholders [Barnea et al., 1985, pp. 37-38].

E. <u>Informational Asymmetry</u> - In an imperfect
market, information is not costless and available to
everyone. Management may possess information about the
firm's projects which is unavailable to the market. If the
information can be revealed efficiently to the market, then
the market will value the firm's projects at a fair price.
Otherwise, the market may undervalue or, at times,
overvalue the firm. The amount by which a firm is
undervalued is the agency cost of informational asymmetry
[Barnea et al., 1985, p. 38].

Agency costs can be divided into two components: the

agency cost of debt and the agency cost of equity. Both on
the job perquisite consumption and informational asymmetry
costs are associated with equity, while the agency costs
associated with debt include those associated with equity
plus costs associated with the risk incentive, investment
incentive, and bankruptcy. The agency costs of debt are at
a maximum when all outside funding is in the form of debt,
and equity costs are at their peak when all outside funding
is in the form of equity. When the marginal agency costs
of issuing additional debt and equity are positive, these
costs can be added to produce a total agency cost curve
which is U shaped and offers a minimum agency cost solution
which determines the optimal capital structure [Jensen and
Meckling, 1976, p. 344].

If capital markets are efficient and are characterized
by rational expectations, then the prices of all securities
will reflect the relevant agency costs. Thus, the
owner-manager will get less when selling new shares on the
market and will incur higher interest rates when borrowing
funds so that the owner-manager will bear the agency costs.
Therefore, the owner-manager will attempt to find the
optimal mix of debt and outside equity so as to minimize
these costs.

The Existence of Debt Covenants

Because debtholders have rational expectations, they
recognize that stockholders have an incentive to make

decisions which transfer wealth from the debtholders to the
equityholders. Hence, debtholders will invest in various
types of covenants and monitoring devices in order to
protect their wealth. Such covenants protect the
debtholders in serving as a disincentive for management to
engage in high-risk activities on behalf of stockholders
[Smith and Warner, 1979]. However, the costs of writing
and enforcing such covenants are also significant and are
themselves agency costs.

When debt covenants go into technical default, agency
costs increase greatly because amendments need to be made
to the covenants, and these amendments are costly to
secure. Public debt may be more difficult to renegotiate
but the cost of renegotiation with private lenders is not
costless. For example, the lender may require a new higher
interest rate, especially if interest rates have changed
substantially since issuance of the debt [Watts and
Zimmermann, 1986, p. 215].

Firms which are approaching technical default on their
debt covenants have high financial risk. The managers of
these firms will attempt to minimize agency costs in order
to maximize firm value; they will choose acceptable
accounting methods which serve to reduce the possibility of
technical default. Choice of accounting method can affect
the possibility of technical default, because as shown by
Fogelson [1978], covenants normally include provisions

based on accounting numbers which are defined with reference to generally accepted accounting principles (GAAP). Evidence is provided by Smith and Warner [1979] that debt agreements usually specify the use of GAAP but do not detail how to compute the accounting numbers.

Debt covenants that use accounting numbers are designed to restrict activities which would result in a transfer of wealth from debtholders to equityholders. Both Leftwich [1980] and Smith and Warner [1979] describe provisions normally included in debt covenants. Their descriptions are based on observations from the American Bar Association's Commentaries on Indentures, which is a compendium of typical covenants found in lending agreements. These provisions include dividend and share repurchase restrictions, maintenance of working capital, restrictions on merger activity, restrictions on investments in other firms, restrictions on the disposition of assets, and restrictions on additional debt.

Based on agency theory, managers of firms with high financial risk will tend to choose accounting methods which increase net income and net tangible assets because these methods will decrease the possibility of technical default. Managers of firms with low financial risk will not have the same incentive to choose these accounting methods, but will do so if recordkeeping is easier when these methods are used.

Positive Accounting Theory

The objective of positive accounting theory is to explain and predict accounting practice. The theory is important because it can provide those who make decisions regarding accounting policy (regulators, financial analysts, investors, loan officers, public accountants, corporate managers) with predictions of, and explanations for, the consequences of their decisions. It is assumed that all decision makers will attempt to maximize their own utility [Watts and Zimmerman, 1986, p.3].

Positive accounting theory proposes that because debt covenants are usually defined by reference to GAAP, managers of firms with large amounts of debt will oppose those accounting standard changes that would reduce reported earnings or net tangible assets. This follows from the fact that the probability of a firm having to obtain costly amendments to debt covenants increases when leverage increases. The theory identifies an empirically testable hypothesis involving the effect of leverage on a manager's choice of accounting method:

> The debt/equity hypothesis: The larger a firm's debt/equity ratio, the more likely the firm's manager is to select accounting procedures that shift reported earnings from future periods to the current period [Watts and Zimmerman, 1986, p. 216].

Leverage is often used as a surrogate for financial risk, although it is not necessarily equivalent to

financial risk. For example, some highly levered firms may have stable cash flows that cover their costs of debt while other firms with a small amount of leverage may have great variability in their cash flows. In this case, the firm with the small amount of leverage actually may have a greater probability of payment default due to the instability of its cash flows. The debt/equity hypothesis, therefore, may be restated to predict that firms with high financial risk would choose accounting methods which increase current earnings.

The Banking Environment

Through informal talks with several banking leaders in Louisiana and Texas,[1] some interesting aspects of their concerns regarding oil and gas loans were revealed. Most notably, it was found that while financial ratios, primarily those dealing with net worth, are used in oil and gas loan covenants, they are not as important to bankers as such ratios are in other industries. In the oil and gas industry, the bankers' primary concern is with proven

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[1] The bankers spoken to are executives with banks in Houston and Dallas, Texas, and in Shreveport and Baton Rouge, Louisiana. Three of the bankers hold the position of Executive Vice-President of the Energy Division, while two bankers hold the position of Senior Vice-President of Loans.

developed producing reserves.   Provisions concerning these

reserves are included in loan covenants.   The covenants

normally do not require that particular accounting methods

be used and do allow firms to change methods, as long as

the methods used are in accordance with GAAP.   Thus, firms

using successful-efforts accounting possibly could avoid

technical default by switching to use of the full-cost

method.   Bankers do not see this as a major problem since

their main concern is with the amount of proven developed

producing reserves.

However, all of the bankers spoken to stated that when

a company is in technical default on their covenants based

only on financial ratios, some form of action always will

be taken.   When a company enters technical default, its

financial position is scrutinized by the bank in order to

determine the extent of its problems.   If the default

appears to be of a self-correcting nature, the company may

be granted a cure period during which to correct the

default.   If the default is not corrected, the loan may be

renegotiated at a higher interest rate, extra fees could be

imposed on the borrower, or future credit may be limited or

cut off by the bank.   At a very minimum, in the case of a

minor technical default, the bank talks to the firm's

management, admonishing them of the possibility of

penalties if the severity of the "default" should become

more pronounced.   Therefore, the possibility of technical

default is a real threat to the corporate manager, since penalties could be imposed on the manager's firm by the bank.

Conversations with banking leaders revealed that they tend to utilize the financial ratio provisions of loan covenants as a means of maintaining a position of control over the borrowing firms In actuality, however, their main concern is really with the reserves reports.

As stated before, past studies of the oil and gas industry have associated the amount of firm leverage through the use of leverage ratios with financial risk (Deakin, 1979; Dhaliwal, 1980; Foster, 1980; Lilien and Pastena, 1982; and Johnson and Ramanan, 1988]. However, in practice bankers evaluate financial risk based primarily on reserves reports of the company. They are much less concerned with financial ratio analysis in the oil and gas industry than they normally would be in dealing with other industries. Therefore, the use of a leverage ratio as a surrogate for financial risk may not be as appropriate for the oil and gas industry. Instead, a variable which measures financial risk based on market data may be a better measure of financial risk. This study introduces such a variable. In an efficient market, reserves figures are taken into account when assessing financial risk.

Research Questions

As discussed earlier, when debt covenants go into

technical default, the corporate manager feels threatened
since penalties could be imposed on the firm by the bank.
Because the full-cost accounting method serves to increase
reported earnings and net tangible assets presented in the
financial statements while not affecting cash flows, and
because debt covenants are based in part on these
accounting figures, use of this method tends to reduce the
possibility of technical default on debt covenants. Thus,
managers of firms with high levels of financial risk should
prefer to use the full-cost accounting method in order to
reduce the possibility of technical default on debt
covenants. This leads to the main research question
addressed by this study:

> Does the level of firm financial risk (not only
> leverage) affect the manager's choice of full-cost or
> successful-efforts accounting in the oil and gas
> industry?

In order to answer this general question, four specific
questions are identified.

(1)   Is the level of financial risk of firms using
      the full-cost method higher than that of firms
      using the successful-efforts method?

(2)   Do firms which switch to the full-cost method
      experience an increase in financial risk
      prior to the change?

(3)   Do firms which switch to the successful-efforts
      method experience a decrease in financial risk
      prior to the change?

(4)   Is the level of financial risk of firms which
      do not change methods relatively stable over
      time?

Research Hypotheses

The research questions were answered through use of the following hypotheses:

Hypothesis 1

Null: The level of financial risk of firms using the successful-efforts method is at least as great as the financial risk level of firms using the full-cost method.

Alternate: The average financial risk of firms using the full-cost method is greater than that of firms using the successful-efforts method.

Separate samples were taken of firms having public debt and of those having only private debt.

Although a great deal of switching of accounting methods is not observed within the oil and gas industry, some firms have decided to change accounting methods. If financial risk is related to choice of accounting method, then it would be expected that firms that switch to full-cost accounting experience an increase in financial risk preceding the change. On the other hand, firms that switch to the successful-efforts method may experience a decrease in financial risk. This leads to the next two hypotheses:

Hypothesis 2

Null: The level of financial risk, preceding the time of the change, of firms switching to the full-cost accounting method decreases or is stable.

Alternate: Firms switching to full-cost accounting

experience an increase in financial risk
prior to the change.

Hypothesis 3

Null: The level of financial risk, preceding
the time of the change, of firms switching
to the successful-efforts accounting method
increases or is stable.

Alternate: Firms switching to successful-efforts
accounting experience a decrease in
financial risk prior to the change.

That most firms do not switch accounting methods
indicates that their level of financial risk may remain
relatively stable over time. This leads to the final two
hypotheses:

Hypothesis 4

Null: There is no difference in the level of
financial risk over time for firms which
use the full-cost method and which do not
switch accounting methods.

Alternate: There is a difference in the level of
financial risk over time for firms which
use the full-cost method and which do not
switch accounting methods.

Hypothesis 5

Null: There is no difference in the level of
financial risk over time for firms which
use the successful-efforts method and which
do not switch accounting methods.

Alternate: There is a difference in the level of
financial risk over time for firms which
use the successful-efforts method and which
do not switch accounting methods.

Methodology Overview

The Sample

The sample was selected from the 1986 Oil and Gas

Journal's OGJ 400 which ranks the top 400 oil and gas entities by total assets and revenue on a yearly basis. Only companies with primary SIC codes of 1310 or 1311 were included as potential sample firms because these firms deal primarily in the exploration and production of oil and natural gas.

Of the remaining entities, only corporations for which data was available were used in the sample. The ranking includes many trusts and partnerships that are not of interest in this study since the concern herein is with the behavior of the corporate manager. The period examined in this study is 1977 through 1986, which is the ten year period ending with the latest year for which the Oil and Gas Journal's OGJ 400 ranking is available. The entities remaining were divided into firms which had not switched between full-cost and successful-efforts accounting during the 1977-1986 time period, and those firms that had switched methods during the period. In turn, the firms that switched methods were divided into those changing to full-cost and those changing to successful-efforts accounting. All change and nonchange firms were then separated into firms that issue public debt and those which place only private debt. Only one change firm was both integrated and had public debt, so it was eliminated from the study since it may not be comparable to firms with only private debt.

The Variables

Four measures of financial risk are analyzed and compared in this study. The measures consist of three variables representing leverage and a variable representing the firm's debt beta.

A. The Leverage Variables - Financial risk is an indicator of the probability that a firm will not be able to meet the required interest and principal payments on its debt. Therefore, a firm's financial risk usually increases as the amount of debt it holds rises. Because of this, leverage is often used as a surrogate for financial risk.

Dhaliwal (1980) tested for differences in the leverage of full-cost versus successful-efforts firms by comparing their debt to equity ratios. Significant differences in leverage were found, but because equity is affected by accounting method, these differences could have been due to the use of accounting equity in the variable measuring financial risk. The first leverage variable used in this study is the debt to equity ratio using book values. This variable is included as a means of comparing the results of the tests to prior research.

In order to avoid the problem caused by using the book value of equity, the second leverage variable in this study is the debt to equity ratio using the market value of equity. The third leverage variable, the debt to revenue ratio, is examined because revenue is not affected by

choice of full-cost or successful-efforts accounting. This measure indicates the degree of leverage used to generate the firm's level of revenue. For purposes of both the second and third leverage variables, the market values of debt are used for firms issuing public debt while the book values of debt are used for firms placing only private debt.

B. **The Variable Utilizing Betas** - The stock beta, which is also called the equity beta, depends on both the business risk of the assets held by the firm and the level of financial risk of the firm. Because borrowing while maintaining a fixed amount of equity increases the risk of the equityholder, the beta for the stock of a levered firm should be greater than the beta for the stock of an otherwise identical unlevered firm [Hamada, 1969].

A firm's asset beta reflects the business risk of the firm's existing assets. As the firm issues debt, its common stock becomes riskier, thereby increasing the firm's equity beta above its asset beta. The weighted difference between the firm's equity and asset betas reflects the firm's financial risk. This risk increases as debt increases [Brealey and Myers, 1984, pp. 173-174].

The firm's equity beta can be computed by examining how the price of the stock has responded in the past to market movements. The regression model used to estimate the firm's equity beta is referred to as the stock's

characteristic line with the market portfolio [Reilly, 1985, p. 253]. This is a line of best fit through a scatter plot of rates of return for the stock and for the market portfolio of stocks over some past time period. In the current study, 78 weekly observations were used to estimate the equity betas. An equally weighted index of the New York Stock Exchange and the American Stock Exchange was used to represent the market portfolio.

An asset beta reflects business risk, and is equal to the equity beta for firms with no debt since these firms do not have financial risk associated with leverage [Brealey and Myers, 1984, p. 177]. Therfore, an average of the equity betas of firms with no debt can be used as a surrogate for an industry-wide asset beta reflecting the risk of holding crude petroleum. In this study, firms with market value based debt to equity ratios of less than .05 were considered as entities with no debt in their capital structure. In most cases, the very small amount of debt held by these firms was of a short-term nature and was comprised of trade payables.

Several empirical studies have found that extractive industries have strong industry components in their stock movements [Gaumnitz, 1970; Meyers, 1973; and Livingston, 1977]. Therefore, it is reasonable to assume a constant asset beta for the industry as a whole. This asset beta can then be used in the equation estimating the firm's debt

beta based on the weighted difference between the equity and asset betas.

Comparison of Financial Risk Variables

The theory underlying each variable of financial risk is somewhat different. The debt to revenue ratio and the debt to equity ratios all measure financial leverage and assume that leverage is a good surrogate for financial risk. As stated before, other factors affect financial risk, and in fact, bankers base their assessment of financial risk mainly on reserves reports. Therefore, a measure of financial leverage may not be as good a surrogate for financial risk in the oil and gas industry as in other industries.

The variable which estimates a debt beta has not been used in previous studies. The variable utilizes market data to estimate an equity beta and an asset beta, from which a debt beta is estimated by taking the difference between the weighted asset and equity betas. This debt beta reflects financial risk. An unlevered firm's asset and equity betas are equal, so that for levered firms, any difference between these weighted betas must be due to the use of leverage. Since this variable is based purely on market data, all factors considered by an efficient market in assessing financial risk, including reserves reports and the variability of cash flows, is reflected in the debt beta.

Test of Hypothesis 1

The first hypothesis is used to determine if the level of financial risk of firms using the successful-efforts method is at least as great as the level of financial risk of firms using the full-cost accounting method for firms which did not switch methods over the test period of 1977 through 1986. Separate tests were made for the sample of firms holding public debt and the sample of firms holding only private debt. The four measures of financial risk were computed for each member of the samples using recent data through 1986.

A one-tailed t-test was used to test the null hypothesis that the level of financial risk of firms using the successful-efforts method is at least as great as the financial risk level of firms using the full-cost method for each measure of risk. When the variables were not normally distributed, a Wilcoxon rank sum test was employed.

Test of Hypothesis 2

In order to measure the change (if any) in the level of financial risk for firms identified as switching to the full-cost method during the period 1977 through 1986, the four measures of financial risk were computed at two times: five years and one year preceding the accounting change. For each firm, the level of financial risk five years preceding the change was matched with the risk level one

year preceding the change. Descriptive statistics were
used because only seven firms all with private debt
comprised the population of firms switching to the
full-cost method.

Test of Hypothesis 3

In order to measure the change (if any) in the level of
financial risk for firms identified as switching to the
successful-efforts method during the period 1977 through
1986, the four measures of financial risk were computed at
two times: five years and one year preceding the
accounting change. For each firm, the level of financial
risk five years preceding the change was matched with the
risk level one year preceding the change. Descriptive
statistics were once again used because there were only
seven firms with private debt in the population of firms
switching to the successful-efforts method.

Test of Hypothesis 4

For full-cost firms that did not switch methods over
the test period, the four measures of financial risk were
computed for both the years 1977 and 1986. Separate
samples were taken for firms having public debt and those
having only private debt. The null hypothesis that there
is no difference in the level of financial risk over time
for the firms was tested using the matched-pairs two-tailed
t-test for each measure of financial risk for each sample.
Again, when the variables were not normally distributed,

Wilcoxon matched-pairs two-tailed signed-ranks tests were
employed.

Test of Hypothesis 5

For firms using the successful-efforts method that did
not change accounting methods over the test period, the
four measures of financial risk were computed for both the
years 1977 and 1986. Again, separate samples were taken
for firms having public debt and for firms having only
private debt. The null hypothesis that there is no
difference in the level of financial risk over time for the
firms was tested using the matched-pairs two-tailed t-test
for each measure of financial risk for each sample. When
the variables were not normally distributed, Wilcoxon
matched-pairs two-tailed signed-ranks tests were employed.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews prior research related to the methods of accounting for pre-production exploration and development costs in the oil and gas industry. The chapter begins with a brief discussion of the history of full-cost and successful-efforts accounting. Next, the empirical research concerning the presence of a debt effect associated with the mandatory use of the successful-efforts accounting method is summarized. Third, a review of empirical research on the differentiating attributes of firms using the full-cost and successful-efforts methods is presented. As indicated in Chapter One, the results of this research has been regarded as evidence that full-cost firms have higher levels of financial risk than successful-efforts firms. A possible explanation of why this may be an incorrect interpretation of the results is discussed in the final section of the chapter.

Historical Perspective

The full-cost method of accounting was introduced in the mid-1950s, and, by 1970, about one half of all publicly held oil and gas producers had adopted this method [Dehne,

1983, p. 55]. The accepted use of both methods was not questioned until the Arab oil embargo of 1973 prompted Congress to pass the Energy Policy and Conservation Act of 1975. The Act required the SEC to establish standardized accounting practices for the oil and gas industry by December 1977. The SEC turned to the FASB who responded by issuing the Exposure Draft of the Statement of Financial Accounting Standards Number 19 (SFAS 19) in July 1977 which mandated the use of successful-efforts accounting [FASB, 1977].

Following issuance of the Exposure Draft of SFAS 19 in July 1977, there was an outcry from independent producers who claimed that a mandated change to the successful-efforts method of accounting would impair their ability to raise capital. These producers received substantial support for their position. One source of support came from investment banking firms. For example, E.F. Hutton and Company stated:

> Requiring companies that use full-cost accounting to switch to successful-efforts accounting will strip those companies of hundreds of millions of dollars of equity and will substantially reduce their earnings. This will reduce the ability of these companies to compete for new debt and equity capital at a time when the industry needs unprecedented amounts of capital for exploration and development [Collins et al., 1978, p. 49].

Also, the Federal Trade Commission's Bureau of Competition filed a comment with the SEC in which it opposed SFAS 19 because it felt that the mandated use of

successful-efforts accounting would limit the ability of independent producers to gain financing. The FTC felt that this would cause independent producers to eliminate high risk exploration efforts completely which, in turn, would be detrimental to the development of our nation's resources [Randall, 1978, p. 9].

Accounting Series Release Number 253, issued by the SEC in August 1978, succumbed to political pressure and rejected the mandatory use of successful-efforts accounting. It called for the development of a new method of oil and gas accounting. This method, termed reserve recognition accounting (RRA), was based on the present value of the companies' reserves. Because of the inability of oil and gas companies to predict the present value of their future reserves, RRA was abandoned in February 1981. The use of both full-cost and successful-efforts accounting continues to date.

The debate concerning the need for a uniform method of accounting in the oil and gas industry is ongoing. Clarence Sampson, former chief accountant of the SEC and current member of the FASB, believes that the full-cost method of accounting should be abolished. In his opinion, dry hole costs should not be capitalized because they provide no future economic resources to the firm. Independent producers continue to lobby against such a change. They warn that the change would cause many

companies to go into technical default on their loan
covenants. Two cabinet members, interior Secretary Donald
Hodel and Energy Secretary John Herrington, took the
unusual step of urging the SEC not to eliminate the use of
full-cost accounting, warning that it would stifle energy
exploration [Ingersoll, 1986, Sec. 1, p. 9].

Studies Testing the Debt Effect of the Mandatory Use of Successful-Efforts Accounting

Independent producers oppose the abolition of full-cost
accounting because they believe that their ability to
obtain financing, primarily from banks, would be impaired.
This belief suggests the existence of a debt effect
associated with the mandatory use of successful-efforts
accounting. Several studies, which are outlined below,
have tested for the existence of a debt effect associated
with SFAS 19.

Collins, Rozeff, and Dhaliwal [1981]

Collins et al. tested for the existence of a debt
effect associated with SFAS 19 by testing the hypothesis
that full-cost firms with loan covenants defined in terms
of reported accounting numbers experienced greater negative
abnormal security returns as a result of SFAS 19 than did
those full-cost firms without such covenants.

The authors also tested the hypothesis that full-cost
firms with management compensation plans written in terms
of accounting numbers would experience lower returns than

firms without such plans following the issuance of SFAS
19.   Because only three firms in the sample with such
compensation plans did not also have loan covenants, a
joint variable was operationalized through the use of a
dummy variable wherein firms with either debt covenants or
management compensation plans defined in terms of
accounting numbers were assigned a one, while other firms
were assigned a zero.

A multiple regression based on six variables was
performed.   The variable included (1) the percentage change
in total stockholder equity resulting from implementation
of SFAS 19, (2) the debt/equity ratio, (3) the proportion
of revenues devoted to exploration and production, (4) the
possession of public versus private debt, and (5) the size
of the firm in addition to the dummy variable defined
above.   The regression utilized returns for a two week
period surrounding issuance of the Exposure Draft of SFAS
19 in July 1977.

The variable defined by the existence of a debt
covenant or a management compensation plan written in terms
of accounting numbers did prove to be significant along
with the variables for the percentage change in
stockholders' equity and firm size.   Collins et al.
concluded that full-cost firms with either debt covenants
or management compensation plans tied to accounting numbers
would suffer adverse effects if forced to switch to using

the successful-efforts method.

Larcker and Revsine [1983]

Larcker and Revsine tested for the presence of a debt
effect associated with SFAS 19 by examining market returns
for 52 full-cost and 42 successful-efforts firms for five
days on either side of the issuance of the Exposure Draft.
They reasoned that if there are debt effects, then their
consequences could be expected to occur when a debt
covenant exists and earnings are expected to decrease upon
implementation of SFAS 19. Also, the debt effect should
increase as the ratio of long-term debt to the market value
of equity increases and as the percentage of revenues from
oil and gas activities increases.

A variable representing the debt effect was
operationalized by forming a product of the dichotomous
variable for the existence of a debt covenant, the
dichotomous variable for the change in earnings arising
from incentive aspects, the ratio of long-term debt to the
market value of equity, and the percentage of revenues from
oil and gas activities. Variables for incentive and
political effects were also included in the study.

A multiple regression which tested for the significance
of incentive and political effects as well as for a debt
effect was performed. The resulting coefficient for a debt
effect had the expected negative sign but was not
statistically significant, providing no evidence of a debt

effect.   The incentive effects variable was significant while the political effects variable was not.

Lys [1984]

Lys investigated the stock price effects of a mandated change to successful-efforts accounting by examining stock price returns on and surrounding three events; issuance of the Exposure Draft of SFAS 19, issuance of SFAS 19, and issuance by the SEC of ASR 253 which rejected the mandated change.   Analysis of the returns revealed that abnormal returns are associated only with the issuance of the Exposure Draft.   He criticized the Collins et al. study because they used the debt to equity ratio as a proxy for the tightness of debt constraints.   Lys points out that this ratio is a poor proxy because firms with little variability in their cash flows have high debt to equity ratios, but the higher the variability of their cash flows, the closer the firms are likely to be to their debt constraints because the debt is more risky.

An attempt is made by Lys to resolve this problem in the study by including in the cross-sectional regression an estimate of the variance of the firm's cash flows in addition to the debt to equity ratio.   The model upon which the estimator is based is the Black and Scholes [1973] option pricing model.   It utilizes an estimate of the daily standard deviation of returns adjusted for the firm capital structure.

Other variables used include the debt's term to
maturity, the proportion of public to private debt, the
standard's effect on the inventory of payable funds, the
standard's effect on the firm's proximity to the statutory
dividend paying restrictions, the proportion of revenues
derived from oil and gas operations, and a debt refinancing
cost variable that is estimated as the difference between
the debt's market and nominal values.

The relation between the debt variables and the
abnormal returns was significant at the .05 level and
explained 52 percent of the cross-sectional abnormal return
variations. However, only the variables estimating the
cash flow variance and the debt to equity ratio were
significant. This is consistent with Lys' contention that
the omission of a variable estimating cash flow variance
induces the insignificance of the debt to equity ratio in
the Collins et al. study. However, the equation deriving
the cash flow variable includes an adjustment utilizing the
ratio of the book value of debt to the market value of
equity. This is an adjustment for leverage and could cause
the variable to behave as a leverage variable.

Implications of Studies

Both the Collins et al. [1981] and the Lys [1984]
studies provide evidence of the existence of a debt effect
associated with the mandatory use of successful-efforts
accounting for firms using the full-cost method. The

possible presence of a debt effect for full-cost firms provides an explanation of why managers of firms with high levels of financial risk may choose to use the full-cost accounting method and oppose its abolition.

Studies Testing for Differentiating
Attributes of Firms

Several studies have attempted to identify the differentiating attributes of firms using full-cost and successful-efforts accounting. These studies, which are outlined below, found that in general full-cost firms tend to be smaller, more highly levered, and more aggressive in their exploration activities than successful-efforts firms.

Deakin [1979]

Deakin investigated seven discriminating variables between full-cost and successful-efforts firms. Three variables were used as indicators of aggressiveness in exploration. These variables were average depth of exploratory wells, the ratio of the number of exploratory wells to revenues, and the ratio of the number of development wells to total wells. The debt to revenue ratio and the ratio of capital expenditures to revenue were used as indicators of need for external capital. Total revenue was used as a measure of firm size, and the maturity of the company was measured by the age of the company in years.

The variables were tested in a multiple discriminant

analysis which was significant at the .01 level, having a
canonical correlation coefficient of .56. However, the
only variables which were statistically significant were
the age variable, the debt to revenue ratio, and the ratio
of capital expenditures to revenue.

A classification analysis utilizing all of the relevant
variables was able to correctly categorize full-cost and
successful-efforts firms 71.7 percent of the time.
Dichotomous classification tests based on each variable
separately revealed that the debt to revenue ratio was by
far the best explanatory variable, correctly classifying
firms 73.6 percent of the time. Deakin concluded that
full-cost firms were not more aggressive in exploration
activities than successful-efforts firms, but were more
highly levered and made greater use of outside capital.

Dhaliwal [1980]

Dhaliwal examined the effect of the firm's capital
structure on management's choice of full-cost or
successful-efforts accounting in the oil and gas industry.
He compared the debt to equity ratios for the year 1976 for
72 full-cost firms and 41 successful-efforts firms.
Full-cost and successful-efforts firms were matched based
on revenue, resulting in 33 matched pairs. A matched-pairs
t-test revealed a significant difference in the debt to
equity ratios of full-cost and successful-efforts firms at
the .09 level for a one-tailed test in which the alternate

hypothesis was that the debt to equity ratios of full-cost firms were higher than those of successful-efforts firms.

Because a firm's amount of equity is affected by their choice of full-cost or successful-efforts accounting, this could have induced significant results in the previous test comparing debt to equity ratios. In order to avoid the effect of method of accounting on the debt to equity ratios, the average total amounts of long-term debt between the two groups were examined as an alternative to the previous test. It was hypothesized that if full-cost and successful-efforts firms were to have equal debt to equity ratios if equity were not affected by accounting method, then their total debt must be equal. A matched-pairs one-tailed t-test was then performed to determine if full-cost and successful-efforts firms matched by size have equal amounts of debt. The alternate hypothesis was that full-cost firms would have greater debt than successful-efforts firms. The results were significant at the .025 level, from which Dhaliwal concluded that managers of more highly levered firms tend to select the full-cost method of accounting.

Lilien and Pastena [1982]

Lilien and Pastena not only examined discriminatory variables between full-cost and successful-efforts firms, but also tested for the discriminatory ability of these variables concerning choices in intramethod applications of

full-cost and successful-efforts accounting.   Prior to the

SEC's issuance of ASR 253 and ASR 258 in 1978, oil and gas

managers had considerable discretion in choosing procedures

with which to apply either full-cost or successful-efforts

accounting.   The SEC rulings specified how to apply each

method and required firms to adjust retained earnings

retroactively to reflect what it would have been if the

specified procedures had been in effect all along.   Firms

were required to make negative adjustments to retained

earnings if they previously followed intramethod policies

which produced higher net income than the specified

procedures, and made positive adjustments to retained

earnings if previously used procedures produced lower net

income than the new procedures.

Lilien and Pastena used these adjustments as a measure

of the magnitude of intramethod differences which existed

in the oil and gas industry before the SEC's conformity

rulings.   The disclosure of these adjustments for 102

sample firms were obtained from their 1978 Form 10-Ks filed

with the SEC.   Four variables were examined in order to

determine if they could discriminate first between

full-cost and successful-efforts firms, second, between

intramethod choices, and lastly, between joint choices of

full-cost or successful-efforts accounting and intramethod

procedures.

The first variable was a political variable measured by

revenue. It was hypothesized that size was positively correlated with the use of successful-efforts accounting and intramethod choices which minimize income. The leverage variable used was the ratio of debt to equity. Leverage was expected to be positively correlated with the use of full-cost accounting and intramethod policies which maximize income. The level of exploratory risk was measured by the ratio of the number of dry wells to total wells. It was hypothesized that exploratory risk should be positively correlated with the use of full-cost accounting and intramethod choices which defer expenses and maximize income. Because full-cost accounting was introduced in the 1950s, older firms using full-cost accounting would have had to make a deliberate switch to the method. Therefore, age was used as a consistency variable where age was expected to be positively correlated with the use of successful-efforts accounting and intramethod policies which minimize income.

The variables were examined using N-chotomous probit analysis (NPA), multiple discriminant analysis (MDA), and regression analysis. When testing for intermethod choice, the NPA model found age, exploratory aggressiveness, and revenue to be significant as discriminators. The model was significant at the.001 level and achieved 72 percent correct classification. The probit model was also significant at the .001 level when applied to intramethod

choice, with a 59 percent correct prediction rate. All
four variables were significant in the hypothesized
direction. When examining the dual intermethod and
intramethod choice, the model was significant at the .01
level and had an 87 percent correct prediction rate. The
results indicated that revenue and age are correlated with
income minimization while leverage and exploratory
aggressiveness are correlated with income maximization.

The results of the regression analysis revealed that
for intramethod choices, revenue and age were positively
correlated with income minimization while exploratory
aggressiveness and leverage were positively correlated with
income maximization. All variables were significant and in
the hypothesized direction when testing for intermethod
choice and for the dual intermethod and intramethod choice.

The MDA model achieved a successful classification rate
of 72.5 percent for intermethod choice, 73.5 percent for
intramethod choice, and 86.8 percent for the dual choice.
All variables were significant and in the hypothesized
direction.

Lilien and Pastena concluded that full-cost and
successful-efforts firms could be distinguished by their
level of exploratory aggressiveness, use of leverage, age,
and revenue amount. Intramethod choices could also be
discriminated based on these same variables.

Johnson and Ramanan [1988]

Johnson and Ramanan examined the differentiating attributes between successful-efforts firms which decided to switch to full-cost accounting and success_ul-efforts firms which did not change methods over the 1970 through 1976 test period. The sample consisted of 19 firms which switched from successful-efforts to full-cost accounting during the test period, and 55 firms which used the successful-efforts method throughout that period.

Six variables were examined for their discriminatory ability. A variable representing firm size was measured by the natural logarithm of total operating revenues. Three variables were used as surrogates for the firm's proximity to restrictive covenants. The first was a leverage variable measured by the ratio of long-term debt and preferred stock to tangible assets. The second variable representing proximity to restrictive covenants was the ratio of earnings before interest to interest expense, and the third was the ratio of cash dividends paid common stockholders to available unrestricted retained earnings. Two financial measures of exploration activity were used as surrogates for drilling intensity. These were the ratio of capital expenditures to total operating revenues, and revenues from oil and gas activities as a percent of total operating revenues.

Logit analysis was used to evaluate the ability of

these variables to differentiate between change and nonchange sample firms. The analysis was performed in event time using randomly selected subsamples of control group firms. This was done because the number of firms changing from successful-efforts to full-cost accounting was too small for statistically meaningful comparisons. The logit models for all years were significant with an overall classification success rate ranging from 72 to 78.2 percent. However, only the leverage variable was statistically significant for all years, while the ratio of capital expenditures to total operating revenues was significant for the year of change and the year preceding the change. The discretionary power of the remaining variables was not statistically significant.

The analysis revealed that oil and gas firms which changed from successful-efforts to full-cost accounting had higher levels of leverage and capital expenditures per sales dollar in the year of and for two years preceding full-cost adoption when compared to firms which retained use of the successful-efforts method. In order to provide further insights into the timing of the decision to change to full-cost accounting, annualized rates of growth were examined for total debt financing, leverage, capital expenditures, and capital expenditures per sales dollar for each firm switching to the full-cost method for each of five years prior to the change through one year following

the change. It was found that firms switching from the successful-efforts to the full-cost method experienced abnormal increases both in total debt and capital expenditure growth at least two years before full-cost adoption.

The authors concluded that the decision to change to the use of full-cost accounting is associated with high leverage and capital expenditure levels, and also with concurrent increases in debt financing and exploration activities. They found these results to be consistent with the debt covenant hypothesis in that highly levered firms that issue additional debt and/or expand their drilling activities increase their likelihood of technical default and, therefore, prefer accounting methods that reduce default probability.

Implications of Studies

These studies have shown that full-cost firms tend to be more highly levered than successful-efforts firms. This evidence has been interpreted as meaning that full-cost firms have more financial risk. However, leverage is not necessarily directly related to financial risk. The market assesses the firm's level of financial risk based on other factors in addition to the amount of leverage. These factors could include variability of cash flows, and uncertainty of price fluctuations for crude petroleum. A limitation of the studies reviewed is that the authors only

measure leverage. Deakin [1979] utilized the debt to
revenue ratio, Dhaliwal [1980] used the debt to equity
ratio and the amount of long-term debt, Lilien and Pastena
[1982] used the debt to equity ratio, and Johnson and
Ramanan [1988] utilized the ratio of long-term debt and
preferred stock to tangible assets. Even though these
variables revealed that full-cost firms are more highly
levered, it cannot be interpreted as meaning that they have
more financial risk.

Based on personal interviews with several bankers, it
is apparent that bankers evaluate the financial risk of oil
and gas companies primarily based on the firm's reserves
reports. Therefore, the use of leverage as a surrogate for
financial risk may not be appropriate in the oil and gas
industry. In an efficient market, reserves figures
information is impounded into market data. Thus, financial
risk should be measured relative to market data which, in
an efficient market, includes all significant information.

CHAPTER 3

RESEARCH METHODOLOGY

This study analyzes the effect of the level of firm financial risk on management's choice of accounting method in an oil and gas environment. More specifically, this study examines whether firms using the successful-efforts and full-cost accounting methods have different levels of financial risk.

This chapter presents the methodology used in the study to answer the above question. The first section discusses the time frame of the study. Second, the sample selection techniques and criteria are described. Third, the development of the variables is presented, and fourth, the hypotheses are listed and statistical tests are explained. Finally, a brief summary of the issues outlined in this chapter is presented.

Time Period

The test period for this study is from 1977 through 1986. This is a ten year period ending with the latest year for which the published ranking of oil and gas entities from which the sample was drawn is available. It also should be noted that 1977 is the first full year in

which prices of some type of domestic petroleum were totally decontrolled. The price of oil from stripper wells became decontrolled in September 1976.

Sample Selection

The sample of firms used in this study was drawn from the Oil and Gas Journal's OGJ 400 which ranks the top 400 oil and gas entities by total assets and revenue on a yearly basis. The 1986 ranking was used. All companies with primary SIC codes of 1310 and 1311 were included in the study since they engage primarily in the exploration and production of crude petroleum and natural gas. Firms dealing primarily in transmission, pipelines, refining, contract drilling or other related areas have different SIC codes and were eliminated as potential sample firms. This procedure ensured that the firms included in the samples derive a significant portion of their income from exploration and production, and, therefore, their choice of the full-cost or successful-efforts accounting method would have a significant impact on their financial statements.

Other inclusion criteria consisted of the following:

1. The firm must be incorporated.

2. The firm must be listed on the American or New York stock exchanges or be on the National Association of Securities Dealers Automatic Quotations System (NASDAQ).

3. The firm must have 10-Ks on file with the SEC for the period tested for each sample.

The first requirement is included since the concern of

this study is with the behavior of the corporate manager.
Also, because disclosure requirements differ for businesses
which are not incorporated, only corporations were
included. Master limited partnerships were not included
due to (1) the unavailability of data for them over the
entire test period, and (2) the differences in disclosure
requirements. The remaining requirements relate to data
availability.

The entities meeting the above requirements were
divided into firms which had not switched between full-cost
and successful-efforts accounting during the 1977-1986 time
period, and those firms which had switched methods during
this period. The switching firms were then divided into
those changing to full-cost and those changing to
successful-efforts accounting. Those firms which did not
change methods over the test period were separated into
firms maintaining successful-efforts and firms maintaining
full-cost accounting. Each of the change and nonchange
categories was then divided into firms issuing public debt
and firms issuing only private debt. All but one of the
firms changing methods placed only private debt. The firm
with public debt was eliminated from the study since it may
not be comparable to firms with only private debt.

The following number of firms met all of the above

requirements in each category:

Category	Number
Full-Cost Firms With Public Debt	16
Successful-Efforts Firms With Public Debt	16
Full-Cost Firms Without Public Debt	57
Successful-Efforts Firms Without Public Debt	70
Firms Changing to Full-Cost	7
Firms Changing to Successful-Efforts	7

Random samples were drawn from each category.[2] For firms with public debt, ten full-cost and ten successful-efforts firms were randomly selected. Thirty full-cost and thirty successful-efforts firms without public debt were randomly chosen. Ten full-cost and ten successful-efforts firms without public debt which were in existence for the entire 1977 through 1986 time period were selected randomly in order to compare risk over time. Because of the small number of firms changing methods in the population, descriptive statistics for all such firms were examined. Debt betas were not measured for firms with market value based debt to equity ratios of less than .05, since these firms effectively have no debt, and debt betas are not defined for them. However, these firms were included in the samples for tests of the other variables.

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[2] Appendix A lists the firms included in each sample category.

Variables and Hypotheses

The Variables

Four measures of financial risk are analyzed and compared in this study. The measures consist of three variables representing leverage and a variable representing the firm's debt beta.

A.   The Leverage Variables - Financial risk is an indicator of the probability that a firm will not be able to meet the required interest and principal payments on its debt. Therefore, a firm's financial risk usually increases as the amount of debt it holds rises. Because of this, leverage is often used as a surrogate for financial risk.

Dhaliwal [1980] tested for differences in the leverage of full-cost versus successful-efforts firms by comparing their debt to equity ratios. Significant differences in leverage were found, but because equity is affected by accounting method, these differences could have been due to the use of accounting equity in the variable measuring financial risk. The first variable used in this study is the debt to equity ratio using book values, for which the results may be compared with previous research. The second leverage variable is the debt to equity ratio using the market value of equity; the use of this variable eliminates the problem of the book value of equity being affected by accounting method choice.

The third leverage variable, the debt to revenue ratio,

is examined because revenue is not affected by choice of full-cost or successful-efforts accounting. This measure indicates the degree of leverage used to generate the firm's level of revenue. For both the debt to revenue ratio and the debt to equity ratio using the market value of equity, the market values of debt are used for firms issuing public debt while the book value of debt is used for firms placing only private debt.

B.   The Variable Utilizing Betas - The stock beta, also called the equity beta, depends on both the business risk of the assets held by the firm and the level of financial risk of the firm. Because borrowing while maintaining a fixed amount of equity increases the risk of the equityholder, the beta for the stock of a levered firm should be greater than the beta of the stock of an otherwise identical unlevered firm [Hamada, 1969]. Thus, the covariance of the levered firm's stock returns with the market returns should be greater than the covariance of an otherwise identical unlevered firm's returns with market returns.

A firm's asset beta reflects the business risk of the firm's existing assets. As the firm issues debt, its common stock becomes riskier, thereby increasing the firm's equity beta above its asset beta. The difference between the firm's equity and asset betas reflects the firm's financial risk. This risk increases as debt increases

[Brealey and Myers, 1984, pp. 173-174].

The relationship between a firm's betas was explained by Hamada [1969]. The systematic risk of a common stock is:

$$\beta_E = \frac{cov(R_{Et}, R_{Mt})}{var(R_{Mt})} \tag{1}$$

where:

R_{Et} = the common shareholder's rate of return during period t,

R_{Mt} = the rate of return on the market portfolio during period t.

The systematic risk for the same firm over the same period if there were no debt in its capital structure would be its asset beta:

$$\beta_A = \frac{cov\ (R_{At}, R_{Mt})}{var(R_{Mt})} \tag{2}$$

where:

R_{At} = the rate of return during period t to the common shareholder if the firm had no debt.

Likewise, the systematic risk of the firm's debt is its debt beta:

$$\beta_D = \frac{cov\ (R_{Dt}, R_{Mt})}{var(R_{Mt})} \tag{3}$$

where:

R_{Dt} = the rate of return to the debtholder during period t.

An additive relationship among a firm's betas was proven by Hamada (1969). The asset beta may be represented as a weighted average of the debt and equity betas. This relationship has intuitive appeal. For example, if someone were to buy one hundred percent of a corporation's debt and equity, then that person would own an asset in the form of a portfolio of the firm's debt and equity securities. The risk of the portfolio would be a weighted average of the risk of the debt and equity securities within the portfolio. The relationship is represented by the following equation [Brealey and Myers, 1984, p. 175]:

$$\beta_A = \beta_D \frac{debt}{debt + equity} + \beta_E \frac{equity}{debt + equity}$$

Solving this equation for the debt beta yields:

$$\beta_D = \beta_A \frac{debt + equity}{debt} - \beta_E \frac{equity}{debt}$$

The firm's equity beta can be computed by examining how the price of the stock has responded in the past to market movements. The following regression model used is referred to as the stock's characteristic line with the market portfolio [Reilly, 1985, p. 253]:

$$R_{Et} = a_E + \beta_E R_{Mt} + \epsilon_t$$

where:

R_{Et} = the rate of return for stock E during period t,

R_{Mt} = the rate of return for the market portfolio during period t,

a_E = the intercept term of the regression,

β_E = the slope coefficient for the regression which

is equal to $Cov(R_{Et}, R_{Mt})/var(R_{Mt})$,

ϵ_t = the random error term during period t.

This is a line of best fit through a scatter plot of rates of return for the stock and for the market portfolio of stocks over some past time period. This line of best fit is referred to as the market model which was developed by Sharpe [1964].

The market model when applied empirically is a simple linear regression model which is estimated in this study using the method of least squares. According to the Gauss-Markov theorem, under the conditions of the model, the least squares estimators are unbiased and have minimum variance among all unbiased linear estimators [Neter et al., 1985, p. 39]. The model assumes the following [Kmenta, 1986, p. 208]:

1) Normality: ϵ_t is normally distributed.

2) Zero Mean: $E(\epsilon_t) = 0$.

3) Homoskedasticity: $Var(\epsilon_t) = \sigma^2$.

4) Nonautocorrelation: $Cov(\epsilon_s, \epsilon_t) = 0$
where $s \neq t$.

5) Nonstochastic X: X is a nonstochastic variable with values fixed in repeated samples and such that, for any sample size n,

$$\Sigma (X_t - \overline{X})^2/n$$

is different from zero, and its limit as n approaches
infinity is a finite number.

The first two assumptions state that the disturbance is
normally distributed around zero for each value of the
explanatory variable. Each value of the disturbance may be
considered as the result of a large number of small causes,
each cause producing a small deviation of the dependent
variable from what it would be if the relationship were
deterministic. In these circumstances, which are
reasonable to assume in this study, assumptions of
normality and zero mean are appropriate [Kmenta, 1986, p.
208-209]. Even if the disturbances are not normally
distributed, as long as the remaining assumptions hold, the
least squares estimators of the regression coefficients are
best linear unbiased estimators [Kmenta, 1986, p. 262].
Finally, with the use of a version of the central limit
theorem, it can be determined that these estimators are
asymptotically normal, and that the tests of significance
involving the regression coefficients are asymptotically
valid even if the disturbances are not normal, as long as
the sample size is fairly large [Kmenta, 1986, p. 262].
The sample size in this study is fairly large with each
regression utilizing 78 observations.

The third assumption, concerning homoskedasticity,
means that every disturbance has the same variance whose
value is unknown. This assumption is not considered to be

troublesome for models involving observations over short time periods, since the values of the explanatory variable (the market return in this study) are typically of the same order of magnitude at all points of observation. The same is true of the values of the dependent variable (the individual stock return in this study). Unless the time period covered is very long, the assumption of homoskedasticity is plausible [Kmenta, 1986, p. 269].

The fourth assumption of nonautocorrelation is reasonable in the market model because in an efficient market, each observation of returns is based on information available to the market at that time, and is independent of previous returns [Copeland and Weston, 1983, pp. 301-305]. However, in order to check for autocorrelation, a Durbin-Watson test was used. No autocorrelation was present for the firms in this study.

The final assumption begins with the requirement that the values of the explanatory variable (the market return in this study) be fixed in repeated samples. This assumption clearly is valid in this study. The requirement that $\Sigma(X_t - \bar{X})^2/n$ be a finite number different from zero means that the values of the explanatory variables must not be equal to the same number and that they cannot approach plus or minus infinity. This requirement is also valid in this study.

In this study, 78 weekly observations were used to

estimate the equity betas. There is no theoretically
correct time period of analysis in using the market model,
but a trade-off is involved between getting enough
observations and not going so far back in time that the
parameters may change over the period (Reilly, 1985, p.
253). However, in order to reduce the chance of having a
large sample error, a sample size of greater than ten
observations should be used (Lapin, 1978, p. 319). The use
of 78 weekly observations satisfies the requirements of
being large enough to avoid sampling error, but small
enough so that the parameters would remain relatively
stable over the time period. An equally weighted index
using the New York and American stock exchanges represented
the market portfolio. The American stock exchange has
smaller firms listed on it than firms listed on the New
York exchange. Therefore, use of the equally weighted
index recognizes the returns for a wider spectrum of firms
over the time period.

An asset beta reflects business risk, and is equal to
the equity beta of an unlevered firm (Brealey and Myers,
1984, p. 177). Therefore, an average of the equity betas
for the appropriate years of firms with no debt may be used
as a surrogate for an industry-wide asset beta which
reflects the risk of holding petroleum products. For
purposes of this study, firms with market value based debt
to equity ratios of less than .05 were considered as

entities with no debt. In most cases, the debt held by these firms was in the form of short-term trade payables. Therefore, for all practical purposes, these are all-equity firms. Debt betas for these firms are not defined, so the firms were excluded from tests of debt betas. However, the leverage variables could be measured for these firms, so the firms were included in the samples in tests of the other variables. The all-equity firms are listed by year in Appendix B. The industry-wide asset betas for each year are in Appendix C.

A major form of business risk in the petroleum industry is the volatility of oil prices. Price changes in the market reflect this risk. Because all firms in the industry face the risk of changing prices, the computed asset beta serves as a good estimator of the risk of assets industrywide. Several empirical studies have found that extractive industries have strong industry components in their stock movements [Gaumnitz, 1970; Meyers, 1973; and Livingston, 1977]. Therefore, it is reasonable to assume a constant asset beta for the industry as a whole. This asset beta can then be used in the equation estimating the firm's debt beta based on the weighted difference between the equity and asset betas.

The Hypotheses

In order to determine whether the firm level of financial risk affects the manager's choice of full-cost or

successful-efforts accounting in the oil and gas industry,

four specific research questions are presented:

1) Is the level of financial risk of firms
   using the full-cost method higher than that
   of firms using the successful-efforts
   method?

2) Do firms which switch to the full-cost
   method experience an increase in financial
   risk prior to the change?

3) Do firms which switch to the successful-
   efforts method experience a decrease in
   financial risk prior to the change?

4) Is the level of financial risk of firms
   which do not change methods relatively
   stable over time?

Eight hypotheses are presented to answer the research

questions. In order to address the first specific research

question, the following null hypotheses are formulated:

HO1: The level of financial risk of firms with
     public debt using the successful-efforts
     method is at least as great as the financial
     risk level of firms using the full-cost method.

HO2: The level of financial risk of firms with
     only private debt using the successful-
     efforts method is at least as great as the
     financial risk level of firms using the
     full-cost method.

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[3] Each of the hypotheses 1, 4, and 5 of Chapter One is
split into two hypotheses here: one for firms with public
debt and one for firms with only private debt. In
addition, for all hypotheses, the four measures of
financial risk were tested separately.

Each of these hypotheses was tested using a one-tailed t-test at the .05 level of significance. Use of the .05 level of significance is consistent with prior research in oil and gas accounting [Dhaliwal, 1980; Lys, 1984]. The P-values are presented for each test in this study. A one-tailed test was used in order to determine if financial risk was higher for firms using full-cost accounting as is suggested by agency theory. Thus, the alternate hypotheses state that the financial risk of firms using the full-cost method is higher than that of firms using the successful-efforts method. The t-test assumes that the variables are normally distributed. To test this normality assumption, a Shapiro Wilks test was utilized since the sample sizes were less than 51 [SAS, 1985, p. 1187]. In cases in which the variables were not normally distributed, one-tailed Wilcoxon sum-ranks tests, which is the nonparametric equivalent of the t-test for group means, were employed [Lapin, 1978, pp. 620-623].

To address the second specific research question, the following null hypothesis is formulated:

H03: The level of financial risk, preceding the time of the change, of firms switching to the full-cost accounting method decreases or is stable.

Because the population of firms switching to the full-cost accounting method within the time period consisted of only seven firms (all with only privately placed debt), no statistical tests were performed for these

companies. However, descriptive statistics were obtained
for each financial risk variable for both one year and five
years preceding the accounting method change.

The third research question is addressed using the
following null hypothesis:

HO4:   The level of financial risk, preceding
        the time of the change, of firms
        switching to the successful-efforts
        accounting method increases or is
        stable.

As before, because the population of companies with
only privately placed debt which switched to the
successful-efforts method of accounting during the test
period consisted of only seven firms, no statistical tests
were performed for this hypothesis. Instead, descriptive
statistics were obtained for the population on each
financial risk variable for both one year and five years
preceding the time of the accounting method change.

To address the fourth specific research question, the
following null hypotheses are formulated:

HO5:   There is no difference in the level of
        financial risk over time for firms with
        public debt, where the firms use the full-
        cost method (and thus have not switched
        accounting methods).

HO6:   There is no difference in the level of
        financial risk over time for firms with
        only private debt, where the firms use the
        full-cost method (and thus have not switched
        accounting methods).

HO7:   There is no difference in the level of
        financial risk over time for firms with
        public debt, where the firms use the
        successful-efforts method (and thus have

not switched accounting methods).

HO8:   There is no difference in the level of
       financial risk over time for firms with only
       private debt, where the firms use the
       successful-efforts method (and thus, have
       not switched accounting methods).

Each separate measure of financial risk for these firms

was matched for the years 1977 and 1986. A matched-pairs

two-tailed t-test was used to test each null hypothesis at

the .05 level of significance. A Wilcoxon matched-pairs

two-tailed signed-ranks test was employed instead when the

variables proved not to be normally distributed through use

of the Shapiro Wilks test.

Summary

Agency theory suggests that managers of firms with high

levels of financial risk will choose accounting methods

that increase net income and net tangible assets, because

these methods will decrease the possibility of technical

default on loan covenants. The procedures described in

this chapter are designed to test whether the behavior of

corporate managers in the oil and gas industry is

consistent with agency theory.

CHAPTER 4

DATA ANALYSIS

This chapter presents the data and the statistical tests used in the study to determine the effect of financial risk on the manager's choice of full-cost or successful-efforts accounting in the oil and gas industry. The first section of this chapter discusses the formulation of the variables. The next section reports on the tests of the hypotheses, and finally, a summary of the results is presented.

The Formulation of the Variables

The Debt to Revenue Ratio

For firms holding public debt, the market value of that debt was determined as of the last day of the year for which the variable was being measured. This information was obtained from Moody's Bond Record. The book value of debt was used for firms with only private debt. To formulate the ratio, total firm revenue was used for the year being measured.

The Debt tr Equity Ratio

For the debt to equity ratio using market values, the market value of the debt of firms holding public debt was determined as of the last day of the year for which the

ratio was being measured. The book value of debt was used for firms with only private debt. The market value of equity for each firm was determined as of the last day of the year for which the measurement was taken. The stock prices were taken from the Wall Street Journal and the number of shares outstanding was obtained from the firms' 10-Ks. Book values of debt and equity were used for the ratio utilizing book values.

The Debt Beta

In order to derive a firm's debt beta, both that firm's equity beta and the industry's asset beta had to be determined. The weighted difference between the asset and equity betas resulted in an estimation of the debt beta.

A. The Equity Beta - Each firm's equity beta was determined by regressing that firm's weekly returns against the weekly market returns for the 78 week period ending with the final week in December of the year for which the measurement was being taken. An equally weighted index of the New York and American Stock exchanges was used to represent the market portfolio. To test for autocorrelation, a Durbin-Watson test was performed on each regression. The results revealed that no autocorrelation was present for the sample firms in the years measured.

B. The Asset Beta - An industry asset beta was estimated for each year in the study by taking an average of the equity betas for that year of the firms determined

to be all equity firms. An asset beta for each year from 1977 through 1986 was needed because of their use in estimating the debt betas of firms changing methods. Debt betas were obtained for these change firms for both one year and five years preceding the method change, resulting in the necessity of an asset beta for each year in the study.

C. The Debt Beta - The debt betas were derived using the following formula:

$$\beta_D = \beta_A \frac{debt + equity}{debt} - \beta_E \frac{equity}{debt}$$

The equity betas for each firm and the asset betas for the industry estimated from above were utilized for the periods being tested. In the equation, market values of debt were used for firms holding public debt by taking the market value of that debt for the last day of the year for which the estimation of the debt beta was being made. The book values of debt were used for firms that had only private debt. The market values of equity were used in the estimation equation for each sample firm by taking the market value of the firm's equity as of the last day of the year for which the debt beta estimate was being made. Thus, an estimate of the debt beta was derived for each sample firm except for all-equity firms for each year being tested. Debt betas are not defined for firms with no debt, so debt betas were not derived for these firms.

Tests of the Hypotheses

Hypothesis 1

The first hypothesis is designed to determine if the financial risk level of successful-efforts firms with public debt is as least as great as the financial risk level of full-cost firms with public debt (each financial risk variable being tested separately). Group means of the 1986 risk levels for each variable were compared for ten randomly selected firms using each accounting method. To test for the normality assumption, the Shapiro-Wilks test was used. This test statistic showed that the null hypothesis of a normal distribution was rejected at the .05 level of significance for each financial risk variable. Therefore, Wilcoxon rank sum tests were performed on each risk variable. The hypothesis was rejected at the .05 level of significance for both the debt to equity ratio using the book value of equity, and for the debt to revenue ratio. The group means for each variable and summary statistics for the tests are presented in Table 1.

Hypothesis 2

This hypothesis is designed to determine if the financial risk level of successful-efforts firms with only private debt is as least as great as the financial risk level of full-cost firms with only private debt (each financial risk variable being tested separately). Group means of the 1986 risk variables were compared for thirty

TABLE 1

HYPOTHESIS ONE

TESTS OF FINANCIAL RISK VARIABLES

OF FULL-COST AND SUCCESSFUL-EFFORTS FIRMS

ISSUING PUBLIC DEBT

Var.	Group Means		Test Performed	Critical Value	Level of Significance for a One-Tailed Test	Reject Hypothesis
	SE	FC				
D/E bk	1.9484	6.6949	Wilcoxon	Z=1.965	.0247	Yes
D/E mkt	2.0547	4.8545	Wilcoxon	Z= .832	.2023	No
D/R	1.6166	3.2904	Wilcoxon	Z=3.024	.0013	Yes
Beta	.7284	.7858	Wilcoxon	Z=1.134	.1284	No

randomly selected firms using each accounting method. To test for the normality assumption, the Shapiro-Wilks test was used. This test statistic showed that the null hypothesis of a normal distribution was rejected at the .05 level of significance for each variable. Therefore, Wilcoxon rank sum tests weie performed for all variables. These tests resulted in rejection of the null hypothesis at the .05 level of significance for only the debt to revenue variable. However, the debt to equity variable using the book value of equity was borderline to rejection, with a P-value of .0585. Group means for each variable and summary statistics for the tests are presented in Table 2.

Hypothesis 3

The purpose of this hypothesis is to determine if the financial risk level of firms changing to the full-cost accounting method decreases or is stable prior to the change. Because the population of firms changing to the full-cost method during the test period consisted of only seven companies (each with only privately placed debt), descriptive statistics on the entire population were obtained. These statistics are presented in Table 3.

Hypothesis 4

This hypothesis is designed to determine if the financial risk level of firms changing to the successful-efforts accounting method increases or is stable preceding the time of the change. The population of firms with

TABLE 2

HYPOTHESIS TWO

TESTS OF FINANCIAL RISK VARIABLES

OF FULL-COST AND SUCCESSFUL-EFFORTS FIRMS

PLACING ONLY PRIVATE DEBT

Var.	Group Means		Test Performed	Critical Value	Level of Significance for a One-Tailed Test	Reject Hypothesis
	SE	FC				
D/E bk	.9949	5.7151	Wilcoxon	Z=1.567	.0585	No
D/E mkt	2.0855	2.5486	Wilcoxon	Z=1.515	.0648	No
D/R	1.8534	2.6263	Wilcoxon	Z=2.025	.0214	Yes
Beta	.9508	.8533	Wilcoxon	Z= .282	.3890	No

TABLE 3

HYPOTHESIS THREE

DESCRIPTIVE STATISTICS OF

FINANCIAL RISK VARIABLES OF FIRMS

CHANGING TO FULL-COST ACCOUNTING

Variable	5 Years Before Change Mean	Std. Deviation	1 Year Before Change Mean	Std. Deviation	Increase (Decrease) in Mean	Percent Increase (Decrease)
D/E bk	2.3219	2.3048	1.4259	.6923	(.8960)	(38.59%)
D/E mkt	.2942	.1517	.8169	.4563	.5227	177.69%
D/R	1.8134	.7289	1.6373	.7273	(.1761)	(9.71%)
Beta	.6664	.6871	1.7393	.9190	1.0729	160.99%

private debt and changing to the successful-efforts method
during the test period consisted of seven companies.
Because of the small number of firms in the population,
descriptive statistics were obtained and presented for the
entire population. These statistics are presented in Table
4.

Hypothesis 5

This hypothesis is designed to determine if the risk
level of firms with public debt and which maintain use of
the full-cost accounting method remains constant over
time. The risk levels of these firms for the year 1977
were matched to their risk levels for the year 1986 for
each financial risk variable. A Shapiro-Wilks test
revealed that only the debt to revenue ratio and the debt
beta were normally distributed at the .05 level of
significance. A two-tailed matched-pairs t-test was used
for these variables. Two-tailed Wilcoxon matched-pairs
signed-ranks tests were used for the remaining risk
variables. The hypothesis of no change over time in risk
levels was rejected only for the debt to equity ratio using
the book values. Group means for each variable and summary
statistics are presented in Table 5.

Hypothesis 6

The purpose of this hypothesis is to determine if the
financial risk level of firms with only private debt and
which use the full-cost method remains constant over time.

TABLE 4

HYPOTHESIS FOUR

DESCRIPTIVE STATISTICS OF

FINANCIAL RISK VARIABLES OF FIRMS

CHANGING TO SUCCESSFUL-EFFORTS ACCOUNTING

Variable	5 Years Before Change Mean	5 Years Before Change Std. Deviation	1 Year Before Change Mean	1 Year Before Change Std. Deviation	Increase (Decrease) in Means	Percent Increase (Decrease)
D/E bk	1.1976	1.2241	1.5216	1.0318	.3240	27.05%
D/E mkt	.8550	1.1204	1.6490	.9416	.7940	92.87%
D/R	.9437	.6603	5.9223	8.8836	4.9786	527.56%
Beta	1.7525	1.5998	1.7559	.6406	.0034	.19%

TABLE 5

HYPOTHESIS FIVE

TESTS OF FINANCIAL RISK VARIABLES

OVER TIME

OF FULL-COST FIRMS ISSUING PUBLIC DEBT

Var.	Group Means 77	86	Test Performed	Critical Value	Level of Significance for a Two-Tailed Test	Reject Hypothesis
D/E bk	3.2609	7.0554	Wilcoxon	Z=1.682	.0463	Yes
D/E mkt	5.9679	4.8545	Wilcoxon	Z=1.784	.0744	No
D/R	1.6174	3.3004	T-test	T=1.200	.2454	No
Beta	.5212	.7864	T-test	T= .704	.4992	No

The risk levels of these firms were matched for the years 1977 and 1986 for each financial risk variable. The Shapiro-Wilks test revealed that only the debt beta variable was normally distributed at the .05 level of significance. A two-tailed matched-pairs t-test was used for the debt beta variable. Two-tailed Wilcoxon matched-pairs signed-ranks tests were performed for the remaining variables. The tests resulted in rejection of the hypothesis of no change in risk levels at the .05 level of significance only for the debt to equity ratio using market values. Group means for the variables and summary statistics are presented in Table 6.

Hypothesis 7

This hypothesis is designed to determine if the financial risk level of firms with public debt and which maintain the use of successful-efforts accounting remains constant over time. The financial risk variables were matched for the years 1977 and 1986 for the sample firms. The Shapiro-Wilks test revealed that none of the variables were normally distributed at the .05 level of significance. Therefore, two-tailed Wilcoxon matched-pairs signed-ranks test were performed. The hypothesis of no change was rejected at the .05 level of significance only for the debt beta variable. Group means and summary statistics are presented in Table 7.

TABLE 6

HYPOTHESIS SIX

TESTS OF FINANCIAL RISK VARIABLES

OVER TIME

OF FULL-COST FIRMS PLACING ONLY PRIVATE DEBT

Var.	Group Means 77	Group Means 86	Test Performed	Critical Value	Level of Significance for a Two-Tailed Test	Reject Hypothesis
D/E bk	.6529	2.3972	Wilcoxon	Z= .968	.1664	No
D/E mkt	.2770	4.6531	Wilcoxon	Z=2.191	.0284	Yes
D/R	1.8967	2.8797	Wilcoxon	Z=1.172	.2412	No
Beta	1.2482	.6150	T-test	T= .542	.6074	No

TABLE 7

HYPOTHESIS SEVEN

TESTS OF FINANCIAL RISK VARIABLES

OVER TIME

OF SUCCESSFUL-EFFORTS FIRMS ISSUING PUBLIC DEBT

Var.	Group Means 77	Group Means 86	Test Performed	Critical Value	Level of Significance for a Two-Tailed Test	Reject Hypothesis
D/E bk	1.1976	1.9484	Wilcoxon	Z=1.478	.0697	No
D/E mkt	.9293	2.0547	Wilcoxon	Z=1.580	.1142	No
D/R	.6504	1.6166	Wilcoxon	Z=1.478	.1394	No
Beta	1.6339	.7284	Wilcoxon	Z=2.600	.0093	Yes

Hypothesis 8

This hypothesis is designed to test if the financial risk level of firms with only private debt and which maintain the use of successful-efforts accounting remains constant over time. The financial risk variables were matched for the years 1977 and 1986 for the sample firms. The Shapiro-Wilks test revealed that none of the variables were normally distributed at the .05 level of significance. Therefore, two-tailed Wilcoxon matched-pairs signed ranks tests were performed. The hypothesis failed to be rejected at the .05 level of significance for all variables. Group means and summary statistics are presented in Table 8.

Discussion of the Results

Hypotheses One and Two

The first two hypotheses are designed to test if the level of financial risk of successful-efforts firms is as least as great as that of full-cost firms. The debt to revenue ratio was found to be significantly greater for full-cost firms both with and without public debt. The finding regarding the debt to revenue ratio is consistent with previous research performed by Deakin (1979) in which it was found that the debt to revenue ratios of full-cost firms were higher than those of successful-efforts firms.

The debt to equity ratio utilizing book values was found to be significantly greater for full-cost firms issuing public debt, but not for full-cost firms placing

TABLE 8

HYPOTHESIS EIGHT

TESTS OF FINANCIAL RISK VARIABLES

OVER TIME

OF SUCCESSFUL-EFFORTS FIRMS PLACING ONLY PRIVATE DEBT

Var.	Group Means		Test Performed	Critical Value	Level of Significance for a Two-Tailed Test	Reject Hypothesis
	77	86				
D/E bk	.6516	2.0265	Wilcoxon	Z= .561	.2875	No
D/E mkt	.3198	.5983	Wilcoxon	Z=1.886	.0594	No
D/R	.9010	1.0758	Wilcoxon	Z= .866	.3862	No
Beta	1.2618	.9065	Wilcoxon	Z= .674	.5002	No

only private debt. This result is partially consistent
with prior research which found that the debt to equity
ratios of full-cost firms tend to be higher than those of
successful-efforts firms (Dhaliwal, 1980; Lilien and
Pastena, 1982). However, in this study, the P-value of
.0585 for firms placing only private debt indicates that
the hypothesis was close to being rejected at the .05 level
of significance. The mean of the variable for full-cost
firms was 5.7151 which is quite higher than the mean of
.9949 for successful-efforts firms.

Thus, to the extent of the aforementioned variables,
the results of this study are generally consistent with
prior research. Whatever inconsistencies remain in this
regard may result from the different time periods used.
Dhaliwal (1980) used 1976 as the year for which the test
for differences was performed, whereas Lilien and Pastena
(1982) used 1978 as the test year. These years were
periods of generally high exploration activities,
especially in comparison to 1986, the year used in this
study, which was generally a period of low exploration
activities. The use of full-cost or successful-efforts
accounting affects the book value of equity, and this
effect becomes more pronounced as exploration activities
increase due to the capitalization of unsuccessful
exploratory wells under the full-cost accounting method.

In this study, for both firms with and without public

debt, the hypotheses failed to be rejected when using the debt beta variable. Therefore, it cannot be concluded that the debt betas of full-cost firms are higher than those of successful-efforts firms. This is consistent with agency theory which would predict that firms facing increases in risk have incentives to switch to full-cost accounting, but firms maintaining methods over fairly long time periods may not exhibit differences in risk levels.

Hypothesis Three

The purpose of this hypothesis is to determine if the financial risk levels of firms changing to the full-cost accounting method decrease or are stable prior to the change. The group means reveal that the debt to equity ratio using market values and the debt beta variable increased prior to the change. This is consistent with agency theory which would predict that as a firm's financial risk increases, the management of that firm may switch to use the full-cost method of accounting in order to avoid technical default on loan covenants.

The debt to equity ratio utilizing book values and the debt to revenue ratio decreased prior to the change. The amount of debt held by these firms generally increased prior to the change, but not proportionately as great as the increase in revenue and the book value of equity. The standard deviation of the debt to equity variable utilizing book values for the fifth year preceding the change is

large due to a wide range of ratio values for the small
number of firms examined.

Hypothesis Four

This hypothesis is designed to determine if the
financial risk level of firms changing to the successful-
efforts accounting method increases or is stable prior to
the change. Agency theory generally predicts a decrease in
the financial risk levels of these firms prior to the
change. Examination of the means of the variables for both
one year and five years preceding the change reveals that
all of the risk variables except the debt beta increased
prior to the change. The most significant difference is
found in the debt to revenue ratio. The debt beta variable
remained constant. These results indicate that the firms
were not prompted to change by decreases in financial
risk. Other factors must have contributed to the decision
to change methods. One such factor could be the ease of
recordkeeping when using successful-efforts accounting.
The standard deviations for these variables is large due to
a wide range of values for the variables and the small
number of firms examined.

Hypotheses Five and Six

The purpose of these hypotheses is to determine if the
financial risk levels of full-cost firms which do not
switch accounting methods remain constant over time.
Agency theory would predict, ceteris paribus, that the risk
levels of these firms should not change. The results for

the most part were consistent with agency theory. The only significant changes in risk were found for the debt to equity ratio using book values of firms with public debt and for the debt to equity ratio using market values of firms with only private debt. Based on examination of the means, both of these ratios were found to increase. These increases were due to a general decrease in both the book value and market value of the equity of these firms over the time period.

Hypotheses Seven and Eight

These hypotheses are designed to determine if the financial risk levels of successful-efforts firms which do not switch methods remain constant over time. Agency theory would predict, ceteris paribus, that the financial risk levels of these firms should not change significantly. The results were consistent with agency theory with one exception. This exception was for the debt beta of firms issuing public debt, which changed over the period. Examination of the means for each year indicates that the debt beta decreased from 1977 to 1986. The firms in this sample are, for the most part, the largest firms tested in this study. Eight of the ten firms in the sample are major integrated oil companies. Prior research has considered the largest twenty-four oil and gas entities as the major integrated oil companies (Deakin, 1979; Dhaliwal, 1980). The eight major integrated firms included in this

sample may have experienced a decrease in financial risk
due to further diversification efforts during the 1977 to
1986 period.

Summary of the Results

In conclusion, the financial risk levels of full-cost
firms generally were found not to be higher than those of
successful-efforts firms. Firms changing to the full-cost
method experienced increases in their debt betas prior to
the change, while no decreases in the risk variables were
present for the firms switching to successful-efforts
accounting. Instead, for firms switching to the
successful efforts method, fairly large increases were
found in the debt to equity ratio and in the debt to
revenue ratio, although the debt beta was stable. For the
most part, the financial risk levels of firms which did not
change accounting methods could not be discerned to be
other than stable over the period.

Firms which switched to full-cost accounting
experienced a substantial increase in their debt betas
prior to the change. This may suggest that a change in the
market assessment of financial risk may be a significant
factor in the decision to change accounting methods. The
extent of a firm's leverage, however, does not appear to be
a factor in the change decision. Firms which do not change
methods generally cannot be said to have significant
differences in leverage or market assessed risk over time.

The exception is for the debt betas of firms with public debt which maintained use of the successful-efforts accounting method. These firms' debt betas were shown to decrease over time. This may be because of further diversification of these integrated companies. That the beta variable did not always behave in the same manner as the leverage variables suggests that there may be differences between using leverage as an indicator of risk, and a market assessment of risk. The market apparently may consider other factors in addition to leverage in assessing a firm's financial risk level.

CHAPTER 5

SUMMARY AND CONCLUSIONS

This chapter presents the summary and the major
implications of the research study. The chapter begins
with a summary of the research. Next, the implications of
the findings of the study are discussed, followed by a
section outlining the limitations of the study. Finally,
some suggestions for future research are presented.

Summary

The full-cost method of accounting was introduced in
the mid-1950s, and by 1970, approximately one-half of all
publicly held oil and gas producers had adopted this method
[Dehne, 1983, p. 55]. The Exposure Draft of SFAS 19 was
issued in 1977 which proposed to eliminate the full-cost
accounting method. This caused an outcry from independent
producers who claimed that a switch to the successful-
efforts accounting method would impair their ability to
raise capital. The full-cost method is still accepted
today, but this same type of outcry was once again voiced
in 1986 when the SEC considered abolishing the full-cost
method.

Agency theory can be used to explain the opposition to

the abolishment of full-cost accounting. Full-cost firms which oppose the abolition of full-cost accounting may have debt covenants with provisions based on accounting numbers with reference to GAAP. In technical default, amendments need to be made to the debt covenants, and these amendments are costly to secure. Therefore, agency theory predicts that managers of firms with high financial risk will prefer to use accounting methods which increase net tangible assets and income. The full-cost method tends to increase net tangible assets and provides for a more stable net income.

However, when dealing with the oil and gas industry, bankers do not consider the ratio provisions of debt covenants as being important, but instead are concerned with reserves reports. Therefore, leverage may not be an appropriate surrogate for financial risk in the oil and gas industry where it is found that bankers consider other factors as being more important than ratios in assessing financial risk.

The focal point of this study was to determine if the level of firm financial risk affects the manager's choice of full-cost or successful-efforts accounting in the oil and gas industry. Past studies in this area had all used leverage as a surrogate for financial risk [Deakin, 1979; Dhaliwal, 1980; Foster, 1980; Lilien and Pastena, 1982; and Johnson and Ramanan, 1988]. The debt beta, a variable

measuring a market assessment of risk, was introduced in this study. The market considers other factors besides leverage in assessing financial risk, and these other factors are reflected in the debt beta. Three leverage variables were also included in the study as measures of financial risk: the debt to equity ratio using book values, the debt to equity ratio using market values, and the debt to revenue ratio.

This study sought to answer four specific questions. The first question dealt with determining if the financial risk of nonchanging full-cost firms is higher than that of nonchanging successful-efforts firms. The only variable found to be significantly higher for both full-cost firms issuing public debt and full-cost firms placing only private debt was the debt to revenue ratio. This variable is, however, questionable as a measure of capital structure. The debt to equity ratio is a clearer indicator of the firm's use of leverage because the use of equity in the denominator has a more direct relationship with capital structure than revenue. The debt beta of full-cost firms was not found to be higher than the debt beta of successful-efforts firms. Therefore, it cannot be concluded that leverage or financial risk of full-cost firms is greater than that of successful-efforts firms.

The second question dealt with determining if firms

switching to use full-cost accounting experience an
increase in financial risk prior to the change. It was
determined that the debt betas, which are the market
assessment of risk, did increase prior to the change. The
debt to equity ratio utilizing market values also increased
prior to the change.

The next question dealt with determining if the
financial risk levels of firms changing to the successful-
efforts method decrease prior to the change. None of the
variables substantially decreased prior to the change.
Instead, the leverage variables increased, with the most
substantial increase being in the debt to revenue ratio,
while the debt beta remained constant.

The final question was to determine if the risk levels
of firms which do not change methods remain relatively
stable over time. In general, it could not be concluded
that these risk levels changed over the test period. An
exception was for the debt betas of successful-efforts
firms with public debt. These firms' debt betas decreased
over the time period. This could be due to further
diversification on the part of the integrated firms
included in this sample.

The Implications

The findings of this research may be useful to both the
FASB and the SEC. The debt beta, which is the market
assessment of financial risk, appears to be a relevant

consideration in the decision to change accounting methods
when successful-efforts firms switch to use the full-cost
method. The method change does not appear to be due to
auditor pressure since only three of the fourteen firms
which changed methods switched auditors in the five years
preceding the method change. These changes involved "Big
Eight" firms having clients using both methods. The
relevance of financial risk to the decision to change to
full-cost accounting could explain why firms which
anticipate possible increases in financial risk would
oppose elimination of the full-cost method. However, other
firms opposing elimination of the full-cost method must
have other reasons for their opposition. These reasons
could include a resistance to the reduction of accounting
options, the effect of the change on reported net income,
and the effect of the change on management compensation.

This study also has agency theory implications. The
findings of this study are consistent with agency theory in
that firms which changed to full-cost accounting had
increases in their debt betas prior to the change. Agency
theory predicts that firms with increasing financial risk
may tend to change to the full-cost method in order to
avoid technical default on their loan covenants. Agency
theory generally predicts a decrease, prior to the change,
in the financial risk of firms switching to the
successful efforts method. The results of this study,

however, do not support this claim.

For firms maintaining the use of one method, it could not be concluded that the debt betas for full-cost firms exceed those for successful-efforts firms. This finding is also consistent with agency theory which does not predict the necessary use of one method or the other for firms with stable risk over time.

In general, no change in the debt betas over time of the firms that did not change accounting methods during the test period could be discerned. This is consistent with agency theory which predicts that firms which do not change methods have stable financial risk over time. The only exception was a decrease in the debt betas of successful-efforts firms with public debt.

An important finding of this research is that the debt betas do not always behave in the same manner as the leverage variables. This suggests that the market does consider other factors besides leverage when assessing financial risk. Therefore, the use of leverage as a surrogate for financial risk may not be appropriate in the oil and gas industry.

The Limitations

Several limitations are common to nonexperimental studies such as this one. First, it was not possible to take a random sample from the entire population of all oil and gas firms in order to assign them to the full-cost and

successful-efforts categories. However, random samples
were taken from each category of firms in this study,
except for firms changing methods for which the entire
populations were examined. Secondly, no independent
variables were manipulated because it was not possible to
change the firm's level of financial risk in order to
observe if accounting method changes would then occur.

In this study, the debt beta was obtained by taking a
weighted difference of the asset and equity betas. It may
be possible to obtain the debt beta through use of
alternate methods, which were not explored here. Also, in
this study, a common asset beta was assumed for all firms
in the industry. There may be some differences in the risk
of holding crude petroleum among firms in the industry.

Only financial risk was examined as being a possible
determinant of accounting method choice. Other variables
which may affect that choice were not considered. However,
an attempt was made to control for some confounding
variables. First, companies which deal primarily in areas
other than in the exploration and production of crude
petroleum and natural gas were eliminated as potential
sample firms because they would not be influenced
significantly by the choice of full-cost or successful-
efforts accounting. Also, firm size was controlled to some
extent by using separate samples for firms having public
debt and firms having only private debt. The public debt

firms were in general larger than the firms with private debt.

Future Research

The findings of this research appear to have important implications as to the design of future research projects. Leverage can no longer automatically be accepted as a surrogate for financial risk. The market considers additional information in assessing a firm's financial risk. Future research could be performed which would attempt to reveal what factors are considered by the market in assessing this risk.

Future research could also attempt to uncover what other factors enter into the decision to change accounting methods in the oil and gas industry. It appears that firms that change to the full-cost accounting method experience an increase in risk prior to the change, but other factors may also enter into the change decision. Also, it is apparent that other factors enter into the decision to change to the successful-efforts method of accounting. However, this study makes a significant contribution to the direction of future research through the introduction of the debt beta.

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APPENDIX A

LISTS OF SAMPLE FIRMS BY CATEGORY

Sample of Firms Maintaining

Full-Cost Accounting

With Public Debt

Firm No.	Name
1	Mitchell Energy and Development
2	Apache Corporation
3	Pogo Producing
4	Forest Oil Corporation
5	Triton Energy Corporation
6	Southwestern Energy Company
7	Wainoco
8	Universal Resources
9	Consolidated Oil and Gas
10	Wilshire Oil Company of Texas

Note: All firms in this sample were used in testing the
hypotheses which matched the 1977 and 1986 risk levels.

Sample of Firms Maintaining

Successful-Efforts Accounting

With Public Debt

Firm No.	Name
1	Mobil Oil Corporation
2	Texaco Incorporated
3	ARCO
4	Sun Company
5	Standard Oil Company
6	Unocal
7	Amerada Hess Corporation
8	Diamond Shamrock Corporation
9	Quaker State Corporation
10	Louisiana Land and Exploration

Note: All firms in this sample were used in testing the hypotheses which matched the 1977 and 1986 risk levels.

Sample of Firms Maintaining

Full-Cost Accounting

With Only Private Debt

Firm No.	Name
1	Callon Petroleum
2	McFarland Energy Incorporated
3	Patrick Petroleum Company
4	Galaxy Oil
5	Basic Earth Science Systems
6	Hershey Oil Corporation
7	Summit Energy
8	Bayou Resources Incorporated
9	GeoResources Incorporated
10	Amacan Resources
11	TGX Corporation
12	Chapman Energy Incorporated
13	Federated Natural Resources
14	Plains Resources
15	Presidio Oil
16	Swift Energy Company
17	Kimbark Oil and Gas Company
18	Saxon Oil Company
19	Harken Oil and Gas
20	Ranger Oil
21	Partners Oil Company

Sample of Firms Maintaining

Full-Cost Accounting

With Only Private Debt

(Continued)

Firm No.	Name
22	Whiting Petroleum
23	Evergreen Resources Incorporated
24	Normandy Oil and Gas
25	Prima Energy Corporation
26	Striker Petroleum
27	Valex Petroleum Company
28	Alta Energy Corporation
29	Falcon Oil and Gas Company
30	Toklan Oil Corporation
31	Chaparral Resources
32	Roberts Oil and Gas Incorporated

Note: The first ten firms on this list were included in the tests matching the 1977 and 1986 risk levels. Hershey Oil and Amacan Resources were included only in those matched tests and were not used in tests comparing risk between full-cost and successful-efforts firms for 1986.

Sample of Firms Maintaining

Successful-Efforts Accounting

With Only Private Debt

Firm No.	Name
1	ODECO
2	Park-Ohio Industries
3	Sabine Corporation
4	Wiser Oil Company
5	Beard Company
6	Maynard Oil Company
7	Equity Oil Company
8	Baruch-Foster Corporation
9	Western Natural Gas Company
10	Petrol Industries
11	Hamilton Oil Corporation
12	Alamco
13	Pyramid Oil Company
14	Cobb Resources
15	Mustang Companies
16	Usenco Incorporated
17	Burkhart Petroleum Company
18	Burton-Hawks Corporation
19	Oxford Consolidated
20	Southern Minerals Corporation
21	Great Eastern Energy and Development

Sample of Firms Maintaining

Successful-Efforts Accounting

With Only Private Debt

(Continued)

Firm No.	Name
22	Arch Petroleum Corporation
23	Greenwood Resources Incorporated
24	Norris Oil Corporation
25	Willard Pease Oil and Gas Company
26	Plano Petroleum Company
27	Taurus Petroleum Incorporated
28	Tyrex Oil Company
29	Penn Pacific Corporation
30	Albion International Resources
31	Exploration Company
32	Oil City Petroleum
33	Big Piney Oil and Gas Company

Note: The first ten firms on this list were included in the tests matching the 1977 and 1986 risk levels. Park-Ohio Industries, Sabine Corporation, and Wiser Oil Company were included only in those matched tests and were not used in tests comparing risk between full-cost and successful-efforts firms for 1986.

Firms Changing To Full-Cost Accounting

Firm No.	Name	Yr. of Change
1	Hadson Corporation	1984
2	Tom Brown Incorporated	1984
3	Nahama and Weagant Energy	1986
4	OXOCO Incorporated	1984
5	Asamera Incorporated	1982
6	Nugget Oil Company	1982
7	Wichita Industries	1984

Firms Changing To Successful-Efforts Accounting

Firm No.	Name	Yr. of Change
1	Ensources Incorporated	1985
2	Brock Exploration	1986
3	Texas International Company	1983
4	KRM Petroleum	1985
5	Allegheny and Western Energy	1985
6	Conquest Exploration	1986
7	American Exploration Company	1986

APPENDIX B

LISTS OF ALL-EQUITY FIRMS BY YEAR

All-Equity Firms

1977

Number	Name
1	Hershey Oil Company
2	GeoResources Incorporated
3	Wiser Oil Company
4	Equity Oil Company
5	Western Natural Gas Company

All-Equity Firms

1978

Number	Name
1	Equity Oil Company
2	Wiser Oil Company
3	Chaparral Resources

All-Equity Firms

1979

Number	Name
1	McFarland Energy Incorporated
2	Wiser Oil Company
3	Equity Oil Company

All-Equity Firms

1980

Number	Name
1	McFarland Energy Incorporated
2	Amacan Resources
3	Wiser Oil Company

All-Equity Firms

1981

Number	Name
1	Plano Petroleum Company
2	Tyrex Oil Company
3	Big Piney Oil and Gas Company
4	Great Eastern Energy and Development

All-Equity Firms

1982

Number	Name
1	Tyrex Oil Company
2	Big Piney Oil and Gas Company
3	Plano Petroleum Company

All-Equity Firms

1983

Number	Name
1	Plano Petroleum Company
2	Tyrex Petroleum Company
3	Big Piney Oil and Gas Company

All-Equity Firms

1984

Number	Name
1	Plano Petroleum Company
2	Tyrex Petroleum Company
3	Exploration Company
4	Big Piney Oil and Gas Company

All-Equity Firms

1985

Number	Name
1	Southern Minerals Corporation
2	Tyrex Petroleum Company
3	Exploration Company
4	Big Piney Oil and Gas Company

All-Equity Firms

1986

Number	Name
1	Southern Minerals Corporation
2	Plano Petroleum Company
3	Amacan Resources

APPENDIX C

LIST OF INDUSTRY-WIDE ASSET BETAS

BY YEAR

Industry-Wide Asset Betas By Year

Year	Asset Beta
1977	1.2376
1978	1.2270
1979	1.2813
1980	1.2828
1981	1.8230
1982	1.7495
1983	1.8435
1984	1.9620
1985	.7480
1986	.8180

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                          Implications of Models and Theories of Finance to Accounting.

                          Issues in Petroleum Accounting.

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Honors and Awards

AICPA Grant for Doctoral Studies, 1985-1988.

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Outstanding Young Women of America, 1981.

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Financial Executives Institute Award for Outstanding Accounting Senior, 1980.

Phi Chi Theta Key Award for Outstanding Female Senior in the College of Business, 1980.

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Beta Alpha Psi National Accounting Honor Society.

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Professional and Academic Organizations and Activities

American Institute of Certified Public Accountants.

Texas Society of Certified Public Accountants.

American Accounting Association, Associate Member.

Petroleum Accountants Society of Houston (Chairperson of Education Committee, 1984-1985).

Professional Experience

Budget Supervisor, Columbia Gas Development Corporation, 1980-1985. Duties included preparation of capital budgets on oil and gas drilling activities for corporate management, monitoring and analysis of capital expenditures, preparation of budget presentation and long-range plan, and preparation of economic evaluations on oil and gas prospects.

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DOCTORAL EXAMINATION AND DISSERTATION REPORT

Candidate   Linda Marie Nichols

Major Field: Accounting

Title of Dissertation   An Examination of the Effect of Financial Risk on the
Manager's Choice of Accounting Methods

Approved

Kenneth N Orbach
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Date of Examination:

June 15, 1989