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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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Philip Schwarz

4/18/2013

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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

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

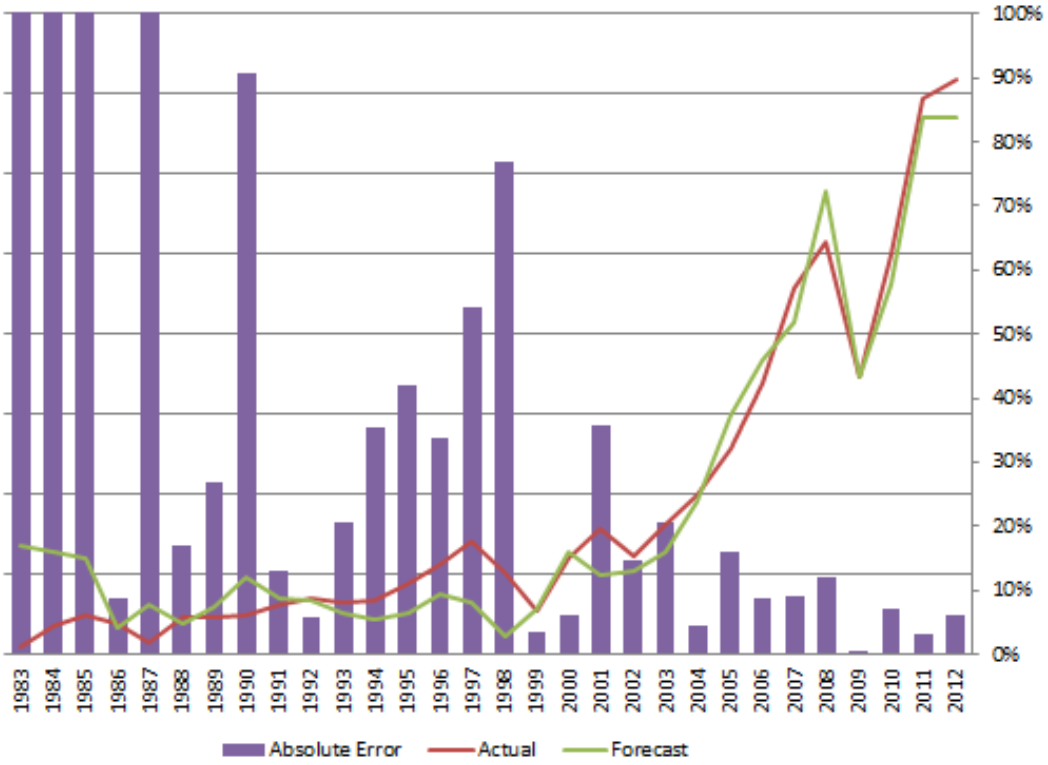
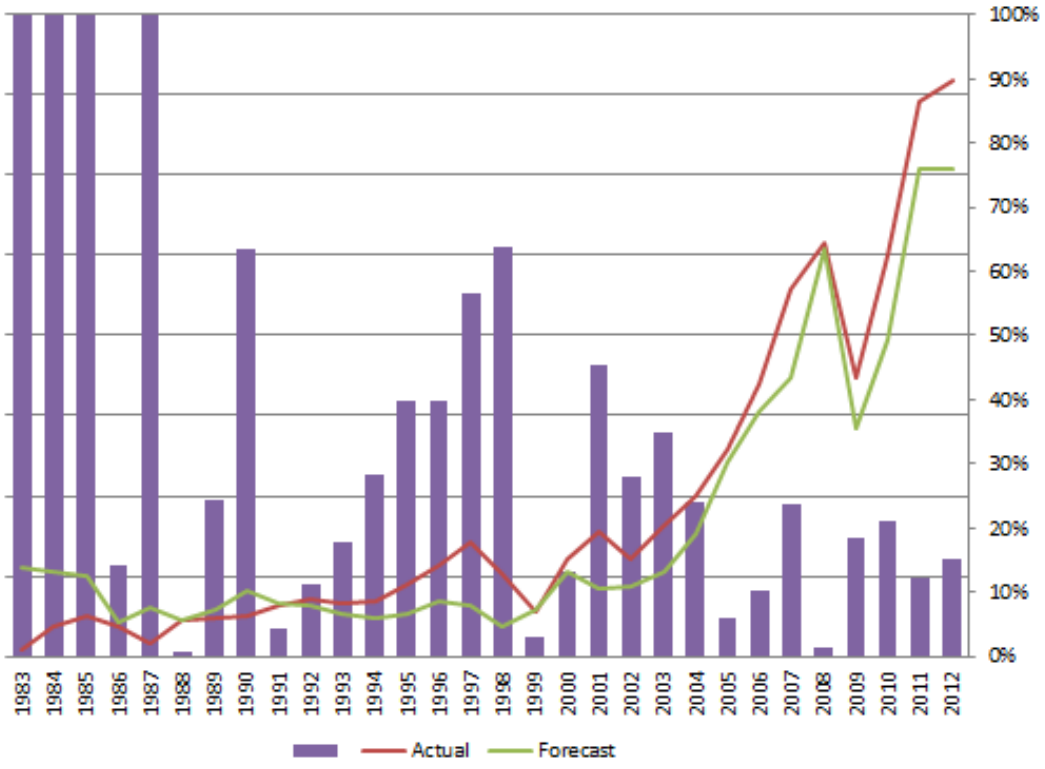


Figure 2 plots the forecasted revenues after being retransformed from their logarithmic form. Transforming revenues and the price of oil to logarithmic form did not improve overall forecast accuracy. The three periods with high absolute errors experienced reductions in their overall error, however on 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.

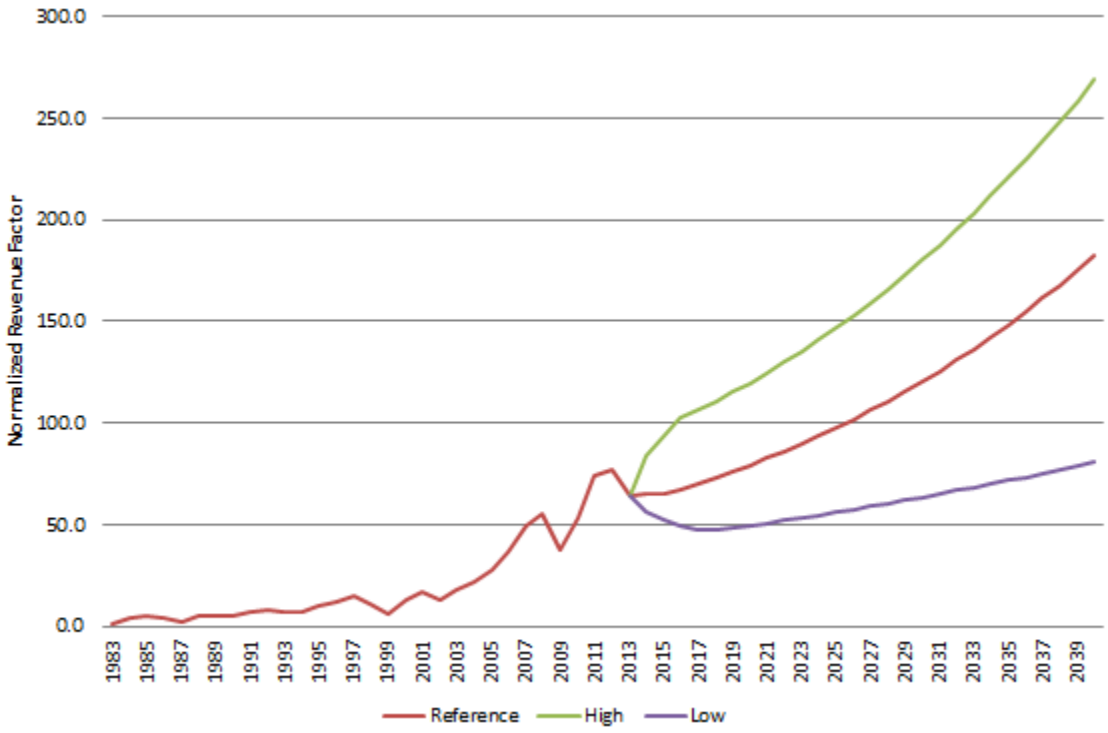
Figure 2: Actual Annual OFITE Revenues vs. Forecast with Absolute Errors (Retransformed)



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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