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The Impact The Price Of Oil Has On A Product Manufacturer In The Oil And Gas Industry

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THE IMPACT THE PRICE OF OIL HAS ON A PRODUCT MANUFACTURER IN THE OIL AND
GAS INDUSTRY

by

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This thesis, submitted by Philip Schwarz in partial fulfillment of the requirements for the Degree of Master of Science in Applied Economics from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.

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This thesis meets the standards for appearance, conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

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ABSTRACT

OFI Testing Equipment, Inc. (OFITE) is a manufacturer of laboratory testing

equipment in the upstream oil and gas industry. This paper measures the dependency

of OFITE's revenues on the price of oil. Moreover, the paper outlines a revenue forecast

based on the price of Brent crude oil. The analysis finds that over 94% of the variability

in OFITE's revenues is explained by the price of Brent oil. This information is important

to OFITE owners and management if they wish to increase revenues when oil prices are

flat or decreasing. A diversification strategy is one avenue owners could take to lessen

OFITE's dependency on the price of oil.

CHAPTER I

INTRODUCTION

Any business strategy revolves around sales and profitability growth in some

shape or form. This growth translates into increased shareholder wealth, arguably the

top priority for any Chief Executive Officer (CEO) (Carrott & Jackson, 2009). In many

cases, growth also translates into increased wealth for employees through bonuses,

stock options, and/or profit sharing plans.

To project future growth one must understand how past growth was achieved,

and particularly which economic factors contributed to that growth. Two sets of factors

matter: firm specific and industry specific. Understanding the extent that revenue

growth is dependent on industry factors can help guide business strategy. If a

company's growth is highly dependent on fluctuating industry factors, a diversification

strategy may help owners stabilize growth. Ansoff (1957) describes diversification as

the departure from the existing product line and market structure in effort to create

new markets and new products. Much of OFITE's existing product lines target specific

laboratory applications in the upstream oil and gas industry. To diversify, OFITE would

need to find ways to generate revenues outside this market.

This paper will analyze the impact the price of oil has had on the revenues of OFI Testing Equipment (OFITE) during the period 1983 through 2012. A revenue forecast through 2040 will then be made based on the projections of oil prices published by the Energy Information Association. This forecast is important for OFITE's leadership team to serve as a guide for management decisions (Diebold, 2007). If the forecasted growth is low and does not meet the owner's expectations, strategic decisions can be made to support higher levels of revenue growth. Additionally, this forecast is important because their success is measured based on growth. If a company's growth is tightly correlated with industry factors, and goals are set independently of these factors, their efforts may be unsuccessful in years when the price of oil negatively impacts the company's growth.

The Energy Information Association publishes historical prices and future estimates for Brent crude oil, the international price index for crude oil. Other industry factors which impact OFTITE revenue growth include but are not limited to annual oil and gas operator capital expenditures and the number of active drilling rigs. Those factors will not be studied in this analysis because forecasts for these indicators are not published and updated on a frequent basis.

CHAPTER II

METHODS

The purpose of this study is to quantify the impact that the price of oil has on the

growth of OFI Testing Equipment, Inc. Once this effect is quantified, a detailed forecast

will be made through 2040 using oil price forecast data from the Energy Information

Association. Understanding these effects can assist in strategic planning, particularly in

acquisition and merger strategy. Depending on the degree in which OFITE's growth is

tightly correlated to industry, ownership may place a higher emphasis on partnering

with a company which has a majority of its revenues generated outside the oil and gas

industry to diversify its revenue base.

This study utilizes a linear regression model to understand the impact the price

of oil has on OFITE's revenues on an annual and quarterly basis. An autoregressive (AR)

model is then used to forecast future sales. OFITE's revenues are used as the

dependent variable and the price of oil is used as the independent variable. Significant

portions of OFITE's revenues are generated in the U.S. and internationally, therefore the

price of West Texas Intermediate (WTI) Crude, Brent Crude, and world oil price are

analyzed to determine which benchmark has the greater impact on OFITE's revenues.

WTI is the price benchmark utilized in the U.S. and Brent is the price benchmark utilized

internationally. A weighted average price between the two is the world oil price.   The

natural log of OFITE sales is also used in the forecasting model to help stabilize the

dependent variable and understand its dependence on the price of oil. Finally, an

average annual oil price and a December oil price are analyzed for to uncover any

potential differences when the price of oil data is taken. OFITE's annual revenues are

finalized on the last business day in December. As such, it was thought that there may

be a better correlation with December crude price.

CHAPTER III

RESULTS

Tables 1 and 2 show independent linear regression results for OFITE revenues vs.

the price of oil. Table 1 displays the six linear regression results for *annual* data from

1983 – 2012, the entire history of OFI Testing Equipment. Table 2 displays the

regression results for *quarterly* data from 2000-2012. Quarterly data is unavailable

before the year 2000.

In both tables, all independent variables show a very high statistical significance

with OFITE revenues. Each independent variable exhibit P values of less than 0.001 and

R^2 values of higher than .80. The independent variable with the highest statistical

significance for both annual and quarterly data is the Brent Crude price average. This

can be attributed to a majority of OFITE's revenues being generated outside the U.S.

The annual average Brent price also correlates more tightly with OFITE revenues than

does the December price. This can be explained that OFITE's customer spending is

based on the firm's price forecasts which in turn determines their budget.

Table 1: Linear Regression Results: OFITE Annual Revenues vs. Price of Oil

Independent Variable	Coefficient	Standard Error	t Statistic	R^2
Avg. WTI Price	359436.5	20768.23	17.31	.9145
Avg. Brent Price	328977.3	15301.35	21.50	.9429
Avg. World Price	339749.4	16601.88	20.46	.9373
December WTI Price	340666.1	30832.13	11.05	.8134
December Brent Price	313492.7	25655.04	12.22	.8421
December World Price	323190.9	27052.58	11.95	.8360

*All variables have $p < 0.001$

Table 2: Linear Regression Results: OFITE Quarterly Revenues vs. Price of Oil

Independent Variable	Coefficient	Standard Error	t Statistic	R^2
Avg. WTI Price	81541.36	6392.783	12.76	.7649
Avg. Brent Price	74903.54	4415.066	16.97	.8520
Avg. World Price	77614.40	4945.782	15.69	.8312
December WTI Price	78308.58	6832.703	11.46	.7243
December Brent Price	72412.55	4904.902	14.76	.8134
December World Price	74957.63	5425.700	13.82	.7924

*All variables have $p < 0.001$

Table 3 reveals the results of the ARIMA model under standard condition and

natural logarithm conditions. The natural logarithm case is used to stabilize the variance

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of the series (Lütkepohl & Xu, 2009).   In both cases, the independent variable shows

high statistical significance.

Table 3: ARIMA OFITE Annual Revenues vs. Average Brent Price

Dependent Variable	Ind. Variable	Coefficient	Standard Error	Statistic	X^2
Annual Revenues	Avg. Brent Price*	328977.3	16734.27	19.66	386.47
LN (Annual Revenues)	LN(Avg. Brent Price)*	1.295382	.5184287	2.5	6.24

* $p < 0.001$

Figure 1 plots the forecasted revenues versus the actual from 1983 to

2012. OFITE revenues are not published hence the revenue values on the Y-axis of the

graph are not shown. The forecasted results from the ARIMA model show high errors in

the first half of the data set and lower errors in the latter half. The highest absolute

errors occur over 3 periods. The first period occurs in the 1980's (1983, 1984, 1985, and

1987) with absolute errors exceeding 100%. The second period occurs in the 1990's

(1991, 1994-1998) with absolute errors ranging from 30-90%. The third period occurs

from 2001 – 2003 with errors ranging from 15% to 40%. The errors in the first period

can be attributed to a decrease in oil prices and an increase in OFITE revenues. The

price of oil declined nearly 50% from 1983 to 1988 however OFITE revenues increased

by 400%. The first period of larger error occurred as OFITE quickly captured market

share during a time of declining market size. The absolute errors during the 2nd period

occur due to a recession (1991) and the addition of a new market. In the mid 1990's,

the addition of a new product line in the cement testing market and the continued

expansion of international business helped grow OFITE's revenues 110% while the price

of oil increased 20%. The final period can be attributed to a recession which occurred in

2001.

The model forecast shows very good results from 2006 to 2012 with absolute

error average of 6.7%. The highest absolute error during this period occurred in 2008

(12%), another recessionary period. One reason for the low errors in the model in

recent years can be attributed to the recent dominance the price of oil has on

exploration and production investments. In 2004, 40% of the active drilling rigs globally

were drilling for oil as opposed 80% today (Baker Hughes, 2013).

Figure 1: Actual Annual OFITE Revenues vs. Forecast with Absolute Errors
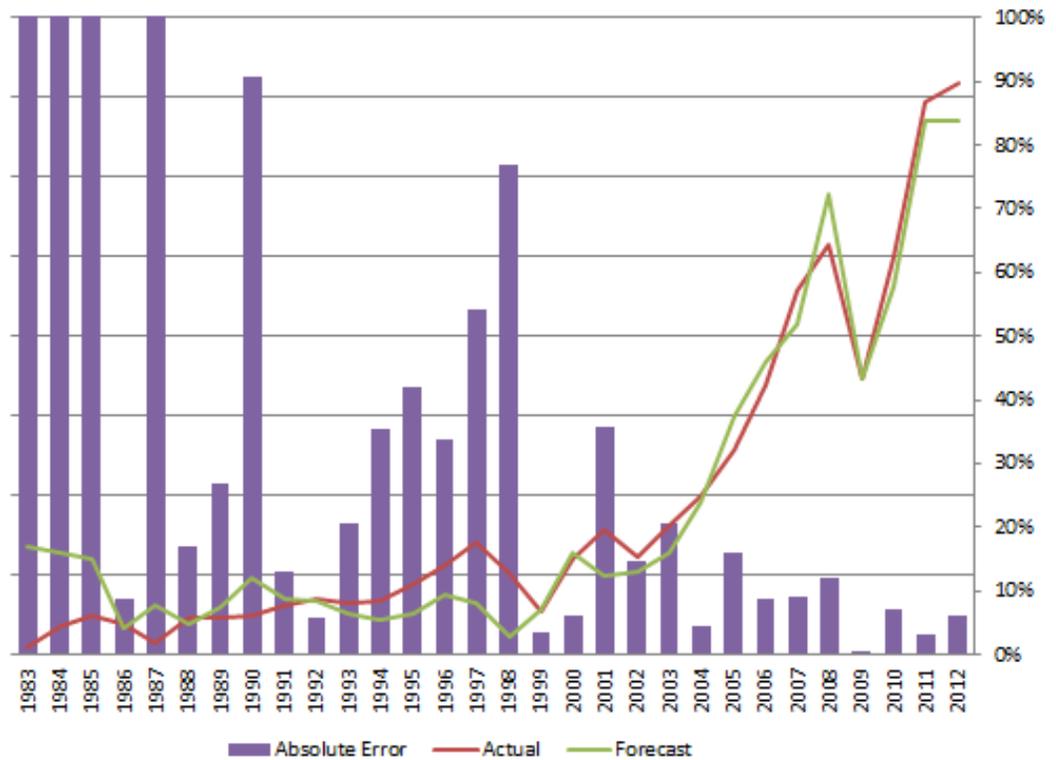
Figure 2 plots the forecasted revenues after being retransformed from their logarithmic form. Transforming revenues and the price of oil to logarithmic form did not improve overall forecast accuracy. The three periods with high absolute errors experienced reductions in their overall error, however on a relative basis the errors continued to exceed 40%. The average percentage error from 2006 to 2012 was nearly twice that of the forecast model not using logarithmic transformation. Lag and time variables were added to the ARIMA model, however the absolute errors increased.

Figure 2: Actual Annual OFITE Revenues vs. Forecast with Absolute Errors (Retransformed)
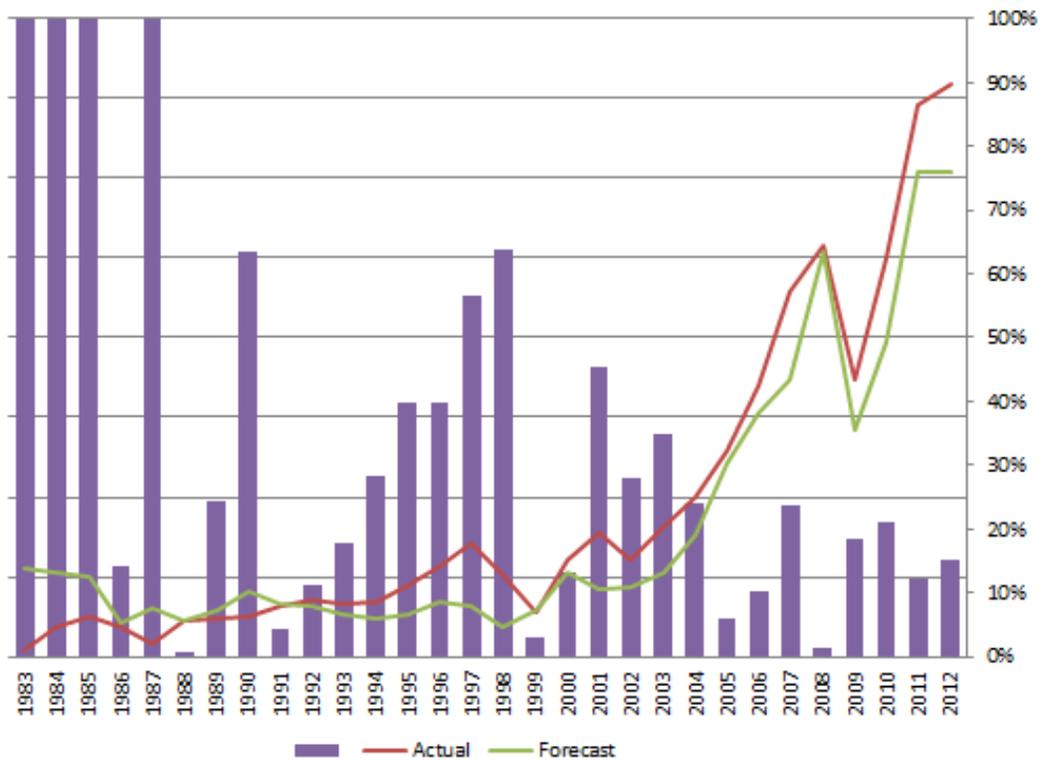
Finally, utilizing the output of the ARIMA in Table 3 and forecast oil data from the EIA, a revenue forecast is created using data from the EIA. Figure 3 shows OFITE forecasted revenues (normalized) based on three cases of oil data from the EIA,

reference, high, and low. Under the reference forecast, it's estimated that OFITE

revenues will increase 140% from 2012 to 2040. This is equivalent to a 3.1% compound

annual growth rate (CAGR). The low forecast estimates revenues will grow only 5.6%

(.2% CAGR) over this time while the high forecast estimates growth to be slightly over

250% (4.6% CAGR).

Figure 3: OFITE Revenues in Three Cases 1983-2040
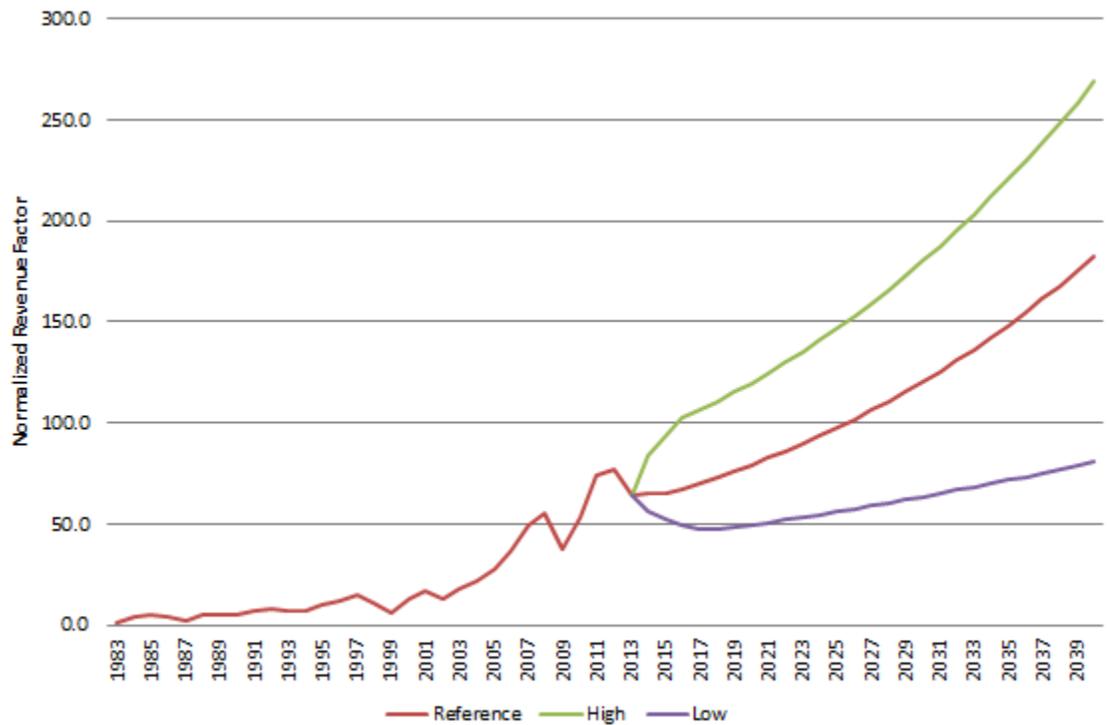
CHAPTER IV

CONCLUSION

A vast majority of the variability of OFITE revenues can be statistically explained by the changes in industry factors, particularly the price of oil. A model solely based on the price of Brent crude can estimate OFITE revenues with an absolute error average of 6% since 2007. This model combined with forecasted oil data from the Energy Information Association shows OFITE revenues to increase 140% (4.6% CAGR) by 2040. The low and high forecast cases show a wide gap in potential growth between 5% (.2% CAGR) and 250% (3.1% CAGR) between current levels and the year 2040.

Despite the low errors, the model depends on forecasted data for the price of oil. Forecast oil data shows a high oil price in 2040 that is three times as much as the low oil price. This spread in oil prices translates into a wide range of forecast revenues.

Creating and implementing a diversification strategy is one avenue to lessen the dependence revenue growth has on the price of oil and avoid the low forecast case of .2% annual growth.

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