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## STEVE SHARPE: A STOCK REPORT

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Margaret M. Tanner, University of Arkansas – Fort Smith

### CASE DESCRIPTION

*This case pertains to the valuation approach for a common stock being considered for purchase by a student in a Student-Managed Fund (SMF) class at a university. The fundamental factors of analysis pertaining to the profile of the company include the firm's products/services, the nature of the demand for the products and the managerial comparisons for sales. In addition, earnings per share, return on sales, return on assets and return on equity are considered. However, historical data on price-earnings ratios and dividend payout ratios are very important in all valuations, but they are not stressed in the case.*

*The emphasis of the case relates to recognition of risk, as it pertains to the common stock of the firm, estimations of the required rate of return (sometimes known as the hurdle rate), calculation of the "present value factor" which permits analysts to determine the present value of annualized return data projected into a specific future period. A price of the common stock projected into the future can be discounted to compare its present value with the current market price to determine whether the stock is undervalued or overvalued. In like fashion, a holding period return calculated in a time period greater than five years can be annualized for comparison with the required return obtained from an asset pricing model to determine whether the stock is undervalued or overvalued.*

*This case has a difficulty level appropriate for senior level or first year MBA students. It is designed to be taught in a single class period. Approximately two hours of student preparation time should be adequate for most students depending on their proficiency.*

**JEL:** G11; A29

**KEYWORDS:** Risk, Stock Report, Required Rate of Return, Student-Managed Fund

### CASE INFORMATION

Steve Sharpe is a graduate of Lowell State University. While attending Lowell State he enrolled in the university's Student-Managed Fund (SMF) class a number of years ago. Now a faculty member at Wettown University, Steve teaches graduate and undergraduate investment classes and he would like to offer the heart of a stock report normally prepared by those enrolled in an SMF class. Steve would like to present to his students the use of the regression and some quantitative techniques pertaining to the valuation process. He called his friend Jack Pettyjohn to see if a case could be put together. Jack agreed because there is a shortage of cases from which good projects can be made for investment classes.

Descriptive measures and selected single-index monthly regression results of a company called *BIG-T* are provided. The purpose is to review pertinent concepts of describing and summarizing a bath of numerical data in the context of identifying portfolio properties. Although these concepts have been covered in basic statistics courses, it is important enough to go over again so that students may be better prepared for discussions regarding various risk measurements in portfolio management.

Table 1: Descriptive Measures of the Return Series

<i>Descriptive Measure</i>	<i>The Big-T</i>	<i>The S&amp;P 500</i>
Arithmetic Mean	0.30%	0.59%
Mode	No Mode	No Mode
Count	104	104
Minimum	-12.24%	-14.46%
First Quartile	-2.31%	-1.89%
Median	0.70%	0.93%
Third Quartile	3.19%	3.80%
Maximum	10.22%	9.78%
Range	22.46%	24.24%
Variance	0.002250	0.002031
Standard Deviation	4.74%	4.51%
Geometric Mean	0.19%	0.49%

*This table shows the descriptive measures of the monthly return series of Big-T and that of S&P 500. Note: For all the estimates expressed in percentages, two digits after the decimal point are taken. For example, the standard deviation of the Big-T fund is displayed as 4.74%, but the more accurate estimate obtained from the Excel spreadsheet (not shown) is 4.74301379856173%. For the ease of exposition, it is rounded off to 4.74%.*

For the outputs shown in Table 2, the following regression equation was estimated.

$$r_{Big-T,t} = \alpha_{Big-T} + \beta_{Big-T} \times r_{M,t} + \varepsilon_{Big-T,t} \tag{1}$$

Equation (1) is called the single-index (market) model, where:

$r_{Big-T,t}$  = return for the *Big-T* over month  $t$ .

$\alpha_{Big-T}$  = regression coefficient representing the intercept term for the *Big-T*. It is the *Big-T*'s return component that is independent of the market's return.

$\beta_{Big-T}$  = regression coefficient representing the slope of the regression line. It measures the expected change in the *Big-T*'s return given a change in the market's return.

$r_{M,t}$  = return on a selected market index (i.e., *S&P 500*) for month  $t$ .

$\varepsilon_{Big-T,t}$  = error term of the regression for month  $t$ . It measures the deviation of the observed return from the return predicted by the regression and has an expected value of zero.

Ordinary Least Squares estimates were obtained. The results are presented in Table 2.

Table 2: Selected Outputs from the Regression of the Single-index (Market) Model

Regression Statistics	
R-Square	89.90%
Adjusted R-Square	89.80%
The Standard Error of the Estimate	1.52%
The Coefficient of Correlation	0.9481
Observations	104

	Coefficients	Standard Error	t Statistic	P-value
Intercept	-0.0029	0.0015	-1.9180	0.0579
The Beta Estimate	0.9979	0.0331	30.1245	0.0000

This Table 2 shows the regression results from the Ordinary Least Squares estimation using Equation (1). The monthly return series are those of Big-T and that of S&P 500, respectively.

A return is composed of two pieces: yield and price change. Yield is the income divided by the purchasing price. The second component of it is the increase or decrease in the price of the security. For a common stock, the yield is the dividend divided by the price paid. For a bond, the yield is the interest divided by the price paid. Our concern pertaining to the return in this case is the common stock (equity) return. When considering returns it should be recognized that there is a difference between “expected” return and “realized” return. Expected return is what you pay for when you buy a security, while realized return is what you receive at the end of an investment horizon. When discussing returns in investing, two terms are defined as follows:

$$\text{Holding Period Return (HPR)} = \frac{P_1 + D}{P_0} \tag{2}$$

$$\text{Holding Period Yield (HPY)} = \frac{(P_1 - P_0) + D}{P_0} \tag{3}$$

where:

$P_1$  = ending wealth or ending price.

$P_0$  = beginning wealth or beginning price.

$D$  = dividend, distribution or income.

A simple application is given below. You invest \$100 ( $P_0 = \$100$ ) in a common stock for a period, during which you received a \$5 dividend ( $D = \$5$ ). The ending price of the stock is \$110 ( $P_1 = \$110$ .) Thus, in this example:

$$\text{Holding Period Return (HPR)} = \frac{P_1 + D}{P_0} = \frac{\$110 + \$5}{\$100} = 1.15.$$

$$\text{HPY} = \frac{(P_1 - P_0) + D}{P_0} = \frac{P_1 - P_0}{P_0} + \frac{D}{P_0} = \frac{\$110 - \$100}{\$100} + \frac{\$5}{\$100} = 0.10 + 0.05 = 0.15 = 15\%.$$

As mentioned previously, your return of 15% by investing in this common stock consists of the following two components:

Price change (price appreciation):  $\frac{P_1 - P_0}{P_0} = \frac{\$110 - \$100}{\$100} = 0.10$  (or 10%), and

$$\text{Yield: } \frac{D}{P_0} = \frac{\$5}{\$100} = 0.05 \text{ (or 5\%)}$$

Alternatively,

$$HPY = HPR - 1 = 1.15 - 1 = 0.15 = 15\%$$

Every individual interested in putting together a plan for his or her retirement should be introduced to *Stocks, Bonds, Bills and Inflation (SBBI)*, a yearly publication of Ibbotson & Associates. If one had invested \$1 in large Cap common stocks, the annual geometric mean return ending at the end of 2009 would be about 9.80% for the full 84-year period. If one is concerned for a cost of equity, or other returns usable for future planning, arithmetic mean returns are shown to be 11.80% for the *S&P* stocks. Using Ibbotson data, the desirability of using equity (common stocks) for investing in a retirement plan considered for a long period, i.e., greater than 25 years, can be illustrated. The (inflation-adjusted) purchasing power can be calculated to show the equity desirability. In the following example, the period is 84 years.

Large Cap Stocks	9.80%
Long-term Treasury Bonds	5.40%
Annual Average Inflation	3.00%

The purchasing power of the return provided by Large Cap stocks is estimated to be,

$$\left( \frac{1 + 9.80\%}{1 + 3.00\%} \right)^{84} = \left( \frac{1.098}{1.030} \right)^{84} \approx (1.06601942)^{84} \approx \$214.92.$$

The purchasing power of the return provided by Long-term Treasury bonds is estimated to be,

$$\left( \frac{1 + 5.40\%}{1 + 3.00\%} \right)^{84} = \left( \frac{1.054}{1.030} \right)^{84} \approx (1.02330097)^{84} \approx \$6.92.$$

Put differently, \$1 invested in Large Cap stocks on January 1<sup>st</sup>, 1926 grew to \$214.92 by the end of 2009 over the 84 years adjusted for inflation. However, the purchasing power only would have grown to \$6.92 if it had been invested in Long-term Treasury bonds. The choice of purchasing power of \$214.92 compared to a “choice” of purchasing power of \$6.92 is obviously preferred. Table 3 contains an illustration of difference between the arithmetic mean and the geometric mean.

If returns vary, the geometric mean will always be lower than its arithmetic mean. The larger the standard deviation, the larger the difference. Only if the returns are the same in each period, will the geometric mean equal the arithmetic mean. Otherwise, the geometric mean is less than the arithmetic mean.

Another geometric calculation may be needed from time to time. As part of an analysis, the need to know the growth rate of earnings per share (*EPS*) or that of sales will occur frequently. The geometric average of the earnings per share or that of the sales would be either the growth rate of *EPS* or that of the sales, respectively.

Table 3: Calculation for the Arithmetic and Geometric Mean

Year	Holding Period Yield		Holding Period Return
1998	28.36%	HPR = 1 + 28.36% = 1.2836	1.2836
1999	20.87%	HPR = 1 + 20.87% = 1.2037	1.2037
2000	-9.05%	HPR = 1 + (-9.05%) = 0.9095	0.9095
2001	-11.85%	HPR = 1 + (-11.85%) = 0.8815	0.8815
2002	-22.10%	HPR = 1 + (-22.10%) = 0.7790	0.7790
2003	28.37%	HPR = 1 + 28.37% = 1.2837	1.2837
2004	10.75%	HPR = 1 + 10.75% = 1.1075	1.1075
2005	4.83%	HPR = 1 + 4.83% = 1.0483	1.0483
2006	15.61%	HPR = 1 + 15.61% = 1.1561	1.1561
2007	5.48%	HPR = 1 + 5.48% = 1.0548	1.0548
The sum of these 10 HPYs	71.27%	The product of these 10 HPRs	1.7610395
Divide the above sum by 10	7.127%	Find the 10 <sup>th</sup> root of the above product, and subsequently subtract 1 from the resultant root	10 <sup>th</sup> root, 1.058223 Minus 1 from it, 5.822%
Arithmetic Mean	7.127%	Geometric Mean	5.822%

*This Table provides selected data of the S&P 500 for the period from 1998 through 2007. For the arithmetic mean, the sum is divided by ten, the number of years. For the geometric mean calculation, the first step is to take the product of ten HPRs.*

An academic definition of the required rate of return is the minimum return required to attract an investor to purchase a security. In this study, the required rate of return is estimated by the Capital Asset Pricing Model (CAPM). With the data used in this case, the CAPM formula is given as follows,

$$E(R_j) = R_{f1} + (R_m - R_{f2}) \times \text{beta}_j \tag{4}$$

where:

$E(R_j)$  = the required rate of return for security  $j$ .

$R_{f1}$  = the current 20-year Treasury bond interest rate estimated at 4.08%.

$R_{f2}$  = the 84-year average of the Treasury bond interest rate estimated at 5.80% by Ibbotson.

$R_m$  = the 84-year arithmetic mean of the market return estimated at 11.80% by Ibbotson.

$\text{beta}_j$  = security  $j$ 's response to the market's movement or volatility (risk).

The most common proxy for a risk-free security is a 20-year Treasury bond interest rate. Consequently, any reference to  $R_f$  in this case uses a current 20-year T-bond rate. At the end of May 2010, the rate was about 4.08%. There may be two reasons why a T-bond rate is the better proxy because (1) it contains long-term inflation expectations, which more closely matches the usual investment horizon of stock investments, and (2) it is influenced less by the Federal Reserve's policy actions.

Thus, as an example, the required rate of return of the *Big-T* shown in Table 2 is estimated by applying Equation (4) as follows:

$$\begin{aligned}
 E(R_{Big-T}) &= R_{f1} + (R_m - R_{f2}) \times \beta_j \\
 &= 4.08\% + \left( \frac{1 + 11.80\%}{1 + 5.80\%} - 1 \right) \times 0.9979 \\
 &= 0.0408 + 0.0567 \times 0.9979 \\
 &= 0.0408 + 0.05658 = 0.09738 \approx 9.74\%.
 \end{aligned}$$

In Equation (4),  $R_m - R_{f2}$  is defined as the *equity risk premium*. When applying Ibbotson data, the equity risk premium needs to be estimated by dividing the market return by the long-term average of the Treasury bond as shown in the above example. This approach is referred to as a *geometric subtraction*. If one took an arithmetic subtraction instead, i.e.,  $R_m - R_{f2} = 11.80\% - 5.80\% = 6\% = 0.060$  the equity risk premium would have been estimated as 6%. The difference is approximately 0.33%,  $6\% - 5.67\% = 0.33\%$ . As long as Ibbotson data is used in Equation (4), the geometric subtraction estimate is considered more accurate. For instance, the faculty at Lowell State University has used this approach for eleven years with success.

The valuation process is illustrated with a sample data. Besides the aforementioned Ibbotson data, the most recent *Value Line Investment Survey* is used as well. Where possible we will follow a Q&A format to illustrate the valuation process.

Question: What data and sources are needed to calculate the required rate of return?

Answer: The needed data and sources are summarized below ( Table 4).

Table 4: Relevant Ibbotson Data ( 1926-2009)

<b>Relevant Ibbotson Data (1926 – 2009)</b>	
Large-cap Annual Arithmetic Mean Return	11.80%
The Standard Deviation	20.50%
The current 20-year Treasury Bond Interest Rate at the End of May 2010	4.08%
Long-term Government Bond Annual Arithmetic Mean Return	5.80%
<b>Selected Value Line Data: Projections for SnackCo</b>	
Projected Rate of Growth of the Earnings	12.0%
Projected Rate of Growth of the Dividends	5.5%
Projected Future P/E Estimate	20
The Value Line Beta Estimate of SnackCo	0.60
Estimated Average Future Annual Dividend Yield	1.9%

The assumption is made that the date of all calculations is May 31, 2010. Therefore, the base year for all calculations is 2009 for earnings per share and dividends. The 2009 annual earnings for SnackCo is \$3.77 per share and the 2009 annual dividends is \$1.75 per share. The current price of the stock is \$60.00.

Question: What is the estimate of SnackCo’s required return?

Answer: Apply Equation (4). Please remember to use a geometric subtraction to figure out the estimate of the equity risk premium.



$$\begin{aligned}
 E(R_{SnackCo}) &= R_{f1} + (R_m - R_{f2}) \times \text{beta}_{SnackCo} \\
 &= 4.08\% + \left( \frac{1 + 11.80\%}{1 + 5.80\%} - 1 \right) \times 0.60 \\
 &= 0.0408 + 0.0567 \times 0.60 \\
 &= 0.0408 + 0.03402 = 0.07482 \approx 7.48\%.
 \end{aligned}$$

Question: What is the present value factor?

Answer: The factor is the result of a calculation that permits an analyst to discount a future value back to the present date. By doing so, the analyst can determine whether or not there has been any value added during the interim from the present date to the specific future date.

Question: What is involved in calculating such a factor?

Answer: The specific period is determined first, then that period is determined in the form of years and parts of a year if not to a rounded year time. In this case, the period is from today's date, May 31, 2010, to the end of Year 2015. The number of remaining days in 2010 from the end of May to the end of December, i.e., June 1 to December 31, is 214. This part of Year 2010 is 0.5863013 (214 days/365 days). We add five years to this fraction so that there will be 5.5863013 years until the end of Year 2015. The discount factor is based on the required rate of return that has been estimated to be 7.48%. This factor is then based on the time to the end of 2015, which is 5.863013 years. Therefore, the present value factor is obtained by compounding the required rate of return for the time period to the end of 2015,  $(1 + 7.48\%)^{5.863013} = 1.5264215$ . The future value of the stock at the end of 2015 can be discounted back to May 31, 2010 by dividing it by this present value factor of 1.5264215. Alternatively, if you prefer to multiply rather than divide, the multiplier is 0.655127,  $\frac{1}{1.5264215} = 0.655127$ . Whether one divides the future value of the stock by 1.5264215 or multiplies it by 0.655127, the present value of the stock is the same.

Question: What is the dividend growth model?

Answer: For many years, most investment textbooks accept the theory that the dividend is all an investor receives from a share of common stock. Myron Gordon takes one further step and adds the fact that many stocks will be growing and consequently the dividend payments will reflect this growth. The model adds growth aspect to the summation of the dividends to be paid in the future. Gordon's model adds growth to the equation and simplifies the approach to be,

$$P_0 = \frac{D_0 \times (1 + g)}{k - g} = \frac{D_1}{k - g} \tag{5}$$

where,

$P_0$  = expected stock price today.

$D_0$  = the dividend just paid.

$D_1$  = the expected dividend to be paid next period.

$k$  = the expected rate of return of the stock.

$g$  = the constant dividend growth rate, and  $g < k$ .

Question: Describe the approach you are using and show the values.

Answer: First, we estimate the future stock price at the end of 2015. We grow the 2009 dividend of \$1.75 at the 5.50% annual growth rate until the end of 2016. This resultant estimated future dividend will be used as  $D_1$ .  $D_1$ , the 7<sup>th</sup> year dividend, is estimated as,

$$D_1 = \$1.75 \times (1 + 5.50\%)^7 = \$1.75 \times 1.45468 \approx \$2.55 .$$

The next step is to capitalize \$2.55 at a *Value Line* estimate of the average dividend yield of 1.9%, which is  $\frac{\$2.55}{1.9\%} = \$134.21$ . We then use the present value factor estimated earlier. As we said, you have the option of dividing \$134.21 by 1.5264215 or multiplying it by the multiplier of 0.655127. Either way, the stock price today is estimated to be \$87.92,  $\frac{\$134.21}{1.5264215} = \$87.92$  or  $\$134.21 \times 0.655127 = \$87.92$ . Since the price of the stock today is about \$60, it appears that it is undervalued.

Question: What is the nature of the annualized expected return?

Answer: The last calculation is a six-year holding period return (*HPR*). The numerator is the price expected at the end of the period plus the sum of the dividends expected to be paid in the six-year interval. This estimated future price is obtained by projecting the earnings per share (*EPS*) from the 2009 base and in turn multiplying it by the projected *P/E* ratio provided by Value Line. The final step for the *HPR* is to divide the total of the price and the sum of the dividends by the current price of \$60.00. After determining this *HPR* for the whole six-year period, it must be annualized for comparison with the required rate of return. If the resultant annualized *HPY* is greater than the required return, the security is considered to be undervalued.

Question: Can you show the valuation process using the *P/E* model?

Answer: It can be shown in an equation as a guide for the data.

$$\frac{\text{Price}_{2015} + \text{Sum of the expected dividends in the interim}}{\text{Price}_{2010}} = \frac{\text{Price}_{2015} + \text{Sum of the dividends from now through 2015}}{\text{The market price of the stock on May 31, 2010 of \$60.00}}$$

The steps, one at a time, should help clarify the process.

1. Compute earnings per share projected to the end of 2015.

$$EPS_{2015} = \$3.77 \times (1 + 12\%)^6 = \$3.77 \times 1.9738227 = \$7.4413115 \approx \$7.44$$

2. Project the Year-End 2015 Stock Price.

$$P_{2015} = EPS_{2015} \times \text{Projected P/E} = \$7.4413115 \times 20 \approx \$148.83$$

3. Sum all the expected dividends in the interim.

Table 5: Sum of all the Expected Dividends in the Interim

Sum all the expected dividends in the interim	
The remaining dividends to be paid in 2010	\$0.96
The expected dividend in 2011	$\$1.75 \times (1+5.5\%)^2 = \$1.9478$
The expected dividend in 2012	$\$1.75 \times (1+5.5\%)^3 = \$2.0549$
The expected dividend in 2013	$\$1.75 \times (1+5.5\%)^4 = \$2.1679$
The expected dividend in 2014	$\$1.75 \times (1+5.5\%)^5 = \$2.2872$
The expected dividend in 2015	$\$1.75 \times (1+5.5\%)^6 = \$2.4130$
<b>The sum is estimated to be</b>	<b>\$11.8308</b>

4. Compute the *HPR* for the whole period from May 31, 2010 to December 31, 2015.

$$\text{The HPR for the whole period} = (\$148.33 + \$11.8308) / \$60 = 2.6776133$$

5. Annualize the *HPR*.

There will be 5.5863013 years until the end of Year 2015, i.e.,  $N=5.5863013$ .

$$\begin{aligned} \text{The annualized HPR} &= (\text{The HPR for the whole period})^{1/N} = (2.6776133)^{1/5.5863013} \\ &= 1.1928088 \end{aligned}$$

6. Compute the annualized *HPY*.

$$\text{The annualized HPY} = \text{The annualized HPR} - 1 = 1.1928088 - 1 = 0.1928088 \approx 19.28\%$$

Since the estimated *HPY* of 19.28% is greater than the required return of 7.48%, the stock is undervalued.

## QUESTIONS

1. Using the regression output contained in Tables 1 and 2,
  - a. Determine the beta estimate from two sources. Show how.
  - b. How much of the variability in Big-T is answered by the market. Show how.
  - c. Calculate and show work to obtain the covariance.
  - d. Calculate the total risk for Big-T.

Information for Questions 2-5. For a company we will call “Big-T”, selected Value Line data are given.

*EPS* projected growth rate of 14%,

Dividend projected growth rate of 14%,

*P/E* projected to be 20,

Most recent full year (2009) *EPS* is \$3.37 and the dividend is \$0.60 per share,

Big-T pays quarterly dividends each year,

The projected average annual dividend yield is 0.8%, and

The beta estimate is 0.55.

2. Using data provided in the case and as shown above, calculate the required rate of return using the Ibbotson’s approach as illustrated.
3. (a) Calculate  $N$ , the number of years, from August 31, 2010 through the end of Year 2015.  
(b) Calculate the present value factor assuming the present date is August 31, 2010.
4. Using the dividend growth model, find the present value of the price determined by using the 7<sup>th</sup> year expected dividend.
5. Calculate the annualized *HPY* estimate for Big-T. Use all data available in the case and as given. (Hint: use the *HPR*, sum of the dividends expected between August 31, 2010 and the end of 2015, and assume the present stock price on August 31, 2010 of \$54.00.)

# STEVE SHARPE: A STOCK REPORT

## TEACHING NOTES

William P. Dukes, Texas Tech University  
 Zhuoming (Joe) Peng, University of Arkansas – Fort Smith  
 Margaret M. Tanner, University of Arkansas – Fort Smith

## CASE DESCRIPTION

*This case pertains to the valuation approach for a common stock being considered for purchase by a student in a Student-Managed Fund (SMF) class at a university. The fundamental factors of analysis pertaining to the profile of the company include the firm's products/services, the nature of the demand for the products and the managerial comparisons for sales. In addition, earnings per share, return on sales, return on assets and return on equity are considered. However, historical data on price-earnings ratios and dividend payout ratios are very important in all valuations, but they are not stressed in the case.*

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*This case has a difficulty level appropriate for senior level or first year MBA students. It is designed to be taught in a single class period. Approximately two hours of student preparation time should be adequate for most students depending on their proficiency.*

## QUESTIONS

**Question 1:** Using the regression output contained in Tables 1 and 2,

- Determine the beta estimate from two sources. Show how.
- How much of the variability in *Big-T* is answered by the market. Show how.
- Calculate and show work to obtain the covariance.
- Calculate the total risk for *Big-T*.

**Solution 1:**

$$(a) \text{ The beta estimate} = \frac{\text{The Covariance}_{(\text{the Big-T, The S\&P 500})}}{\text{The Variance of the Market}} = \frac{0.9481 \times 0.0474 \times 0.0451}{0.0451^2} \approx 0.9964$$

The beta estimate shown in Table 2 is 0.9979. A matter of rounding causes the difference.

(b) The relationship between the company returns and the S&P 500 returns shows that the variability of the company returns is answered by the  $R^2$  of 0.898 or 89.80%. Thus, the unanswered variability is  $R^2 - 1 = 0.898 - 1 = 0.102$ , or 10.20%.

(c) The covariance is calculated by multiplying the correlation of the two securities by each of the standard deviations of the two securities involved.

The Covariance  $_{(Big-T, The S\&P500)} = 0.9481 \times 0.0474 \times 0.0451 = 0.0020267$  as shown in Assignment 1(a) above.

(d) Total risk is the variance of the return on Big-T. The Variance  $_{Big-T} = 0.0474^2 = 0.0022467$

**Question 2:** Using data provided in the case and as shown above, calculate the required rate of return using the Ibbotson's approach as illustrated.

**Solution 2:**

$$\begin{aligned} E(R_{Big-T}) &= R_{f1} + (R_m - R_{f2}) \times beta_{Big-T} \\ &= 4.08\% + \left( \frac{1 + 11.80\%}{1 + 5.80\%} - 1 \right) \times 0.55 \\ &= 0.0408 + 0.0567 \times 0.55 \\ &= 0.0408 + 0.0831185 = 0.071985 \approx 7.20\%. \end{aligned}$$

For the “purest” who would rather use theory than what practitioners use, the equity risk premium would be estimated as,  $\frac{1 + \text{Common stock return}}{1 + \text{T-bill rate}} - 1 = \frac{1 + 11.80\%}{1 + 3.70\%} - 1 = 1.0781099 - 1 \approx 7.81\%$  where the T-bill rate is an historical average given by Ibbotson.

The current three-month T-Bill rate is about 0.17%, retrieved from [/www.ustreas.gov/offices/domestic-finance/debt](http://www.ustreas.gov/offices/domestic-finance/debt). The required return for the theorist would be,  $0.0017 + 0.55 \times (0.0781) = 0.044655$  or 4.47%. When interest rates are normal and not manipulated for economic purposes, the two approaches are close. It is not too likely that a flat yield curve would permit the same required return to be estimated. For purposes of this case, the required return of 7.20% will be used.

**Question 3:** (a) Calculate  $N$ , the number of years, from August 31, 2010 through the end of Year 2015. (b) Calculate the present value factor assuming the present date is August 31, 2010.

**Solution 3:** The present value factor is used to discount a price or value from some point in the future (a precise date) back to the day of the calculation. Today's date is assumed to be August 31, 2010. The remaining time in the year is 122 days (September 30 + October 31 + November 30 + December 31).

(a).  $N$ (Time to the end of Year 2015).

The time remained in Year 2010 is,  $\frac{122 \text{ Days}}{365 \text{ Days}} = 0.3342466$  (years)

The period from August 31, 2010 to the end of Year 2015 is,  $5 + 0.3342466 = 5.3342466$  (years).

(b). Present Value Factor Calculation. The present value factor is obtained by compounding the required rate of return for the period toward the end of 2015,  $(1 + 7.20\%)^N = 1.072^{5.3342466} = 1.44899348$ . The future value of the stock at the end of 2015 can be discounted back to August 31, 2010 by dividing it by this present value factor of 1.44899348. Alternatively, if you prefer to multiply rather than divide, the multiplier is 0.69013423,  $\frac{1}{1.44899348} = 0.69013423$ . Whether one divides the future value of the stock by 1.44899348 or multiplies it by 0.69013423, the present value of the stock is the same.

**Question 4:** Using the dividend growth model, find the present value of the price determined by using the 7<sup>th</sup> year expected dividend.

**Solution 4:** Dividend Growth Model

The purpose of the model is to estimate a price (value) at the end of Year 2015 by means of capitalizing the 7<sup>th</sup> year's dividend. First, we estimate the future stock price at the end of 2015. We grow the 2009 dividend of \$0.60 at the 14% annual growth rate until the end of 2016. This resultant estimated future dividend will be used as  $D_1$ .  $D_1$ , the 7<sup>th</sup> year dividend, is estimated as,

$$D_1 = \$0.60 \times (1 + 14\%)^7 = \$0.60 \times 2.50226879 = \$1.50136127 \approx \$1.50 .$$

The next step is to capitalize \$1.50 at a *Value Line* estimate of the average dividend yield of 0.8%,  $\frac{\$1.50136127}{0.8\%} \approx \$187.67$ . We then use the present value factor estimated earlier. As indicated in the teaching notes of Assignment 3, you have the option of dividing \$187.67 by 1.44899348 or multiplying it by the multiplier of 0.69013423. Either way, the stock price today is estimated to be \$129.52,

$\frac{\$187.67}{1.44899348} = \$129.52$  or  $\$187.67 \times 0.69013423 = \$129.52$ . Since Big-T is currently selling for about \$54.00, it is considered to be undervalued by a significant amount.

**Question 5:** Calculate the annualized *HPY* estimate for Big-T. Use all data available in the case and as given. (Hint: use the *HPR*, sum of the dividends expected between August 31, 2010 and the end of 2015, and assume the present stock price on August 31, 2010 of \$54.00.)

**Solution 5:** Holding Period Return: The holding period return for the whole period of six years from August 31, 2010 to December 31, 2015 is the heart of the case. The steps, one at a time, should help clarify the process.

1. Compute earnings per share projected to the end of 2015

$$EPS_{2015} = \$3.37 \times (1 + 14\%)^6 = \$3.37 \times 2.19497262 = \$7.39705779 \approx \$7.40$$

2. Project year-end 2015 stock price.

$$P_{2015} = EPS_{2015} \times \text{Projected P/E} = \$7.39705779 \times 20 \approx \$148.00$$

3. Sum all the expected dividends in the interim.

<b>Sum all the expected dividends in the interim</b>	
The remaining dividends to be paid in 2010	\$0.566 (\$0.75-\$0.184 = \$0.566)
The expected dividend in 2011	$\$0.60 \times (1+14\%)^2 = \$0.77976$
The expected dividend in 2012	$\$0.60 \times (1+14\%)^3 = \$0.88895$
The expected dividend in 2013	$\$0.60 \times (1+14\%)^4 = \$1.01338$
The expected dividend in 2014	$\$0.60 \times (1+14\%)^5 = \$1.15525$
The expected dividend in 2015	$\$0.60 \times (1+14\%)^6 = \$1.31698$
<b>The sum is estimated to be</b>	<b>\$5.72032</b>

4. Compute the *HPR* for the whole period from August 31, 2010 to December 31, 2015.

$$\text{The HPR for the whole period} = (\$148.00 + \$5.72032) / \$54.00 = 2.84667259$$

5. Annualize the *HPR*.

There will be 5.3342466 years until the end of Year 2015, i.e.,  $N=5.3342466$ .

The annualized HPR = (whole period HPR)<sup>1/N</sup> = (2.84667259)<sup>1/5.3342466</sup> = 1.2166725

6. Compute the annualized *HPY*.

The annualized HPY = The annualized HPR – 1 = 1.2166725 – 1 = 0.2166725 ≈ 21.67% .

Compared to the required return of 7.2%, the *expected* annualized *HPY* of 21.67% is much higher so that Big-T is considered undervalued. Greater confidence is provided when the dividend growth model confirms the undervalued position of the *P/E* Model.

Both approaches show the security to be undervalued. It is possible that the two approaches could give differing answers. If you are a Gordon fan, you may select the capitalized dividend as your choice. Practitioners would probably prefer the *EPS* or *P/E* approach. In either case, both calculations should be made. Agreement provides more confidence in the valuation.

#### ACKNOWLEDGEMENT

We are grateful to an anonymous reviewer for his/her useful suggestions. All errors are our responsibility.

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#### BIOGRAPHY

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# VARIETY ENTERPRISES CORPORATION: CAPITAL BUDGETING DECISION

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Gulser Meric, Rowan University

## CASE DESCRIPTION

*The capital budgeting decision is one of the most important financial decisions in business firms. In this case, Variety Enterprises Corporation (VEC) is considering whether to invest in a new production system. To determine if the project is profitable, VEC must first determine the weighted average cost of capital to finance the project. The simple payback period, discounted payback period, net present value (NPV), internal rate of return (IRR), and modified internal rate of return (MIRR) techniques are used to study the profitability of the project. MIRR is a relatively new capital budgeting technique, which assumes that the reinvestment rate of the project's intermediary cash flows is the firm's cost of capital. The stand-alone risk of the project is evaluated with the sensitivity analysis and scenario analysis techniques assuming that manufacturing the new product would not affect the current market risk of the company. The case gives students an opportunity to use the theoretical profitability and risk analysis techniques explained in standard finance textbooks in a real-world setting. The case is best suited for MBA and Master of Accounting students and is expected to take approximately three to four hours to complete. The case may also be appropriate for undergraduate senior finance majors.*

**JEL:** G31

**KEYWORDS:** Capital budgeting, weighted average cost of capital, cash flow, payback period, net present value, internal rate of return, modified internal rate of return, sensitivity analysis, scenario analysis

## CASE INFORMATION

Variety Enterprises Corporation (VEC) is planning to invest in a special manufacturing system to produce a new product. The invoice price of the system is \$280,000. It would require \$5,000 in shipping expenses and \$15,000 in installation costs. The system falls in MACRS 3-year class with depreciation rates of 33% for the first year, 45% for the second year and 15% for the third year. VEC plans to use the system for four years and it is expected to have a salvage value of \$40,000 after four years of use.

VEC expects the new system to generate sales of 1,500 units per year. The company estimates that the new product will sell for \$250 per unit in the first year with a cost of \$150 per unit, excluding depreciation. Management projects that both the sale price and the cost per unit will increase by 3% per year due to inflation. VEC's net operating working capital would have to increase by 15% of sales revenues to produce the new product. The firm's marginal tax rate is 40%.

### VEC's WACC

Joan Hamilton, a recent MBA graduate of Columbia University, is conducting the capital budgeting analysis for the project. The company hired her only a few weeks ago as the head of the newly formed Capital Budgeting Analysis Department. In order to evaluate the feasibility of the investment in the new

system, Joan Hamilton's first task is to estimate VEC's WACC. She plans to use the financial data in Exhibit 1 to estimate the WACC. When VEC started evaluating the project, the following conversation took place between Joan Hamilton and Benny Gray. Benny Gray, the CEO of the company, is a Princeton graduate with a major in financial economics and long years of administrative experience.

Hamilton: It may be difficult to estimate the cost of borrowing in the current recessionary environment.

Gray: We can determine the yield to maturity (YTM) on our outstanding bonds by using their current market prices. We can assume that we will be able to issue additional bonds with this YTM as the cost of borrowing. We should be able to place the new bonds without any flotation costs. Therefore, we can assume no flotation costs in our calculations. We can re-examine the feasibility of the project later before raising funds by using sensitivity analysis to assess the impact of possible changes in interest rates on the net present value of the project.

Hamilton: Do you think the company's current market value capital structure is optimal? Can we use the current percentages of the capital components as weights in the calculation of the company's WACC?

Gray: Yes, I believe that the company's current market value capital structure of 30% debt, 10% preferred stock and 60% equity is optimal. We have about \$80,000 in retained earnings this year, which is also available in cash. We should be able to use this year's retained earnings to finance part of the equity financing required for the project. However, we will have to issue some new common shares for the remainder of the necessary equity financing. We can assume a flotation cost of about 10% for the new common shares.

Hamilton: There are three basic methods of calculating a firm's cost of equity when retained earnings are used as equity capital: 1) the capital asset pricing method (CAPM); 2) the discounted cash flow (DCF) approach; and, 3) the bond-yield-plus-risk-premium method. Which of these methods should we use in the calculation of our cost of retained earnings?

Gray: Although each of these methods has its merits, I believe that the most appropriate approach for our company would be to find an average cost with the three methods.

Benny Gray gave only one week to Joan Hamilton for her estimation of VEC's WACC. With the instructions she received from Benny Gray and with the help of the financial data in Exhibit 1, Joan Hamilton began the task of estimating the company's WACC immediately.

Benny Gray knew that estimating the company's cost of capital was the first critical step in the capital budgeting process. Without this analysis, it would not be possible to determine if the new system would be a profitable investment for VEC. That is why he had asked Joan Hamilton to estimate the company's WACC as the first task. Benny Gray was very pleased when he received Joan Hamilton's calculation results and the WACC estimate. He thought that he had made a good decision in hiring Joan Hamilton as the head of the company's newly established Capital Budgeting Analysis Department.

Exhibit 1: Financial data Joan Hamilton plans to use in estimating VEC's WACC

**VEC's current market value optimal capital structure:**

		<u>Weight</u>
Bonds	\$30,000,000	30%
Preferred Stock	10,000,000	10%
Common Equity	60,000,000	60%

**Data to be used in the calculation of the cost of borrowing with bonds:**

- Par value = \$1,000, non-callable
- Market value = \$1,085.59
- Coupon interest = 9%, semiannual payment
- Remaining maturity = 15 years
- New bonds can be privately placed without any flotation costs

**Data to be used in the calculation of the cost of preferred stock:**

- Par value = \$100
- Annual dividend = 9% of par
- Market value = \$102
- Flotation cost = 5%

**Data to be used in the calculation of the cost of common equity:**

- CAPM data:
  - VEC's beta = 1.2
  - The yield on T-bonds = 5%
  - Market risk premium = 5%
- DCF data:
  - Stock price = \$19.08
  - Last year's dividend ( $D_0$ ) = \$1.00
  - Expected dividend growth rate = 5%
- Bond-yield-plus-risk-premium:
  - Risk premium = 3.5%
- Amount of retained earnings available = \$80,000
- Amount of new common stock to be issued =  $(\$300,000)(0.6) - \$80,000$   
= \$100,000

*This exhibit shows the data needed to estimate the firm's WACC. Specifically, it first presents VEC's current market value optimal capital structure used to determine the weights in the WACC calculation. It then provides the data required to calculate the cost of debt, the cost of preferred stock and the cost of common stock. The amount of new common stock to be issued is provided at the end of the exhibit.*

**Analysis of the Profitability of the Project**

Benny Gray and Joan Hamilton had the following conversation regarding how they should evaluate the potential profitability of the project.

Hamilton: With the sales and cost estimates I have obtained from the marketing and accounting departments in Exhibit 2, we should be able to estimate the project's cash flows for the four-year horizon.

Gray: Excellent! How are we going to evaluate the project's profitability to determine if it is feasible?

Hamilton: The Net Present Value (NPV) and Internal Rate of Return (IRR) methods are generally used in the evaluation of projects. However, these two methods have different assumptions regarding the reinvestment rate of the intermediary cash flows. The NPV method assumes that the intermediary cash flows can be reinvested at the firm's cost of

capital. However, the IRR method assumes that the reinvestment rate is the project's IRR. Academicians argue that the reinvestment rate assumption of the NPV method is more realistic. Therefore, they recommend the NPV method. The financial goal of a firm is to maximize market value. The NPV of a project shows its contribution to the market value of the firm.

Gray: Correct! However, the NPV is a dollar amount. It is difficult to explain the profitability of a project as a dollar amount to the stockholders of the company. It is easier to compare the project's IRR with the firm's WACC to convince the stockholders that we can earn a higher percentage return on the investment than what it would cost to finance it. I have heard that there is a new improved capital budgeting technique that measures the profitability of a project as a percentage similar to the IRR method and it assumes that the project's intermediary cash flows can be reinvested at the firm's cost of capital as in the NPV method. I believe the technique is called the Modified Internal Rate of Return (MIRR) method.

Hamilton: No problem. We should be able to calculate the project's MIRR.

Gray: Great! I would also like to see the NPV, IRR, simple payback period, and discounted payback period results for the project.

Hamilton: Consider it done!

With the instructions she received from Benny Gray, Joan Hamilton immediately started to work on the cash flow calculations using the data in Exhibit 2 to analyze the profitability of the project with the NPV, IRR, MIRR, simple payback period, and discounted payback period methods.

### Risk Analysis

After Joan Hamilton submitted the cash flow calculations and the project profitability analysis results to Benny Gray, they had the following conversation regarding the risk analysis for the project.

Gray: The NPV, IRR, MIRR, simple payback and discounted payback results all look promising. However, we should also conduct a risk analysis of the project before we go ahead with it. Since the new product will be similar to the company's other existing products, I do not believe the new project will change the company's beta and its overall market risk. Therefore, it should be sufficient to evaluate the stand-alone risk of the project. What are the techniques that we can use to assess the stand-alone risk of a project?

Hamilton: Sensitivity analysis is a widely used technique to determine how much a project's NPV will change in response to a given change in an input variable. Input variables such as sales or the cost of capital are often used while holding other things constant.

Gray: Sales figures are difficult to forecast with a high degree of accuracy. Therefore, we should conduct a sensitivity analysis with regard to possible changes in the forecasted sales figures. It should be sufficient to evaluate the impact of an increase or a decrease of 10% in sales from our base forecast. The new system will be initially employed at about 80% capacity with our base sales forecast. Therefore, the unutilized capacity of the system should enable us to accommodate a 10% increase in sales. We estimate that

costs, excluding depreciation, will be 60% of sales. We can assume that this ratio will not change with the 10% increase or decrease in sales.

Hamilton: No problem. We can conduct a sensitivity analyses for the project’s NPV with regard to a 10% deviation from our base sales forecast.

Gray: Given the current volatile financial environment, the actual WACC figure is also likely to deviate from the expected base level. I would like to know how sensitive the project’s NPV is to an increase or decrease of 1% in the WACC.

Hamilton: No problem. We should be able to conduct a sensitivity analysis for the project with regard to a possible 1% change in the WACC. Another analysis technique for project risk widely used in practice is scenario analysis. In this technique, the best and worst-case NPV scenarios are compared with the project’s expected NPV. Do you want us to conduct a scenario analysis of the project as well?

Exhibit 2: The data Joan Hamilton plans to use in the calculation of the cash flows for the project and in the evaluation of its profitability

The Machinery’s Invoice Price		\$280,000			
Shipping Charges		5,000			
Installation Cost		<u>15,000</u>			
Depreciable Basis		<u>\$300,000</u>			
<b>MACRS Depreciation Rates:</b>	Year 1	33%			
	Year 2	45%			
	Year 3	15%			
	Year 4	7%			
<b>Salvage Value:</b>		\$40,000			
<b>Annual revenue and cost estimates (assume 3% inflation rate):</b>					
		<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Units		1,500	1,500	1,500	1,500
Unit Price		\$250.00	_____	_____	_____
Unit Cost		150.00	_____	_____	_____
Sales		375,000	_____	_____	_____
Costs		225,000	_____	_____	_____
<b>Net Operating Working Capital (NOWC) Requirement:</b>					
	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales		\$375,000	_____	_____	_____
NOWC (15% of sales)	\$56,250	_____	_____	_____	_____
CF due to NOWC	(56,250)	_____	_____	_____	_____

*This exhibit shows the data needed to calculate the cash flows for this project. The new production system has a useful life of 4 years, a salvage value of \$40,000 and falls in MACRS 3-year class. Annual revenue and cost estimates are presented in the middle of the exhibit. The system is expected to generate sales of 1,500 units per year, with a unit price of \$250 and unit cost of \$150. VEC’s net operating working capital requirement, which is shown at the bottom of the exhibit, is 15% of total sales.*

Gray: Yes. It would be a good idea. As the best-case scenario, assume that the sales forecast will be 10% higher and the WACC will be 1% lower than our original estimates. For the worst-case scenario, assume that the sales forecast will be 10% lower and the WACC will be 1% higher. Please calculate the standard deviation and the coefficient of variation of the project's NPV probability distribution with these scenarios. You can assume a probability of 50% for the base NPV forecast, a probability of 20% for the best-case scenario, and a probability of 30% for the worst-case scenario.

Hamilton: No problem. I should be able to submit the risk analysis results to you within a week.

With the instructions she received from Benny Gray, Joan Hamilton immediately started to conduct a stand-alone risk evaluation of the project with the sensitivity analysis and scenario analysis techniques.

## QUESTIONS

Assume that you are Joan Hamilton. Answer the following questions:

1. Calculate VEC's WACC using the data in Exhibit 1.
2. Calculate the project's cash flows using the data in Exhibit 2. Why is it important to take into account the effect of inflation in forecasting the cash flows? Briefly comment.
3. Evaluate the profitability of the project with the NPV, IRR, MIRR, simple payback period, and discounted payback period methods. Is the project acceptable? Briefly explain. Why is the NPV method superior to the other methods of capital budgeting? Briefly explain.
4. Conduct the stand-alone risk analysis of the project with the sensitivity analysis and scenario analysis techniques. Explain why sensitivity analysis and scenario analysis can be useful tools in the capital budgeting decision-making process when economic and financial conditions are likely to change in the future.

# VARIETY ENTERPRISES CORPORATION: CAPITAL BUDGETING DECISION

## TEACHING NOTES

Ilhan Meric, Rider University  
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Sherry F. Li, Rider University  
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## QUESTIONS

**Question 1:** Calculate VEC's WACC using the data in Exhibit 1.

**Solution 1:** Cost of Debt: (The FV/PV charts, a financial calculator or a spreadsheet can be used in the calculation):  $r_d = 8\%$

Cost of Preferred Stock:

$$r_{ps} = D_{ps} / P_{ps} (1 - F) = (0.09)(\$100) / (\$102)(1 - 0.05) = \$9 / \$96.9 = 9.3\%$$

Cost of Common Equity:

$$\text{CAPM: } r_s = r_{RF} + (RP_M) b = 0.05 + (0.05)(1.2) = 11\%$$

$$\text{DCF: } r_s = [D_0(1 + g) / P_0] + g = [\$1(1 + 0.05) / \$19.08] + 0.05 = 10.5\%$$

$$\text{Own-Bond Yield-Plus-Risk Premium: } r_s = r_d + \text{Bond RP} = 0.08 + 0.035 = 11.5\%$$

$$\text{Cost of retained earnings (average } r_s) = (11\% + 10.5\% + 11.5\%) / 3 = 11\%$$

$$\text{Cost of new common stock} = 11\% / (1 - 0.1) = 12.2\%$$

$$\text{WACC} = w_d r_d (1 - T) + w_{ps} r_{ps} + w_{re} r_s + w_{ncs} r_e = (0.3)(0.08)(1 - 0.4) + (0.1)(0.093) + (0.6)(80,000/180,000)(0.11) + (0.6)(100,000/180,000)(0.122) = 9.37\%$$

**Question 2:** Calculate the project's cash flows using the data in Exhibit 2. Why is it important to take into account the effect of inflation in forecasting the cash flows? Briefly comment.

**Solution 2:** Annual revenue and cost estimates (assume 3% inflation rate):

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Units	1,500	1,500	1,500	1,500
Unit Price	\$250.00	\$257.50	\$265.23	\$273.18
Unit Cost	150.00	154.50	159.14	163.91
Sales	\$375,000.00	\$386,250.00	\$397,837.50	\$409,772.63
Costs	225,000.00	231,750.00	238,702.50	245,863.58

Depreciation:

Year 1	33% x \$300,000 = \$99,000
Year 2	45% x \$300,000 = 135,000
Year 3	15% x \$300,000 = 45,000
Year 4	7% x \$300,000 = 21,000

Operating cash flows:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales	\$375,000.00	\$386,250.00	\$397,837.50	\$409,772.63
Costs	225,000.00	231,750.00	238,702.50	245,863.58
Depreciation	99,000.00	135,000.00	45,000.00	21,000.00
EBIT	51,000.00	19,500.00	114,135.00	142,909.05
Tax (40%)	20,400.00	7,800.00	45,654.00	57,163.62
NOPAT	30,600.00	11,700.00	68,481.00	85,745.43
Add Depreciation	99,000.00	135,000.00	45,000.00	21,000.00
Net Operating Cash Flow	<u>\$129,600.00</u>	<u>\$146,700.00</u>	<u>\$113,481.00</u>	<u>\$106,745.43</u>

Net operating working capital (NOWC) requirement:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales		\$375,000.00	\$386,250.00	\$397,837.50	\$409,772.63
NOWC (15% of sales)	\$56,250.00	57,937.50	59,675.63	61,465.89	
CF due to NOWC	(56,250.00)	(1,687.50)	(1,738.13)	(1,790.27)	61,465.89

Salvage value:  $(\$40,000.00)(1 - 0.4) = \$24,000.00$

Project net cash flows:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Initial Investment	(\$300,000.00)				
Operating Cash Flows		\$129,600.00	\$146,700.00	\$113,481.00	\$106,745.43
CF due to NOWC	(56,250.00)	(1,687.50)	(1,738.13)	(1,790.27)	61,465.89
Salvage Cash Flow					24,000.00
Net Cash Flows	<u>(\$356,250.00)</u>	<u>\$127,912.50</u>	<u>\$144,961.88</u>	<u>\$111,690.73</u>	<u>\$192,211.32</u>

The discount rate generally includes an inflation premium. If the cash flows are not adjusted for inflation, the project's NPV would be understated.



**Question 3:** Evaluate the profitability of the project with the NPV, IRR, MIRR, simple payback period, and discounted payback period methods. Is the project acceptable? Briefly explain. Why is the NPV method superior to the other methods of capital budgeting? Briefly explain.

**Solution 3:** Students can use the FV/PV charts, a financial calculator or an Excel spreadsheet in the calculation of the NPV, IRR and MIRR.

$$\begin{array}{ll} \text{NPV} = \$101,598.73 & \text{Simple Payback Period} = 2.75 \text{ years} \\ \text{IRR} = 21.17\% & \text{Discounted Payback Period} = 3.24 \text{ years} \\ \text{MIRR} = 16.45\% & \end{array}$$

The NPV technique is superior to the other techniques of capital budgeting. The goal of financial management is to maximize the market value of the firm. The NPV of a project shows the contribution of the project to the market value of the firm. The NPV method's reinvestment rate assumption is also more realistic compared with the IRR method.

**Question 4:** Conduct the stand-alone risk analysis of the project with the sensitivity analysis and scenario analysis techniques. Explain why sensitivity analysis and scenario analysis can be useful tools in the capital budgeting decision-making process when economic and financial conditions are likely to change in the future.

**Solution 4:** Assume that WACC is 1 percentage point higher ( $9.37\%+1\%=10.37\%$ ): (Use the same cash flows as in Question 2 and 3 above but a higher discount rate to find the project's NPV.)

$$\text{NPV} = \$91,250.68$$

Assume that WACC is 1 percentage point lower ( $9.37\%-1\%=8.37\%$ ): (Use the same cash flows as in Question 2 and 3 above but a lower discount rate to find the project's NPV.)

$$\text{NPV} = \$112,337.47$$

Assume that the project's sales revenues and costs (excluding depreciation) are 10% higher: (Calculate new cash flows and find the NPV of the project using the base WACC calculated in Answer 1).

Operating cash flows:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales	\$412,500.00	\$424,875.00	\$437,621.25	\$450,749.89
Costs	247,500.00	254,925.00	262,572.75	270,449.93
Depreciation	<u>99,000.00</u>	<u>135,000.00</u>	<u>45,000.00</u>	<u>21,000.00</u>
EBIT	66,000.00	34,950.00	130,048.50	159,299.96
Tax (40%)	<u>26,400.00</u>	<u>13,980.00</u>	<u>52,019.40</u>	<u>63,719.98</u>
NOPAT	39,600.00	20,970.00	78,029.10	95,579.97
Add Depreciation	<u>99,000.00</u>	<u>135,000.00</u>	<u>45,000.00</u>	<u>21,000.00</u>
Net Operating Cash Flow	<u>\$138,600.00</u>	<u>\$155,970.00</u>	<u>\$123,029.10</u>	<u>\$116,579.97</u>

Net Operating Working Capital (NOWC) Requirement:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales		\$412,500.00	\$424,875.00	\$437,621.25	\$450,749.89
NOWC (15% of sales)	\$61,875.00	63,731.25	65,643.19	67,612.48	
CF due to NOWC	(61,875.00)	(1,856.25)	(1,911.94)	(1,969.30)	67,612.48

Project net cash flows:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Initial Investment	(\$300,000.00)				
Operating Cash Flows		\$138,600.00	\$155,970.00	\$123,029.10	\$116,579.97
CF due to NOWC	(61,875.00)	(1,856.25)	(1,911.94)	(1,969.30)	67,612.48
Salvage Cash Flow					<u>24,000.00</u>
Net Cash Flows	<u>(\$361,875.00)</u>	<u>\$136,743.75</u>	<u>\$154,058.06</u>	<u>\$121,059.80</u>	<u>\$208,192.46</u>

NPV @ 9.37% = \$129,983.23

Now, assume that the project's sales revenues and costs (excluding depreciation) are 10% lower: (Calculate new cash flows and find the project NPV using the base WACC calculated in Answer 1.)

Operating cash flows:

	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales	\$337,500.00	\$347,625.00	\$358,053.75	\$368,795.36
Costs	202,500.00	208,575.00	214,832.25	221,277.22
Depreciation	<u>99,000.00</u>	<u>135,000.00</u>	<u>45,000.00</u>	<u>21,000.00</u>
EBIT	36,000.00	4,050.00	98,221.50	126,518.15
Tax (40%)	<u>14,400.00</u>	<u>1,620.00</u>	<u>39,288.60</u>	<u>50,607.26</u>
NOPAT	21,600.00	2,430.00	58,932.90	75,910.89
Add Depreciation	<u>99,000.00</u>	<u>135,000.00</u>	<u>45,000.00</u>	<u>21,000.00</u>
Net Operating Cash Flow	<u>\$120,600.00</u>	<u>\$137,430.00</u>	<u>\$103,932.90</u>	<u>\$96,910.89</u>

Net Operating Working Capital (NOWC) Requirement:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Sales		\$337,500.00	\$347,625.00	\$358,053.75	\$368,795.36
NOWC (15% of sales)	\$50,625.00	52,143.75	53,708.06	55,319.30	
CF due to NOWC	(50,625.00)	(1,518.75)	(1,564.31)	(1,611.24)	55,319.30

Project net cash flows:

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Initial Investment	(\$300,000.00)				
Operating Cash Flows		\$120,600.00	\$137,430.00	\$103,932.90	\$96,910.89
CF due to NOWC	(50,625.00)	(1,518.75)	(1,564.31)	(1,611.24)	55,319.30
Salvage Cash Flow					<u>24,000.00</u>
Net Cash Flows	<u>(\$350,625.00)</u>	<u>\$119,081.25</u>	<u>\$135,865.69</u>	<u>\$102,321.66</u>	<u>\$176,230.19</u>

NPV @ 9.37% = \$73,214.23

*Best-Case Scenario:* Sales revenues and costs (excluding depreciation) are 10% higher, and WACC is 1 percentage point lower. (Student uses the cash flows calculated above with 10% higher revenues, 10% higher costs, and discounts these cash flows to the present by using  $9.37\% - 1\% = 8.37\%$  discount rate (new WACC):

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Cash Flows:	(\$361,875.00)	\$136,743.75	\$154,058.06	\$121,059.80	\$208,192.46

NPV @ 8.37% = \$141,555.55

*Worst-Case Scenario:* Sales revenues and costs (excluding depreciation) are 10% lower, and WACC is 1 percentage point higher. (Student uses the cash flows calculated above with 10% lower revenues, 10% lower costs, and discounts these cash flows to the present by using  $9.37\% + 1\% = 10.37\%$  discount rate (new WACC):

	<u>Year 0</u>	<u>Year 1</u>	<u>Year 2</u>	<u>Year 3</u>	<u>Year 4</u>
Cash Flows:	(\$350,625.00)	\$119,081.25	\$135,865.69	\$102,321.66	\$176,230.19

NPV @ 10.37% = \$63,668.73

$E(NPV) = (0.3)(\$63,668.73) + (0.5)(\$101,598.73) + (0.2)(\$141,555.55) = \$98,211.09$

$$\begin{aligned} \sigma_{NPV} &= [(\$63,668.73 - \$98,211.09)^2(0.3) + (\$101,598.73 - \$98,211.09)^2(0.5) \\ &\quad + (\$141,555.55 - \$98,211.09)^2(0.2)]^{1/2} \\ &= \$27,192.63 \end{aligned}$$

$CV_{NPV} = \$98,211.09 / \$27,192.63 = 3.61$

Sensitivity analysis and scenario analysis can be useful tools in the capital budgeting decision-making process when economic and financial conditions are likely to change in the future.

## BIOGRAPHY

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# WHERE SHOULD GENERAL MOTORS GO FROM HERE?

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## CASE DESCRIPTION

*General Motors was once the pinnacle for industrial accomplishment, leading the automobile industry in market share for over 70 years. Early business strategies paved the way for this success, including; organizational structuring, marketing, and utilizing efficient production through economies of scale and scope. Over time, GM became comfortable and complacent in their market leader position. They did not heed the changes taking place in the automobile market, the overall economy and consumers. As a result, their technology became outdated and their manufacturing practices overly complex and unconcerned with quality, all while costs increased and profits dwindled.*

*General Motors continued to spiral downward until their final collapse in 2008-2009. The company ended up in bankruptcy, but has made plans to reform and revive their business. This case is suitable for undergraduate or graduate business students. The case should require about one hour of outside preparation and one hour of class discussion.*

## CASE INFORMATION

General Motors Company was founded on September 16, 1908 in Flint, Michigan. The business was originally established as a holding company for thirteen car firms and ten parts-and-accessories manufacturers. William (Billy) Durant formed General Motors Company out of merger. He was a well known entrepreneur in the early 1900's who envisioned consolidating several autonomous auto and parts companies into one large firm to achieve economies of scale while satisfying the growing consumer demand for automobiles (Johnson, 1978).

Although Durant was a brilliant capitalist, he had no interest in systematic management. The GM holding company was comprised of decentralized, independent manufacturers with very little top level coordination (Marchand, 1991). Each unit had its own administration and handled operations separately. Durant had knowledge of economies of scale and he wished to utilize resources, but he became too focused on the operations of each company within GM. There was no central policy making or administrative system to direct the activities of each unit toward a common goal (Johnson, 1978). Durant ignored the need for internal reform and did not seem concerned for the corporation as a whole. As a result, by 1922 GM was worth less than the sum of its individual parts (Marchand, 1991).

The auto industry and market experienced a steady increase from the early 1900's to 1920. The Inventory Crisis of 1920 caught Durant off guard. In the economic downturn, demand for autos decreased sharply leading to severe losses (Norton, 1997). Because his family had a large investment interest in GM, Pierre du Pont and his allies stepped in to save the corporation. In the process, the business was reorganized and Durant was forced out of leadership (Marchand, 1991).

### Reorganization

As a part of the reorganization, Alfred Sloan became the eventual President and CEO of General Motors. Sloan worked to reform the corporation, and the changes he implemented led to improved performance

and propelled GM to become a model for the multidivisional corporation and one of the largest and most successful enterprises of the twentieth century (Norton, 1997).

One of the first changes implemented by Sloan in the 1920's, was restructuring the management and coordination of the firm. Sloan kept the operating divisions semiautonomous, appointing decentralized managers for each unit; however, he also established a firm level management team. This top level management was able to focus on policy making, coordination of divisions, and overall performance without becoming bogged down with the details of each unit's day-to-day operations. This new model not only established a much needed structure, but also empowered and held accountable the managers of each division. GM referred to this form of corporate structure as "centralized control with decentralized responsibility" (Johnson, 1978).

Being a holding company for multiple divisions of automobiles, General Motors produced many brands and styles of vehicles. Two developments that can be traced back to the Sloan years are market segmentation and production coordination/sharing among the GM divisions. In order to segment and fully exploit the auto market, GM created the idea of "a car for every purse and purpose" (Raff, 1991). The corporation produced a variety of different cars which they hoped would appeal to all types of customers (Friedlaender, Winston, Wang, 1983). The independent divisions formed an automobile progression or ladder of success. The lowest and cheapest brand, Chevy, was targeted toward the first time buyer market or those individuals seeking an entry level vehicle; whereas the Cadillac division was a high end, luxury automobile line. The design was for customers to work their way through the ranks, purchasing a different GM automobile throughout their lives. The purse and purpose design kept the different GM divisions from directly competing for the same customers and helped to maximize profits (Raff, 1991).

Producing a mass number of vehicles also presented an opportunity for the company to utilize economies of scale and scope, and that is exactly what GM did (Friedlaender, Winston, Wang, 1983). The divisions produced different brands and models of vehicles but they were able to standardize common parts that were used across multiple lines. The sharing of parts in companies such as Chevy, Pontiac, and Oldsmobile reduced the cost of production and offered GM a competitive advantage (Raff, 1991).

Sloan was also credited with establishing the annual model and styling changes of GM vehicles. This was an important business innovation in the 1900's interwar period. The annual model change was planned obsolescence, and encouraged customers to continue buying new models. Companies such as Ford were heavy on the manufacturing side of production and did not change their body styles frequently. GM made the model changes possible by keeping the main engines and mechanics the same and replacing cheaper parts, such as jigs and fixtures. This made the model changes less expensive and helped capitalize on consumer's desire for more modern and fashionable vehicles (Raff, 1991).

To finalize their popularity and growth, General Motors launched an intensive marketing campaign in the 1920's. When Sloan took over, the general public did not know much about the company. Over the next two years, a \$600,000 marketing blitz designed by Bruce Barton introduced the company through radio and print ads. Due to its massive size, GM's marketing was focused on fighting the cold corporate stereotype and portraying itself as a warm, welcoming family. Each division was presented and showcased separately as part of the GM family portrait. The size of GM became a positive characteristic because it signified strength and assurance. Sloan and Barton's marketing of GM became a hallmark of success and created internal cohesion of the divisions and a positive public image (Marchand, 1991).

### Age of Change

Beginning in the 1930's, General Motors was the industry leader in sales for over 70 years. This feat was achieved through the production, management, and marketing instituted in the early founding of the

company. As General Motors grew and matured as a company, the automobile industry continued to progress, the economy suffered fluctuations, and customer preferences shifted. Apparent challenges, weaknesses, and vulnerabilities became evident within the company.

The automobile industry is characterized by large fixed costs. The manufacturing facilities, inventory, and labor required to produce vehicles make up the major capital expenditures. Launch of a new car from the design, prototype, testing, evaluation, and manufacturing can take from three to four years. Fixed costs combined with this long planning horizon make new vehicle production risky and can have a variable affect on the company's stock (Friedlaender, Winston, & Wang, 1983).

Labor, in the form of wages, insurance and retirement compensation, make up a significant portion of GM's cost structure. There has been a long history of labor unions in the automobile industry and the majority of workers in the U.S. are traditionally a part of labor unions. Union workers become part of an organization that utilizes collective bargaining to negotiate contractual terms of employment, regarding pay and working conditions. Unions and collective bargaining were, and still are, of great importance to the survival of American industrial corporations because without labor, companies would lose great sums of money very quickly (Harbison, 1950). When the market suffers and costs need to be cut, labor is first the feel the effects. Reduced employment and layoffs are directly linked to a downturn in production (Meyer & Quadango, 1990).

The retirement benefits paid to General Motors workers were a lucrative part of the collective bargaining package and represent a significant cost to the firm. The automobile industry led the way for retirement benefits in the U.S. and the private pensions became known for their liberal early retirement provisions. The private pension retirement policies tended to focus on length of service rather than a worker's age. GM's notable arrangement of the 1970's known as "30 and out" allowed workers to retire at any age and receive benefits as long as they had served for 30 years (Meyer & Quadango, 1990).

As the automobile industry matured, the relative value of information diminished and General Motors' competitive advantage weakened (Norton, 1997). Strategies implemented in the 1920's weren't relevant post World War II. Customer preferences changed as more options became available. Competition, advanced technology, and economic pressures affected the industry.

The multidivisional structure that characterized the success of GM had its disadvantages. First, the decentralized units had a lot of freedom to decide how to employ their own resources and the tiered management structure limited communication (Johnson, 1978). The top level management became isolated and not well informed with each division (Schwartz, 1991).

General Motors became a powerhouse in the automobile market, but then displayed lackluster innovation. The company experienced a loss of creativity with little technological advancement. The annual model change and ladder divisions converged and people took notice that the cars began to look the same. The parts sharing strategy used to reduce costs also backfired because customers were not willing to buy a more expensive Oldsmobile made with less expensive Chevy parts. In its stagnation, GM made poor choices and instead of admitting setbacks they justified and remained committed to bad decisions. A great example is the introduction of the Corvair. This vehicle was produced despite well known and documented problems (Schwartz, 1991).

### Competition: Japan

Other countries also produced automobiles and employed production and management strategies of their own. In Japan, the production process was superior and labor costs were lower. So much so that the company cost of a small car was \$2,000 less per unit than an American equivalent (Lieberman, Lau, &

Williams, 1990). Japanese had a strict commitment to quality with their philosophy of “kaizen” or continuous improvement. When imports of their vehicles began to rise, they knew their competition would carry an import tax. They brought their production to the U.S. in what came to be known as transplants (Florida & Kenney, 1991).

Japanese automakers came to America and built transplant organizations in locations rather than in the traditional industrial area of Detroit. They chose these particular locations to avoid union employment. The manufacturing facilities they ran were modeled after their sister plants back in Japan. They hired individuals who showed initiative, loyalty, and ability to work in teams. They provided wages and bonuses based on seniority, job performance, and team work. There were few job classifications and status distinctions compared to the American automobile industry. Employees were organized into work teams with shop floor leaders, where they would rotate tasks while planning and carrying out a production job from start to finish (Florida & Kenney, 1991).

The Japanese gained significant market share through the type and quality of automobiles they produced. When oil prices began to rise in the late twentieth century, the smaller and more fuel efficient Japanese cars became popular demand. The reliability of the automobiles was demonstrated by infrequent need for repair. A study by Barber and Darrough found that the majority of automobile recalls in the U.S. were made by American automakers. From 1973 to 1992, GM in particular lost more than \$2.9 billion or 14% of its real market value due to recall announcements (1996).

### Bankruptcy

On Monday, June 1, 2009 General Motors filed for Chapter 11 bankruptcy. The company claimed \$82 billion in assets and \$172.8 billion in debt, making the filing the fourth largest in U.S. history. Chapter 11 bankruptcy refers to the eleventh chapter of the United States Bankruptcy Code. Chapter 11 bankruptcy is also called reorganization bankruptcy and is typically filed when a business finds itself in financial turmoil but feels there is a viable company that can be reorganized and succeed (Moulton & Thomas, 1993).

Chapter 11 bankruptcy is a costly process, both in terms of time and money. There are direct, measurable costs as well as indirect, lingering costs. The direct costs of Chapter 11 bankruptcy include professional fees, court costs, document preparation, and communication costs. In large organizations, the direct costs of bankruptcy are estimated to be three percent of the debtor’s liabilities (Moulton & Thomas, 1993).

There is a social stigma associated with bankruptcy that can affect a company’s public image, consumer appeal, and future success (Moulton & Thomas, 1993). Amongst society, a feeling of resentment can build toward a business as citizens feel burdened to pay for the company’s failures. Top level management often bears the brunt of this stigma and resentment and turnover is expected. The full disclosure of company records and documents is another regrettable requirement of bankruptcy and can result in loss of a company’s proprietary advantage (Payne & Hogg, 1994).

### Government Intervention

In 2008, the U.S. economy suffered a significant downturn and oil prices hit an all time high of \$150 per barrel. American automakers turned to Washington, D.C. for help with their struggles. General Motors and then CEO Rick Wagoner were given nearly \$20 million dollars and a March 2009 deadline to restructure the organization. On March 30, 2009 GM was still deep in debt and had yet to produce a successful viability plan to lawmakers. Rick Wagoner was removed as the head of the company and replaced with Fritz Henderson. Chapter 11 bankruptcy filings were soon to follow as the company could not survive without government support.



The day GM filed for bankruptcy, company share price plunged to its lowest value ever, 27 cents. General Motors was delisted from the stock exchange and the U.S. Treasury became 60 percent owner along with the Canadian government and the United Auto Workers trust. The new General Motors has become a much smaller organization. The business kept only four automobile divisions, Chevrolet, Cadillac, Buick, and GMC. Other planned reductions included; the number of manufacturing plants to decrease from 47 to 34, employment cut from 91,000 to 64,000, and 2,600 dealerships closed across the country. The company debt was slashed to \$48 billion.

## QUESTIONS

1. What caused the decline and loss of the competitive edge at General Motors?
2. What were the weaknesses in General Motor's model?
3. How will the bankruptcy and restructuring help the company to survive and thrive?
4. What can General Motors do to improve their sales?
5. What part did management style and focus have on General Motors decline?

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# WHERE SHOULD GENERAL MOTORS GO FROM HERE?

## TEACHING NOTES

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## CASE DESCRIPTION

*General Motors was once the pinnacle for industrial accomplishment, leading the automobile industry in market share for over 70 years. Early business strategies paved the way for this success, including; organizational structuring, marketing, and utilizing efficient production through economies of scale and scope. Over time, GM became comfortable and complacent in their market leader position. They did not heed the changes taking place in the automobile market, the overall economy and consumers. As a result, their technology became outdated and their manufacturing practices overly complex and unconcerned with quality, all while costs increased and profits dwindled.*

*General Motors continued to spiral downward until their final collapse in 2008-2009. The company ended up in bankruptcy, but has made plans to reform and revive their business. This case is suitable for undergraduate or graduate business students. The case should require about one hour of outside preparation and one hour of class discussion.*

## QUESTIONS

**Question 1:** What caused the decline and loss of the competitive edge at General Motors?

**Solution 1:** There is no question that General Motors was a large and successful American company. When it rose to power in the 1920's, the company had developed solid business strategies and was generating a significant profit. The breakdown came when the company and market matured. GM held on to the same strategies from the 1920's and did not make significant enough changes or innovations. It took over 70 years before the company collapsed, proving how much money and market power was at stake. The company was alive many years past their prime.

The main setbacks for General Motors were its high costs, poor management, and lack of improvement. The semiautonomous, multidivisional structure worked in the founding and early history of the company, but the company grew too large. Top level management was out of touch and communication suffered. When profits were streaming in, no one was questioning the viability of each unit even though this should have been monitored. The pride and stigma associated with downsizing, impaired GM's ability to be lean and maximize profit.

**Question 2:** What were the weaknesses in General Motor's model?

**Solution 2:** The original GM business model valued inventory the same as cash, which might have been accurate in times when demand was unmet. As supply and demand converged however, the building inventory generated additional costs. Yearly model changes discouraged consumers from buying older models and much of GM's production ended up held in warehouses. Further, as GM continued the yearly model changes and divisional parts sharing, the public began noting that products looked alike from year to year and from line to line. No major innovation was taking place, only the body styles were slightly

changing. Also, if a more expensive model vehicle was made with the same parts as a cheaper model vehicle there was no incentive to pay for a premium brand car.

As more Americans began owning automobiles, the novelty faded and priorities changed. After the Great Depression and World War II, consumers did not see the need to switch models as frequently as their money was better spent elsewhere. Additionally, other economic factors began contributing to consumer preference, including oil prices, competition, reliability, and quality. New auto companies, including Japanese companies, began selling in America and GM did little to change its manufacturing strategy. The Japanese superior information processing, inventory control, and quality operations overtook GM's control of market share.

The challenge of labor costs was somewhat self-imposed. Being the generous leader, General Motors set the standard for auto wages and benefits. Contracts continued to expand and when union unrest or strikes took place, the company was powerless to their demands, less they halt production.

**Question 3:** How will the bankruptcy and restructuring help the company to survive and thrive?

**Solution 3:** Reducing the size and scope of GM is certainly a positive step. Too many divisions, plants, product lines, dealerships, excess inventory, and employees is hard to manage and not profitable for the company. By scaling down and refining the business strategy, GM can decrease costs and make production changes, much like the proven Japanese model.

Reduction of the labor force and better, more realistic wage, benefit, and retirement negotiations can be reached. Quality should become a priority and each type of vehicle can have real modifications, in technology, efficiency, and styling. Future design can also focus on economic and market developments and shifts in consumer preferences. Fuel economy, environmental concern, and product quality are likely to be the relevant characteristics of the future automobile industry.

**Question 4:** What can General Motors do to improve their sales?

**Solution 4:** General Motors can and should make changes to their manufacturing and operations, but the real test will be if their vehicles sell. Without sales and market share, there is no profit and GM will never succeed. The legacy of complacency, resistance to change, and social stigma may stick with GM. The public may not accept the fresh from bankruptcy GM, primarily government owned. There are many options nowadays in the automobile industry and the pride, superiority, and obligation toward American made products is waning. Competition is tight and quality is commanded, further narrowing margins. Despite the large reduction in employment, many top executives will stay with GM.

**Question 5:** What part did management style and focus have on General Motors decline?

**Solution 5:** The unfocused management of General Motors and their deliberate resistance to change took this company from top to bottom. In an industry defined by high fixed costs, GM realized great success and profitability in its early years, but clung to old strategies for too long. The company was unprogressive and did not keep up with consumer preferences or worldwide economic influences. Size helped the company hold on as long as it did, but in the end the size became too overwhelming and expensive.

In order to prosper post-bankruptcy, the leadership of General Motors will have to make tough decisions. Already much of the manpower, product divisions, dealerships, and manufacturing plants have been cut. In order to regain consumer trust and ultimately money, GM must prove it has vehicles that are worth

purchase and commit to furthering their automobile innovation to remain competitive and relevant in the industry.

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# WHAT EXECUTIVES CAN LEARN FROM U2: AN EXPLORATORY STUDY

Francis Petit, Fordham University

## ABSTRACT

*The purpose of this research is to determine what executives can learn from the successful development of the musical band and brand known as U2. To determine this information, a historical study of the U2 journey was conducted with the hopes of uncovering key learning points and takeaways for executives. The main findings of this study indicate that there are four (4) overarching themes that have led to not only U2's success but can also be potentially implemented within the daily roles of executives. The results of this exploratory study can potentially ignite increased research into the "U2 Effect" and what Corporate America can learn from this musical group.*

**JEL:** M31, M37, M52

**KEYWORDS:** 2U Effect, Executive compensation, global brand, Entrepreneurial Thought

## INTRODUCTION

For the past thirty plus years, many individuals had the distinct pleasure of experiencing the "band" and the "brand" known as U2. Throughout this time, U2 has achieved success of epic proportions as well as disappointed critics and fans alike. They have also developed a powerful brand that goes beyond the music and have leveraged it like no other band ever. In addition, U2 has evolved as individual musicians and as a group extending their reach and meaning behind their work. Overall, as someone who studies best practices in executive development, this author has become intrigued by the "U2 Phenomenon" and also curious to discover what lessons, if any, this megaband can teach corporate executives. With this as a backdrop, this study set out to uncover the lessons and takeaways executives and professionals can learn from the U2 story and how the U2 brand was built. There are three (3) reasons that illustrate the importance of such an analysis.

First, the band U2 has been extremely successful with their craft (i.e. creating music). For example, according to the official U2 web site, U2 has won twenty two (22) Grammy Awards including "Best Rock Duo or Group", "Album of the Year", "Record of the Year" and "Best Rock Album". In addition, U2 has won a host of other awards including Meteor, BRIT, Q, Juno, AMA and ASCAP. U2 was also inducted into the Rock and Roll Hall of Fame in 2005 as well as being named "Band of the Year" by numerous publications.

Secondly, U2 has generated large sums of income over the years. Without going into too much detail, there are two telling indicators that illustrate their success from the financial side of their work. The first is that during this past decade, *Rolling Stone Magazine* ranked U2 as the second highest concert grossing band of the decade (behind The Rolling Stones) as well as being the top grossing concert band in 2009. Secondly, according to *Billboard Magazine*, U2 earned approximately \$250 million in 2005. ("U2 Tops Billboards Money Maker's Chart, January 20, 2006). Overall, these indicators are quite significant.

Lastly, the U2 brand means much more than just the music and has established "influence" throughout the world. More specifically, U2 has been on the forefront of social and humanitarian issues for quite some time (which will be explained in more detail shortly). Bono, the group's lead singer and band

spokesperson, has met with world leaders including Pope John Paul II. Whether one like's U2's artistic direction or not, the bottom line is that people not only hear their music but also listen to their message.

In addition, the magnitude of such a study is important in that very little has been written on the “U2 Phenomenon” and what corporate leaders can learn these boys from Dublin. Another goal of this study was to also increase the awareness and additional research of the “U2 Effect” from a corporate development perspective. In general, this research began with a thorough historical analysis on the U2 journey from band conception to their current state. The goal of this analysis, as mentioned previously, was to uncover any key learning points that executives can potentially implement within their current roles. It should be noted that the initial hypothesis in this study was that “yes” executives can learn from the U2 story. Interestingly, the extent of the learning was not realized until further into this project as will be illustrated, in detail, by the four (4) takeaways indicated within this research as well as the concluding remarks.

## **LITERATURE REVIEW**

In terms of U2 and what executives can learn from this musical rock group, very little has been written. In 2009, Harvard Business School published a case on Bono and U2 (Koehn, Miller and Wilcox, July 8, 2009) which is a comprehensive historical account on U2 from its formation to its current state and illustrates how the U2 brand was built. In addition, U2 by U2 (Bono, The Edge, Adam Clayton and Larry Mullin Jr., with Neil McCormick, 2006) is another thorough analysis which discusses the journey of the band and the decisions that were made that inevitably led to their success. Beyond these examples, most of the literature on U2 can be obtained from periodicals, interviews and television programming. However, very little to nothing has been written on what executives can learn from U2.

With this as a backdrop, there does exist substantial literature on brand building from a variety of perspectives. For the purpose of this literature review, various brand building techniques will be illustrated with a potential overlap with how U2 built its global brand. For example, brands can be built, as will be discussed further within this study, on the premise of “gut instinct” (verse a formalized strategy). The power of the head (i.e. strategy) combined with the heart (i.e. “gut instinct”) can allow for a historic moment within the formulation of a brand as well as within one’s career. (Kiev, 2009).

In the age of accountability, it may be risky and very difficult to justify strategic decisions made on “gut instinct” as this can be seen with the proliferation of concept testing and copy testing during the new product development and product management processes. (Marketing Magazine, March 20, 2009). Gut instinct decisions in business are usually made when not enough information is either present or an analysis of all options and subsequent repercussions are not taken into full account. Mr. Gerry Gildea, a Human Resource Consultant, strongly advocates on the power of information during the decision making process.

However, there is something very powerful about one’s “gut instinct”. Mr. Jeff Hawkins, the founder of Palm Computing and the inventor of Palm Pilot, within a segment of Stanford University’s Entrepreneurial Thought Leader Lectures, stated that focus groups can only be so effective and listening to customer feedback can add additional insight. However, every so often one must follow one’s “gut instinct” even if the market research dictates otherwise. (Hawkins, 2009). With this said, this research will illustrate the concept of “gut instinct” during the U2 journey and how it enabled them to build their brand.

In addition to “gut instinct” as a potential brand building tool, brands can also be built on the overall experience. We, as a society, are now fully engaged within the “experience economy”. The concept of “experience” is alive and well within the lives of consumers as can be seen by the simple birthday party



example. Originally such a celebration was just limited to a homemade cake and backyard games. The cost of the party was minimal. Now within the “experience economy” birthday parties are outsourced to institutions such as “fun craft” and “party zone” for a price. (Pine and Gilmore, 1999). Consumers are now willing to pay a premium for a delightful and uniquely branded customer experience. (Schmitt, 2003). Whether it is combining the seemingly incompatible within the customer experience to benchmarking best practices outside of one’s industry to breaking down the “sacred cows” within products all such initiatives can potentially add to customer experiences and in essence build a brand. (Schmitt, 2007). Experience can lead to a distinctive position in the marketplace which is a goal for all brands. (Kotler, 2004). The U2 brand is certainly based on a unique experience which will be illustrated further within this research.

Furthermore, innovation strategies such as user-based innovation where “lead users” are utilized for product innovation can also be a method in building a brand. (von Hippel, 2005). Engagement of any form can also allow for a personal relationship of the brand to develop which results in connection and ownership. (Schmitt, 2003). Engagement within the U2 philosophy is certainly evident which will be illustrated.

Overall, there are many methods and frameworks to building a brand. (Kotler, 2005). The brand building strategies just discussed can potentially be applied to the U2 story. In general, there is no specific recipe for building a brand. Rather, there are various frameworks that can lead to this end goal.

## WHAT WE CAN LEARN FROM U2

Upon witnessing the U2 phenomenon firsthand and seeing its success in tangible and intangible forms, the next step in this process was to research, in depth, the band's historical journey. The goal of this research was to determine not only how their success developed but more importantly to see what lessons, if any, executives can learn from their story. Below please find four (4) overarching takeaways from this analysis.

### Takeaway #1 – The Instinctive Gut

Organizations can spend countless time and resources trying to determine the best strategy to either gain market share or penetrate a new market. Consultants are hired and reports are generated all in the hopes of steering an organization to not only formulating a winning strategy but also implementing it effectively. Stakeholders of most organizations believe that planned strategic actions yield desirable and successful results. It is one of the oldest premises in business as we know it.

Yet what about steering off the planned agenda and/or in general following one's "instinctive gut?" There are supporters, for example, within innovation that indicate that even though the market research says otherwise, if your "instinctive gut" believes the new innovation will be a success, go with your "instinctive gut." (Kuczmariski, 2005). This is exactly what U2 did throughout their career which has certainly helped them make their mark.

One example can be seen on July 13, 1985, the day U2 was to perform at the Live Aid Concert Event at Wembley Stadium in London. Live Aid was an international concert event in London, Philadelphia, Sydney and Moscow with a goal to promote awareness and raise funds for famine relief in Ethiopia. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009). While U2 was just given the title of "Band of the Year" by *Rolling Stone Magazine*, they were not yet considered a major international force on the music scene and as a result, they were honored to have been invited to participate in such an event. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009).

As part of the plan, U2 was to perform three songs (*Sunday Bloody Sunday*, *Bad* and *Pride*) during their fifteen (15) minutes of allotted stage time. Yet halfway during the second song (*Bad*) during the actual performance, Bono, the lead singer, decided to jump off stage and dance with a girl in the audience. Bono's "instinctive gut" thought at the time that such a move would play well among the television audience. Little did he as well as his fellow band members know that this action would steer U2's performance strategy way off course eating up valuable time which in the end allowed the band to only perform two out of the three songs. While initially the band members were furious at Bono for following his "instinctive gut" as opposed to the pre-determined plan, his actions, in hindsight were effective as U2, in essence, "stole the show" and became international celebrities that day forward. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009).

In addition to Live Aid, a second example of how U2 has followed their "instinctive gut" can be seen in how they selected *Island Records* as their music label early on. Instead of selecting a label where the initial monetary awards were to be greater, U2 followed their "instinctive gut" for the creative freedom and eventual copyright partial ownership it provided them. As a result of this decision, corporate executives did not dictate the artistic terms of the next project but rather U2 did (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009). Overall, this "instinctive gut" decision allowed U2 to be true to their creative vision as opposed to being pressured to create that next pop hit. Such a decision has had a major impact on U2's success and creative direction.

#### Takeaway #2 – Branding Beyond Core Competency

As a rock and roll band, U2's core product and core competency is to produce music. They have been doing it since 1977 and as illustrated per their awards and recognition, they have been doing it quite well. Yet in addition to producing music they have also gone beyond their core competency which has changed the perception of their brand and the subsequent "U2 Experience" in the marketplace.

More specifically, U2 is known as a band that is committed to social justice issues. For the past twenty five years, U2 has been active in humanitarian efforts including famine relief, debt forgiveness, AIDS, anti-apartheid, and disaster relief for tragedies such as September 11 and the earthquake in Haiti. They have also either spearheaded or have been actively involved in initiatives such as Live Aid, Sun City, DATA (Debt, AIDS, Trade, Africa), Jubilee 2000, Live 8 and "Miss Sarajevo". As indicated earlier, Bono has met with world leaders on such issues and has even lectured at Harvard's Kennedy School of Government. (*U2 by U2*, 2009). He further, along with Bill and Melinda Gates, was named *Time Magazine's* Person's of the Year in 2005. In addition, much of U2's early music has dealt with religious, personal faith and political issues as can be seen with songs such as *Gloria (October)*, *Pride (Unforgettable Fire)* and *Still Haven't Found What I'm Looking For (Joshua Tree)*.

Overall, the U2 brand and the "U2 Experience" is not just about the music but it is about so much more. In a time now where "corporate social responsibility" has become the new buzzword within business strategy, U2, for a long period of time, has been leading the way when it comes to these efforts.

#### Takeaway #3 – The High Powered Team

Larry Mullen Jr., the future drummer of U2, posted a sign in his secondary school in Ireland in September 1976 looking for classmates who were interested in being a part of a new band. This is the official birth date in what would eventually become U2 and the ages of the band members ranged from fourteen to sixteen. (*U2 by U2*, 2009). With no real formal musical training, the "boys" set out unknowingly in what would be an incredible thirty plus year union.

In an industry where egos and creative control are potentially major reasons why musical bands breakup, it is incredible that these four teens from the Mount Temple Comprehensive School in Ireland were able to not only achieve such success but more importantly stay together all this time.

Yet if one watches a U2 live performance closely, one will not be surprised as it is easy to detect the synergy of the U2 musical team. Bono is the band spokesperson and leader on stage. When the band is interviewed, Bono does most of the talking and has done so as early on as 1981 as seen in early footage. This is his role and it has become accepted among the group.

It has also been noted that the band can spend an excruciating amount of time in the studio producing new music as well as on the road touring. Like any married couple with longevity, there are "highs" and "lows" in any relationship. Yet even during the "ups" and "downs", U2 has found a way to not only stay together but also work collaboratively for a common goal. Their continued success, throughout their journey, illustrates their effectiveness as a strong team each with a unifying role moving U2 forward. They understand their roles and their individual impact on the success and direction of U2.

#### Takeaway #4 – Belief in The Human Spirit

The one theme that this research has illustrated is the power of the human spirit. U2, for all intensive purposes, had everything going against them when they came together for the first time in September 1976. None of the boys were musicians and all but one had any musical training. Bono became the singer by default not because of the unique pitch of his voice but rather because he did not own an instrument. (*U2 by U2*, 2009). The Edge (David Evans) owned a guitar and Adam Clayton owned a base guitar and both taught themselves how to play. Larry Mullen Jr. was the only one of the four to have formal music lessons on his instrument -- the drums. As a result, during the initial stages of the group, they were learning to play their instruments and evolving together. (*U2 by U2*, 2009).

Furthermore, each of them, during their youth, suffered in some capacity. Bono, at the age of fourteen, tragically lost his mother to a brain hemorrhage which came about during his maternal grandfather's funeral. Bono has admitted that his ensuing childhood with his father and brother was somewhat dysfunctional. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009). The Edge has described himself as a shy youth and as a loner while Adam Clayton experienced some academic issues. Larry Mullen Jr. saw himself as a disappointment in his father's eyes as his grades were subpar and he was not interested in athletics. (*U2 by U2*, 2009). Overall, when these individuals came together in September 1976, the biggest thing they had going for them was their human spirit which along with their subsequent determination enable them to initially succeed.

This spirit continued throughout the U2 journey and has allowed the band to not only rebound from failure but to also continually reinvent the music. Not every album and every initiative was considered a commercial success. U2's first album, *Boy*, made it to number 63 in the charts while the second album, *October*, did not even crack the charts at all. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009). This trend continued with the third and fourth albums, *War*, and the *Unforgettable Fire* as well as the fifth album, *The Joshua Tree* (Album of the Year) to the sixth album, *Rattle and Hum* which sold only 12 million copies. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009). Continuing on, U2 experienced success and musical reinvention with their next two albums, *Actung Baby* and *Zooropa*, only to crash and burn with their 1997 album, *Pop*, which was an exploration of music and dance, which sold only seven million copies. (*U2 by U2*, 2009). The next two albums, *All That You Can't Leave Behind* and *How to Dismantle an Atomic Bomb* hit the ground running and did well commercially only to receive less enthusiasm for their most recent album, *No Line on the Horizon*. (Koehn, Nancy, Miller, Katherine and Wilcox, Rachel, July 2009).

Overall, one of the great takeaways about U2 is their belief in themselves and the spirit they have exhibited. They have continually reinvented themselves as well as continually persevered which has led to a distinctive brand in the marketplace.

## CONCLUDING COMMENTS

The rock band U2 was born in 1976 and has had a tremendous commercial success and has also built a powerful brand. Their journey has been unique, electrifying and evolving. With this said, the goal of this research was to determine if executives and professionals alike can learn any lessons from the U2 story and how their brand was built. More specifically, the goal was to determine if executives can “operationalize” any wisdom from the “U2 Effect” within their current roles.

As indicated earlier, to determine this information, a thorough historical analysis was conducted on the U2 journey from band conception to its current state. The goal of this analysis was to determine if any apparent and/or not so apparent lessons of wisdom could be determined from this historical review. Upon conducting this research it became apparent that there are four (4) overarching themes and takeaways that executives can learn from U2. They are as follows: (1) The Instinctive Gut; (2) Branding Beyond Core Competency; (3) The High Powered Team; and (4) Belief in the Human Spirit. As indicated within the research, these takeaways were critical in building the U2 brand as it is known today.

Overall this historical exploratory study does have one evident limitation. There is very little academic research that has been conducted on Bono and U2. There is much data that exists from interviews and secondary sources from fans and individuals who may have biases however very little research exists from an academic perspective. While relying on secondary sources was necessary for this type of study more formal academic research should be conducted on the impact of Bono and U2. In closing, executives can learn a great deal from the U2 journey. The goal of this initial study was certainly not only to illustrate some of these takeaways but to also ignite an increase of interest of research on the “U2 Effect”.

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# OPTIMAL EQUIPMENT INVESTMENTS FOR NORTHERN PLAINS GRAIN FARMS

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## CASE DESCRIPTION

*This case presents a teaching tool which requires students to identify an optimal equipment plan for a northern plains small grain farm. Students are presented with information from a farm owner regarding farm size, available labor, farming techniques used and other relevant issues. Students are required to analyze this information to identify the equipment necessary to operate the farm. Students must balance equipment costs and labor issues. They must develop a plan that remains within a predetermined budget. Students use online resources to identify specific equipment along with their appropriate prices. Students are also invited to make general recommendations and comments. This case is suitable for an agricultural economics, agribusiness, or agronomy class. The case is appropriate for use at the senior, or masters level. In some instances, the case may be valuable for Ph.D. students. Students should have some familiarity with farm equipment and the equipment needs of small grain farms before being assigned the case. Students might be assigned to work individually or in teams on the project. Individuals or groups may be required to present their research to the class for discussion and comment. Completion of the case should require 5-10 hours outside of class. Classroom discussion should be about two hours.*

**JEL:** Q12, Q14

**KEYWORDS:** Farm Finance, Farm Equipment, Capital Budgeting

## CASE INFORMATION

David Cobbelston recently retired from farming and moved to the city near his farm. As with many retiring farmers, he managed his equipment to be near the end of its useful life at the time he retired. He recently held a farm auction to sell the machinery from his operations. However, he is planning to retain ownership of the 4,000 acres of land and rent it to other farmers. Today, he approached his son John to inquire about his interest in renting the land. John has wanted to operate the family farm since he was a young child and is excited by the prospect. He would like to quit his job as an account executive for Pitney Bowes to take over the farming operation. As the spring planting season is approaching, David has given John only two weeks to make a commitment.

John needs to investigate financing, potential profitability, his family's willingness to relocate and many other issues to make an informed decision. While John is familiar with farming operations there are certain economic elements he will not have time to fully explore in the two weeks before he must make a decision. One concern is how much money he will need to spend on machinery. He knows his budget will be limited because of funding availability. He has approached you, Bill, an agribusiness major at the local university to assist him. He has asked you to develop a machinery plan for the farm. You are glad to undertake the project, as you think you will learn something, and the consulting fee will pay for your spring break trip. You have taken many classes on agribusiness, finance and other management issues and grew up on a grain farm, so you feel well qualified to handle the task.

You realize that in order to develop the machinery plan, you will need some additional information about the farming operations. You schedule a meeting with John for 8:00 the following morning to gather information. At the meeting, John and David begin by telling you the farm has 4,000 tillable acres. The land is mostly located within a seven mile radius of the farm headquarters with 1,280 acres located ten miles from the headquarters.

The farm has been used exclusively for small grain production. Recently, David had been growing spring wheat, durum, feed barley and safflower. The advantage of this combination is the crops require the same equipment and have somewhat different seasons. This spreads the work out over a longer period of time and allows for more efficient equipment use. Moreover, this combination provides an element of diversification from crop disasters and crop price variations. The land is capable of growing a number of other crops including flax, rye, oats, triticale, winter wheat, sunflower, canola, millet, crambe and spelt. Malting barley is occasionally grown in the area.

In recent years, David has grown about 480 acres each of feed barley and safflower. He has grown about 640 acres of durum and the remaining land has been planted to spring wheat. Crops are typically rotated to different fields in subsequent years to reduce weed and disease problems. John plans to continue growing the same crops in about the same quantities. The land is continuously cropped, so every acre of land is planted every year. The most common method of farming in the area is no-till and John wishes to utilize this approach.

The farm is located 17 miles from a small farming community, Nickinson, with a population of 600 people. It is about 45 miles from a regional center, Avelock, with a population of 25,000 people. A good supply of parts for John Deere and Case IH equipment is available in Nickinson, and parts for most other makes of equipment are available in Avelock. Grain markets where the farm's production is sold are located about 25 miles from the farm.

The farm headquarters has a house and large workshop. There are also two steel buildings that can be used for grain storage or machinery storage. The farm has 200,000 bushel of grain storage all located at the farm headquarters. The grain storage is connected by a series of electric powered elevators, that were not sold at the farm auction. In addition, the equipment for a 3,500 bushel, bin drying system remains in place. A 500 bushel grain pit allows for fast unloading of trucks. All other farm equipment, including the shop equipment, was sold at the auction. John tells you a large capacity 66 foot or longer auger will be required for loading grain into the bins. A 40 foot unloading auger and bin sweep are required to remove grain from the bins and steel buildings. Electricity is available at the bin site.

John and his wife Kathy plan to work the farm together. While Kathy is interested in living and working on the farm, she is not interested in the business of farming. John has agreed to manage the business elements of the farm. Both are willing and able equipment operators. In addition, they have a son, Joe, who is 16 years old. Joe helped his grandfather on the farm the past two summers and is capable of operating most farm machinery. He is excited about the prospect of helping his father. David indicated he would be willing to help John during peak planting and harvesting seasons. Outside labor is available in the area but is expensive during peak planting and harvesting seasons. John tells you that he would like to have enough equipment so that seeding and harvesting can each be completed in about 25 working days. He wishes to operate the farm without hiring outside labor. John and Kathy are both handy in the repair shop. They are capable of handling small to medium sized repairs, including welding and so forth. Neither are capable of handling highly technical projects such as engine overhauls.

John and David describe the production element of the farming process as follows. The production year begins about March 1. The first step is to acquire the necessary planting supplies and move them to the farm. This is generally done with grain trucks and takes about one week. Supplies include seed, dry



fertilizer, fuel, and various chemicals. The farm has ample space to store all the supplies needed during the planting process with the exception of fuel. The fuel tanks were sold at the farm auction.

After the supplies have been purchased, seeding begins. The seeding process starts by spreading bulk fertilizer on the fields. Normally, dry fertilizer is spread in a fertilizer spreader. Fertilizer spreaders are pulled with a smaller tractor, having perhaps 70-100 horsepower. Some seeding equipment has the ability to combine fertilizer application with the seeding process. In these cases, the spreading application is not required. Depending on the amount of weeds that start in the spring, a pre-plant spraying to burn down weeds may be necessary.

Seeding begins as early as mid March and can extend into June, depending upon weather conditions. Generally, crops which are planted earlier produce higher yields. Seeding starts by trucking seed and fertilizer to the seeder. The seed and fertilizer are transferred from the truck to the seeder. The seeder proceeds to plant the field. Seeders operate at about 5.5 to 6 miles per hour. It takes 80-100 tractor horsepower for each 10 feet of seeder used. The operator must spend a certain amount of time adjusting settings on the seeder for optimal planting, refilling the seeder, and moving the seeder from field to field. A seeder can be operated a maximum of about 10-12 hours per day. Barley is usually seeded first, followed by wheat and durum. Safflower is seeded last.

Wheat, barley and durum are susceptible to broadleaf and grassy weeds. Spraying for broadleaf weeds occurs about two to three weeks after the grain has emerged from the ground. Spraying must optimally be completed in a two to three week window. Sprayers typically operate at about 10-15 miles per hour. Pull type, self propelled or pickup mounted sprayers would be suitable for the task. The amount of time that sprayers can be utilized is limited on any given day because of wind and other weather conditions. Wind can cause chemicals to drift to nearby fields resulting in undesirable damage. On average spraying can occur for 3-4 hours per day. A second spraying is sometimes necessary in the same time period to control wild oats. A pre harvest burn down occasionally necessary. Spraying requires the application of about 3-6 gallons of water per acre in addition to the chemicals. Sprayers range in size from 300-1,200 gallons. Returning to the farm headquarters requires about 1.5 hours to refill the tank. Refilling can be completed much faster with a nurse tank that makes water available immediately at the field.

Barley harvest begins in late July or early August. Wheat and durum harvest immediately follow. While wheat and durum are harvested about the same time, they must be handled and stored separately. Safflower is usually harvested in October. The grain is straight harvested so windrowing equipment is not necessary.

Combines can operate about 8-10 hours per day. Modern era combines operate at 6-8 miles per hour. As the combine harvests, the resulting grain is transferred to trucks for transportation to the grain storage facility. Barley will ordinarily yield about 70-100 bushel per acre, spring wheat and durum between 30 and 60 bushel per acre. Safflower commonly yields 1,000-1,500 pounds per acre. A single axle truck will hold about 300 bushel of wheat, a tandem axle truck, 550 bushel, and a semi with trailer about 1,000 bushel. Safflower and other crops produce similar volumes. It takes on average 15 minutes for the trucks to get from the fields to the storage facility, with the trip from the most distant field being about 30 minutes. Return trips take about the same amount of time. Unloading at the storage facility takes an additional 10-15 minutes with a ten inch auger.

In the weeks following harvest, it is sometimes necessary to spray the land to kill any late emerging weeds. It is also necessary to mow road ditches bordering the land to minimize snow drift problems. This usually occurs in October after the first hard frost.

Grain can remain in the storage facility for several years without problems. However, more commonly grain is removed from the storage facility and sold in the local market sometime between October and February. Other activities during the winter months include repairing and refurbishing farm machinery, taking a vacation, tax planning, general planning and government program planning for the following year. This completes the crop cycle.

John tells you he has limited funds available to purchase machinery. He hopes to accumulate enough machinery to operate the farm with \$110,000. He is well aware this implies the equipment will be older model used pieces. He could potentially raise some additional capital for machinery purchases if necessary. He has asked you to prepare a plan with several different funding levels to help make his decision. Specifically he would like recommendations for each a \$110,000, \$220,000, \$330,000 budget. In addition, he would like a budget that includes late model versions of major equipment pieces. Finally, he would like a budget that includes only new equipment.

With this information you are tasked with developing a machinery plan for the farm. You consult your agribusiness professor who suggests you conduct research on machinery needs and prices using online resources. He recommends you consider information from the following websites to develop your plan: [www.tractorhouse.com](http://www.tractorhouse.com), [www.machinerytrader.com](http://www.machinerytrader.com), [www.fastline.com](http://www.fastline.com), [www.agdealer.com](http://www.agdealer.com), [www.ironsearch.com](http://www.ironsearch.com), [www.machinerypete.com](http://www.machinerypete.com), [www.grainfarmer.com](http://www.grainfarmer.com), [www.usedfarmequipment.com](http://www.usedfarmequipment.com), [www.equipmentlocator.com](http://www.equipmentlocator.com) and [www.truckpaper.com](http://www.truckpaper.com).

## QUESTIONS

1. Determine the size and amount of machinery needed to operate this farm. Using internet resources, identify specific pieces of machinery that meet the needs of the farm and collectively remain within the \$110,000 equipment budget. Please print pictures and include them with your completed case study to show the recommended equipment.
2. Do you have any cautionary notes for John regarding this plan?
3. If another \$20,000 of budget becomes available, which piece(s) of equipment should be upgraded, or which additional piece of machinery should be purchased.
4. Now suppose John indicates that Joe is not likely to be available to work in the summers because he wants to spend time in Hawaii learning to surf. Thus seeding and harvesting will need to be completed without his assistance. Nevertheless, John wishes to avoid hiring outside helpers. How does this change the machinery plan? You do not need to completely redesign your machinery plan, but should identify areas where change is necessary.
5. Now suppose David suggests he may move permanently to Europe. If he did, he would not be available to help as originally indicated. If neither Joe or David are available to help during peak seasons, what adjustments need to be made? Again assume no outside labor is hired. You do not need to completely redesign your machinery plan, but should identify areas where change is necessary.
6. Return to the original farming plan, excluding the additional land suggested in question six and with both Joe and David available to work. John has been contemplating the addition of corn and sunflower production into the mix of crops grown on the farm. A retired neighbor has asked if he would like to rent 640 acres of his land for that purpose. The neighbor suggests the possibility of about 320 acres of each corn and sunflowers. John is aware that this would require him to acquire row crop farming equipment. An advantage of growing sunflowers and corn is

that these crops follow a slightly different season and would not interfere with other work. How much would it cost for John to add the necessary equipment for this purpose? Please provide pictures of the recommended equipment.

7. Return to the original farming plan, excluding the additional land suggested in question six and with both Joe and David available to work. Suppose John discovers that his investments have performed much better than he was aware. Instead of having \$110,000 to spend on machinery, he has \$220,000 to spend on machinery. Develop a new machinery plan taking this new information into account. Please provide pictures of the recommended equipment.
8. Continuing with the original farming plan, how would you change the machinery plan if \$330,000 were available to purchase machinery. Please provide pictures of the recommended equipment.
9. Based on the original farming plan, consider a situation where the major pieces of equipment are must be less than six years old. Develop a machinery plan that includes these modern equipment purchases. Please provide pictures of the recommended equipment.
10. Finally, based on the original farming situation, develop a machinery plan that involves the purchase of all new equipment. Please provide pictures of the recommended equipment.
11. Given your computations above, how much money do you recommend that John spends on Machinery, \$110,000, \$220,000, or \$330,000, or some other amount.
12. Do you have any final comments or suggestions for John?

# OPTIMAL EQUIPMENT PLANNING FOR NORTHERN PLAINS GRAIN FARMS

## TEACHING NOTES

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## CASE DESCRIPTION

*This case presents a teaching tool which requires students to identify an optimal equipment plan for a northern plains small grain farm. Students are presented with information from a farm owner regarding farm size, available labor, farming techniques used and other relevant issues. Students are required to analyze this information to identify the equipment necessary to operate the farm. Students must balance equipment costs and labor issues. They must develop a plan that remains within a predetermined budget. Students use online resources to identify specific equipment along with their appropriate prices. Students are also invited to make general recommendations and comments. This case is suitable for an agricultural economics, agribusiness, or agronomy class. The case is appropriate for use at the senior, or masters level. In some instances, the case may be valuable for Ph.D. students. Students should have some familiarity with farm equipment and the equipment needs of small grain farms before being assigned the case. Students might be assigned to work individually or in teams on the project. Individuals or groups may be required to present their research to the class for discussion and comment. Completion of the case should require 5-10 hours outside of class. Classroom discussion should be about two hours.*

## GENERAL COMMENTS

This case represents a considerable challenge for students. It requires them to properly equip an entire farm. Moreover, students are faced with a very constrained budget. In the first analysis, students are limited to spending \$110,000. A single new combine can cost in excess of \$300,000. Thus equipping an entire farm with the many different pieces of equipment required for \$110,000 is difficult at best. Nevertheless, this is the type of challenge faced by many new and established farmers. Clearly, in the constrained budget analyses, the farm will need to be equipped with older model equipment. As the farm is of considerable size, students should be looking at purchases of large equipment. Students are also required to develop machinery plans for other budget amounts. While students should provide pictures with their case solution, pictures are not included here to conserve space.

The following provides a sample machinery plan. The case is open ended, so student solutions may differ markedly from what is presented here. The plan developed here is based on machinery and pricing available in May 2010. Prices reported are based on advertised prices without consideration of any negotiated discounts or transportation charges. Professors who wish to develop a shorter assignment might require students to complete a plan for a single budget amount rather than for several candidate budgets.

## QUESTIONS

**Question 1:** Determine the size and amount of machinery needed to operate this farm. Using internet resources, identify specific pieces of machinery that meet the needs of the farm and collectively remain within the \$110,000 equipment budget. Please print pictures and include them with your completed case study to show the recommended equipment.

**Solution 1:** Several calculations are needed to determine the size of equipment needed to operate this farm. As the owner has indicated a limited equipment budget, it may be necessary to select some pieces of equipment that are on the smaller side of what is necessary. Each major equipment item is addressed in turn.

John has indicated he would like have the capacity to complete the seeding operation in about 25 days. Seeders operate at 5.5 to 6 miles per hour and typically operate 10-12 hours per day. Common large capacity seeding equipment are 30, 45 and 60 foot widths. The first step is to determine how many acres each of these machines can complete in one day. One acre of land is 43,560 square feet. This translates into an area 8.25 feet wide by one mile long. Thus, when traveling one mile, a 30 foot seeder will cover  $30/8.25 = 3.636$  acres. Traveling at a speed of 5.5 miles per hour, the machine can cover  $3.636 \times 5.5 = 20.00$  acres per hour. Thus, in a ten hour day, the machine is capable of covering 200 acres. A certain amount of time must be allocated for setting, refilling and moving the machine. This equals approximately 25 percent of the machine's potential. Thus the machine will cover about  $200 \times 0.75 = 150$  acres per day. Over a period of 25 days, the machine will cover 3,750 acres. Using similar calculations, a 45 foot machine would cover about 5,625 acres and a 60 foot machine 7,500 acres. While the 30 foot seeder is slightly smaller than John has requested, it more closely meets his needs than a 45 foot seeder. The specific recommendation is for a 1989, Case IH, model 8500. The cost of these machines is about \$9,500. The Case IH, model 8500 seeder cannot deep place large amounts of nitrogen fertilizer. Because of this limitation, you will also need a fertilizer spreader to distribute nitrogen prior to seeding. You recommend a Willmar S200 spreader for 2,600.

The size of the primary tractor required depends on the size of the seeder purchased. In order to pull a 30 foot seeder, a tractor with 240 to 300 horsepower is required. By selecting a tractor that has closer to 300 horsepower, higher speeds can be achieved thereby overcoming some lack of seeder size. The recommendation is for a 1979 International 4586. These tractors are quality machines with 300 horsepower that can be purchased for a low price. The recommended machine costs \$10,000.

An 80-100 horsepower tractor is needed for utility operations, such as moving snow and dirt, lifting objects, spreading fertilizer and operating pull type sprayers and power take off (PTO) driven grain augers. The tractor should have a loader, 3 point hitch and power take off. The recommendation is for a 1978 White, 2-135 tractor with loader, 3 point hitch and PTO available for \$8,000. While this is more power than needed for utility operations, it has several valuable added capabilities, including the ability to handle sizeable row crop equipment should John elect to grow those crops in the future.

Spraying equipment is a particularly important piece of machinery because the window for completing spraying operations is narrow and can be disrupted by a variety of weather conditions. Sprayers come in widths from 40 to 120 foot. They typically operate at about 10-15 miles per but are only able to work about 3-4 hours per day. To determine the amount of machinery needed, you note that different crops need to be sprayed at different times. The primary limitation is spraying barley, spring wheat and durum. These crops represent the bulk of the farming operations, and spraying would occur at about the same time for each. These crops are planted on 3,520 acres.

An 120 foot sprayer could cover about  $120/8.25 \times 10\text{mph} = 141$  acres per hour. In a four hour period the sprayer could cover about 564 acres. Refill and move time can be substantial depending upon the water source location. Commonly a nurse tank is used to facilitate rapid refilling. Including refill and move time, coverage for a 120 foot sprayer is estimated to average 100 acres per hour, or 400 acres per average day. Given the sensitivity of spraying to time of application and weather conditions and the fact that additional spraying equipment is relatively inexpensive, a 50 foot pickup sprayer is recommended to supplement the 120 foot sprayer. This smaller sprayer will be more nimble and able to negotiate smaller

areas and spaces with tight turns. The second sprayer will allow coverage of an additional 200 acres per day. Used pickup sprayers are available in many makes and models for about \$3,500. The recommended pull-type sprayer is a 1994, 110 foot Summers SuperSprayer costing \$4,500. In addition, a 2000 gallon home manufactured nurse tank is recommended at a cost of \$2,000.

Due to the no-till nature of the farming operation, tillage equipment will have limited value. Nevertheless, a disk would be beneficial for preparing troublesome weedy spots. An older version International Model 490, 28 foot disk will be sufficient for any tillage required. These disks are available for about \$3,000.

Harvest represents a major step in farming operations. Harvest requires several pieces of machinery and is the most labor intensive part of the production process. Combines are the heart of the harvest operation and represent a significant investment. Given John's financial limitations, older equipment will need to be purchased. Nevertheless, given the substantial size of the farm, the equipment needs to be large. Two 24 foot machines from the mid 1980's would meet the requirement. Combined these machines should cover about 200 acres per day, thereby falling within the 25 day harvest window. Two 1983 Gleaner, N-7 Combines that are in good condition for their age and include 30 foot headers are recommended at a cost of \$14,000 each. The added capacity of the 30 foot headers over the 24 foot headers will increase the harvest speed by about 25 acres per day per machine.

Trucks are needed to transport grain from fields to the storage facility during harvest and again from the storage facility to grain markets after harvest. Trucks are also used to transport seed and fertilizer to the seeder. As the trucks will drive relatively few miles each year older tandem axle, lift-tag trucks should be suitable for the task. Specifically, the recommendation is for three 1973, C70, gasoline powered, Chevrolet trucks each costing \$6,500. Having two 30 foot combines and three 550 bushel trucks may present some limitations, particularly when working on fields further from the headquarters. The combines may have to stop working from time to time because of tucking capacity. Two grain augers, one for loading into bins and the other for loading out of bins are required. For loading into bins, the recommendation is a ten inch diameter, 66 foot in length, Feterl auger with an electric motor available for \$3,000. For loading out of the bins, the recommendation is for an eight inch diameter, 40 foot in length, Westfield grain auger with an electric motor that costs 2,500. A used Wheathheart bin sweep should be purchased for about \$500.

A service pickup is needed to transport fuel to the field, and carry a supply of repair tools. The recommendation is for a 1989, Ford F-250 costing \$2,500. In order to mow ditches, a mower or windrower is necessary. The recommendation is for a 1975, Versatile 400, self propelled, windrower. Nice versions of this older machine are available for about \$2,500.

Some shop equipment is required. The recommendation is to spend extra money on shop equipment because of the equipment's age. The recommendation is for a \$500 wire welder, 500 cutting torch, and \$500 air compressor. Various other tools and shop equipment costing an additional \$2,000 will be required. It is necessary to have fuel storage tanks on the farm to meet daily fuel needs. Two used 500 gallon tanks costing \$500 each should be suitable. Finally, \$2,000 of expenditures on miscellaneous items should be anticipated.

The recommended equipment purchases are presented in Table 1. The total cost of the equipment selected is \$108,100, which is within the \$110,000 limit.

Table 1: Recommended Equipment Purchases for a 4,000 Acre Grain Farm \$110,000 Budget

ITEM	COST
1979 International 4586 Tractor	\$10,000
1989 Case IH8500, 30 foot seeder	\$9,500
1978 White 2-135 tractor w/ loader, 3pt and PTO	\$8,000
Willmar S200 Fertilizer Spreader	\$2,600
2,000 Gallon Water Nurse Tank on Trailer	\$2,000
Pickup Sprayer 50', 500 Gallon	\$3,500
Summers 120' 1,000 Gallon Pull Type Sprayer	\$4,500
International 490 Disk 28'	\$3,000
Versatile 400, Self Propelled Windrower	\$2,500
2, 1983 Gleaner N-7 Combine w header	\$28,000
3, 1973, C-70 Chevrolet Tandem Axle Trucks	\$19,500
Large Capacity Grain Auger	\$3,000
Grain Auger and Sweep	\$3,000
Service Pickup	\$2,500
Shop Equipment	\$3,500
Fuel Storage Tanks	\$1,000
MSC	\$2,000
<b>TOTAL</b>	<b>\$108,100</b>

*This table shows recommended machinery purchases for a Northern Plains grain farm of 4,000 acres. The recommendation is limited to a budget of approximately \$110,000.*

**Question 2:** Do you have any cautionary notes for John regarding this plan?

**Solution 2:** The most notable issue in this plan is the equipment age. The equipment recommended is mostly about thirty years old. This presents certain issues with break downs and parts availability. These issues could impact the amount of work that can be accomplished and long term cost of the equipment. John should be aware of this and should spend time during each winter working on equipment. Specifically, each piece of equipment should be carefully evaluated in terms of its ability to adequately work another season. If the machines are capable of working another season, the equipment should be carefully maintained and repaired during the winter months, so it is fully prepared for the growing season. If the equipment is not suitable for another season, it should be traded for better equipment. Further, John should set aside an amount of money for machinery replacement in the event a break down occurs that is not economically feasible to repair. For example, if the engine in the International 4586 were to fail, repair would not be sensible. Rather, it would be advisable to replace the equipment. Being financially prepared for this eventuality is vital.

**Question 3:** If another \$20,000 of budget becomes available, which piece(s) of equipment should be upgraded, or which additional piece of machinery should be purchased.

**Solution 3:** There are several candidate upgrades. Perhaps the first would be to purchase a larger tractor. Adding \$15,000 to the tractor purchase price would allow John to acquire a tractor in the 400 horsepower range. Candidate tractors include an International 4786 and John Deere 8850. With the extra power, John could pull a 45' seeder rather than a 30' seeder. Older model 30' and 45' seeders are priced approximately the same. So the larger seeder does not imply additional cost. Thus an additional expenditure of \$15,000 would increase seeding capacity considerably. It may also be advisable to increase trucking capacity. There are two primary ways this could be done: purchasing additional or larger trucks or purchasing a grain cart. Given only \$5,000 of available funds after the tractor purchase, it may be best to replace one truck with a semi and trailer.

**Question 4:** Now suppose John indicates that Joe is not likely to be available to work in the summers because he wants to spend time in Hawaii learning to surf. Thus seeding and harvesting will need to be completed without his assistance. Nevertheless, John wishes to avoid hiring outside helpers. How does

this change the machinery plan? You do not need to completely redesign your machinery plan, but should identify areas where change is necessary.

**Solution 4:** The absence of Joe creates interesting challenges. Seeding and spraying should remain manageable without Joe. Harvest is more severely impacted. Without Joe, the harvest must be completed with only three people. This implies two combine operators and one truck operator. In this case, John should consider purchasing at least one larger truck. A Semi truck and trailer, while somewhat more expensive, would be an advisable investment. In addition, a larger unloading auger would be advisable. Changing the ten inch auger for a 12 or 13 inch auger would speed truck unloading considerably.

**Question 5:** Now suppose David suggests he may move permanently to Europe. If he did, he would not be available to help as originally indicated. If neither Joe or David are available to help during peak seasons, what adjustments need to be made? Again assume no outside labor is hired. You do not need to completely redesign your machinery plan, but should identify areas where change is necessary.

**Solution 5:** This change has a significant impact on the farming operations. It will still be possible to manage seeding and spraying with some careful planning. However, significant changes to the harvest operations will be necessary. Moreover, making these changes while remaining within a \$110,000 budget is a significant challenge. In this case, John should not purchase two combines. One newer combine with additional capacity should be purchased instead. A 1996 Gleaner R-72 combine for \$34,000 is recommended. This change increases the overall budget by \$6,000. In addition, trading one tandem axle truck for a semi truck with trailer would be valuable. This change increases the budget by \$8,500. These changes would increase the budget to \$124,500, modestly above the \$110,000 target. There are two other methods that John could use adjust his operations. First, he could move some land away from spring wheat and durum production. Planting crops like oats and winter wheat would help extend the planting and harvest seasons allowing the work to be completed in a timely fashion. John should also consider hiring some of the harvesting done by custom harvesters, thereby taking some pressure off himself and Kathy.

In the event that additional funding were to become available, John might consider purchasing a class VII, VIII or IX combine. While much more expensive, these combines can accommodate 36' and larger headers and travel faster in the field. Such a combine would include machines like a Case IH 2588 or Case IH 9120. In addition, two tandem axle trucks should be replaced with semi trucks.

**Question 6:** Return to the original farming plan, excluding the additional land suggested in question six and with both Joe and David available to work. John has been contemplating the addition of corn and sunflower production into the mix of crops grown on the farm. A retired neighbor has asked if he would like to rent 640 acres of his land for that purpose. The neighbor suggests the possibility of about 320 acres of each corn and sunflowers. John is aware that this would require him to acquire row crop farming equipment. An advantage of growing sunflowers and corn is that these crops follow a slightly different season and would not interfere with other work. How much would it cost for John to add the necessary equipment for this purpose? Please provide pictures of the recommended equipment.

**Solution 6:** Farming an additional 640 acres of row crops can be accommodated with a modest additional machinery investment. Three additional pieces of equipment are required: a row crop planter, a row crop cultivator and row crop headers for the combines. Fortunately, the White 2-135 tractor recommended earlier has 135 horsepower, a three point hitch and PTO. As such it should be able to work with a 12 row planter or cultivator. The recommendation is for a 1984, 12 row CASE IH 800 planter at a cost of \$5,000. In addition a 1980, John Deere RM 230 12 row cultivator costing \$2,000 should be purchased. The header recommendation is for 2, N-830 Headers for the N-7 combines costing \$3,000 each. Thus the total additional direct equipment cost necessary to add the additional 640 acres is \$13,000.



**Question 7:** Return to the original farming plan, excluding the additional land suggested in question six and with both Joe and David available to work. Suppose John discovers that his investments have performed much better than he was aware. Instead of having \$110,000 to spend on machinery, he has \$220,000 to spend on machinery. Develop a new machinery plan taking this new information into account. Please provide pictures of the recommended equipment.

**Solution 7:** In general, availability of additional funds will not affect the amount of equipment purchased. In some instances it will affect the size of equipment purchased. The additional funds will primarily be used to improve equipment quality. The improvements will be primarily in the seeding and harvesting areas.

The first change should be to purchase a better main tractor and seeder. An upgrade to a well conditioned 1988, John Deere 8850 tractor is recommended. This tractor is newer and will have about 70 additional horsepower over the International 4586. Top quality versions of these tractors with recent overhauls, newer tires and nice paint are readily available for \$30,000. This change will improve reliability and will allow the switch from a 30 foot to a 45 foot seeder. The seeder should also be upgraded from an International 8500 to a newer model. A 1999, John Deere 1850, 45 foot, seeder is recommended at a cost of \$50,000. Purchase of a more advanced seeder will increase capacity and reliability. It should also increase the quality of crops grown due to more accurate seed and fertilizer placement. The newer seeder eliminates the need for a fertilizer spreader, thereby providing a significant efficiency enhancement.

The combines should be upgraded to 1996, Gleaner R-72's. These combines with header cost about \$34,000 each. The newer combines should provide an added element of reliability and capacity. An upgrade should also occur in the truck area. One of the Chevrolet trucks should be replaced with a semi truck. Thus, the operation will have two tandem axle trucks and a semi truck. A 1989 Peterbilt, 377 semi truck costing \$6,500 and a 1977, 40 foot Timpte grain trailer costing \$8,500 are recommended for a combined cost of \$15,000. An upgrade for the service truck is recommended, increasing the cost from \$2,500 to \$5,000. Finally, two additional fuel storage tanks costing a total of \$1,000 is recommended. Table 2 provides a summary of the suggested purchases with a \$220,000 budget. The total cost of the recommended equipment is \$219,000.

Table 2: Recommended Equipment Purchases for a 4,000 Acre Grain Farm \$220,000 Budget.

ITEM	COST
1988 John Deere 8850 Tractor	\$30,000
1999, John Deere 1850, 45' Seeder	\$50,000
1978 White 2-135 tractor w/ loader, 3pt and PTO	\$8,000
2,000 Gallon Water Nurse Tank on Trailer	\$2,000
Pickup Sprayer 50', 500 Gallon	\$3,500
Summers 120' 1,000 Gallon Pull Type Sprayer	\$4,500
International 490 Disk 28'	\$3,000
Versatile 400, Self Propelled Windrower	\$2,500
2, 1996 Gleaner R-72 Combine w header	\$68,000
1977 Timpte 40', Hopper Bottom Grain Trailer	\$8,500
1989 Peterbilt 377 Semi Truck	\$6,500
2, 1973, C-70 Chevrolet Tandem Axle Trucks	\$13,000
Large Capacity Grain Auger	\$3,000
Grain Auger and Sweep	\$3,000
Service Pickup	\$5,000
Shop Equipment	\$3,500
Fuel Storage Tanks	\$2,000
MSC	\$3,000
<b>TOTAL</b>	<b>\$219,000</b>

*This table shows recommended machinery purchases for a Northern Plains grain farm of 4,000 acres. The recommendation is limited to a budget of approximately \$220,000.*

**Question 8:** Continuing with the original farming situation, how would you change the machinery plan if \$330,000 were available to purchase machinery. Please provide pictures of the recommended equipment.

**Solution 8:** Once again, the availability of additional funds would generally involve quality improvement as opposed to purchasing additional equipment. The bulk of the purchases will be made in the seeding and harvesting areas.

In this instance a major upgrade to the primary farm tractor is recommended. A 1998 John Deere, 9400 tractor is recommended. The John Deere 9400 will have 50 more horsepower than the John Deere 8850 and cost about \$90,000. This purchase implies a significant improvement in reliability and capacity. Further improvements are recommended in the harvesting area. The first recommendation is the purchase of a grain cart which allows for faster unloading of combines and overall improved harvesting capacity. The specific recommendation is for a Killbros 1200 grain cart, capable of transporting about 700 bushel of grain. The price of a used version of this cart is about \$10,000. A second semi and trailer is also recommended with a combined cost of \$15,000. Improvements to the tandem axle trucks are recommended. Tandem axle, lift-tag trucks have some difficulty operating on slippery surfaces which can be encountered in winter grain hauling and in fields. Changing these trucks to twin-screw trucks would be a noticeable improvement. Moreover, the gas engines in standard tandem axle trucks represent a fire concern during the harvest season. The recommendation is to replace these trucks with diesel engine, twin-screw, 1980 Chevrolet Bruin trucks that cost about \$12,000 each. Additional improvements to the service truck are suggested bringing the total cost of the truck to \$10,000. The recommended purchases are summarized in Table 3. The total cost of this equipment set is \$326,000, just under the \$330,000 limit.

Table 3: Recommended Equipment Purchases for a 4,000 Acre Grain Farm \$330,000 Budget

ITEM	COST
1988 John Deere 9400 Tractor	\$90,000
1999, John Deere 1850, 45' Seeder	\$50,000
1978 White 2-135 tractor w/ loader, 3pt and PTO	\$8,000
2,000 Gallon Water Nurse Tank on Trailer	\$2,000
Pickup Sprayer 50', 500 Gallon	\$3,500
Summers 120' 1,000 Gallon Pull Type Sprayer	\$4,500
International 490 Disk 28'	\$3,000
Versatile 400, Self Propelled Windrower	\$2,500
2, 1996 Gleaner R-72 Combine w header	\$68,000
2, 1977 Timpte 40', Hopper Bottom Grain Trailers	\$17,000
2, 1989 Peterbilt 377 Semi Trucks	\$13,000
2, 1980 Chevrolet Bruin Twin Screw Trucks	\$24,000
Killbros 1200, 700 bushel grain cart	\$10,000
13" 66' Grain Auger	\$8,000
Grain Auger and Sweep	\$3,000
Service Pickup	\$10,000
Shop Equipment	\$3,500
Fuel Storage Tanks	\$2,000
MSC	\$4,000
<b>TOTAL</b>	<b>\$326,000</b>

*This table shows recommended machinery purchases for a Northern Plains grain farm of 4,000 acres. The recommendation is limited to a budget of approximately \$330,000.*

**Question 9:** Based on the original farming plan, consider a situation where the major pieces of equipment must be less than six years old. Develop a machinery plan that includes these modern equipment purchases. Please provide pictures of the recommended equipment.

**Solution 9:** In order to bring the major pieces of equipment to less than six years old, the budget will increase substantially. The first change should be to purchase a 2008 John Deere 9530 tractor costing \$200,000. The seeder will be upgraded to a 48' Bourgault model 3310 costing \$190,000. This large

capacity seeder will increase seeding capacity markedly. The two sprayers noted earlier should be replaced with a self propelled John Deere 4920 sprayer. These large capacity modern day sprayers are able to spray faster and more precisely than their earlier counterparts. An improvement in the water nurse tank is also recommended bringing the cost of this piece to \$6,800. Two 2006 Case IH 2388 combines with 30 foot headers are recommended at a cost of \$155,000 each. An improvement in the unloading auger is recommended to a 13 inch diameter 71 foot length auger costing \$12,000. Finally, additional improvements are recommended for the service truck bringing the cost to \$15,000. The purchases are summarized in Table 4. The total cost of this equipment combination is \$968,800.

Table 4: Recommended Equipment Purchases for a 4,000 Acre Grain Farm with Recent Model Major Equipment Pieces

ITEM	COST
2008 John Deere 9530 Tractor	\$200,000
2008 Bourgault 3310, 48' Seeder	\$190,000
1978 White 2-135 tractor w/ loader, 3pt and PTO	\$8,000
2008, 1,700 Gallon Water Nurse Tank on Trailer	\$6,800
2005 John Deere 4920 Self Propelled Sprayer	\$145,000
International 490 Disk 28'	\$3,000
Versatile 400, Self Propelled Windrower	\$2,500
2, 2006 Case IH 2388 w header	310,000
2, 1977 Timpco 40', Hopper Bottom Grain Trailers	\$17,000
2, 1989 Peterbilt 377 Semi Trucks	\$13,000
2, 1980 Chevrolet Bruin Twin Screw Trucks	\$24,000
Killbros 1200, 700 bushel grain cart	\$10,000
13" 71' Grain Auger	\$12,000
Grain Auger and Sweep	\$3,000
2005 Chevy Service Pickup	\$15,000
Shop Equipment	\$3,500
Fuel Storage Tanks	\$2,000
MSC	\$4,000
<b>TOTAL</b>	<b>\$968,800</b>

*This table shows recommended machinery purchases for a Northern Plains grain farm of 4,000 acres. The budget is not limited, however; late model major equipment pieces are incorporated into the analysis. Specifically major pieces of equipment are all less than six years old.*

**Question 10:** Finally, based on the original farming situation, develop a machinery plan that involves the purchase of all new equipment. Please provide pictures of the recommended equipment.

**Solution 10:** The purchase of all new equipment increases the total machinery cost considerably. New equipment is selected for each piece and is similar, or slightly larger in size to that recommended in Question 9. The one deviation is the Versatile 400 windrower for cutting road ditch grass is replaced with a new mower.

The recommended purchases are presented in Table 5. The total machinery cost in this case is \$2,135,800. It is interesting to note the difference in cost between the machinery purchased in this example versus the previous example. For example, the cost of the sprayer doubles in price. The cost of the same model tractor is \$90,000 more for a new model versus a one year old slightly used version. Moreover, in this example some purchases involve spending large amounts of money on equipment that, while necessary, does not receive a great deal of use. For example, each semi trucks would drive less than 10,000 miles per year. Yet the combined investment in semi trucks and trailers is \$340,000. The same applies for the Kenworth grain trucks and Krause disk.

Table 5: Recommended Equipment Purchases for a 4,000 Acre Grain Farm with All New Equipment Purchases

<b>ITEM</b>	<b>COST</b>
2009 John Deere 9530 Tractor	\$290,000
2009 John Deere 1870, 56' Seeder	\$220,000
2010 John Deere 7330 Loader Tractor w/loader 3pt and PTO	\$100,000
2008, 1,700 Gallon Water Nurse Tank on Trailer	\$6,800
2009 John Deere 4930 Self Propelled Sprayer	\$290,000
2009 Krause 7400 Disk 28'	\$35,000
2009 John Deere 285 Disk Mower	\$12,000
2, 2009 John Deere 9770 Combines w header	\$580,000
2, 2011 Timpfe 48', Hopper Bottom Grain Trailers	\$100,000
2, 2010 Freightliner 450 Horsepower Semi Trucks	\$240,000
2, 2009 Kenworth T-300 Grain Trucks	\$160,000
2009 Killbros 1950, 1,100 bushel grain cart	\$32,000
2009, 13" 71' Westfield Grain Auger	\$23,000
2009 Brandt 8" 42' Grain Auger and Sweep	\$6,500
2010 Ford Service Pickup	\$27,000
Shop Equipment	\$3,500
Fuel Storage Tanks	\$4,000
MSC	\$6,000
<b>TOTAL</b>	<b>\$2,135,800</b>

*This table shows recommended machinery purchases for a Northern Plains grain farm of 4,000 acres. The recommendation is limited to recommending new equipment.*

**Question 11:** How much money do you recommend that John spend on Machinery, \$110,000, \$220,000, \$330,000 or some other amount. Why?

**Solution 11:** It is not entirely clear how much money should be spent. It depends on cash availability, personal preferences, risk tolerance, willingness to repair machinery, debt load of the farm as well as tax and profitability issues. The optimal equipment plan depends in large part upon the amount of money available for the entire farm operation. If the purchase of additional equipment jeopardizes funding availability for other needs, it may be better to utilize older equipment until newer equipment is affordable. On the other hand, if sufficient funding is available for other needs, additional purchases of farm equipment might be advisable.

John should carefully consider farm profitability in making the purchases. The cost of carrying large amounts of equipment must be absorbed into farm operating costs. If excessive money is spent on equipment, the operation may not be profitable.

The \$110,000 budget is certainly a lower limit for this farm. There would be significant reliability issues, and some capacity issues associated with this machinery level. Significant improvements in reliability and capacity are achieved by increasing spending to \$220,000 or \$330,000. While spending \$968,800 or even \$2.1 million may be appealing on some levels, the necessity of these machinery levels is highly questionable for a start-up farmer. The advice is to wait with making these sort of purchases until the farming results demonstrate their affordability. Moreover, carrying cost of these machinery levels would severely limit profitability and could endanger the farm's viability. These higher levels of machinery purchases may be sensible if John was able to do custom work for other farmers to offset the costs. However, the availability of custom work is never certain, so there is considerable risk in this strategy.

Overall, if at all possible, John is advised to move from the \$110,000 level of purchases to \$220,000. The gain in reliability, capacity, and reduced maintenance costs make the additional purchases worthwhile. While less critical, a move to the \$330,000 level would also be advantageous. Equipment levels above the \$330,000 level are not recommended for John.

**Question 12:** Do you have any final comments or suggestions for John.

**Solution 12:** Yes. Prices reported here are based on equipment dealer, and private sale prices. It is not uncommon for equipment auction prices to be considerably lower than dealer prices. John might consider attending auction sales in an attempt to purchase the required machines at a lower price, or improve the quality of machines purchased while staying within the established budget.

### ACKNOWLEDGMENTS

Terrance Jalbert acknowledges his father, Dennis Jalbert, with whom he spent many hours discussing the pricing and merits of various farm machinery. The authors thank Brandon Jalbert for providing information on current farming issues. Any remaining errors are the responsibility of the authors.

### BIOGRAPHY

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# THE STUDENT-MANAGED FUND: A CASE STUDY OF PORTFOLIO PROPERTIES

Zhuoming (Joe) Peng, University of Arkansas – Fort Smith  
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## CASE DESCRIPTION

*This case provides students with an in-depth look at various risk measurements in portfolio management. The primary issues examined in this case are: 1) Review pertinent concepts of describing and summarizing a bath of numerical data in the context of identifying portfolio properties. Although these concepts have been covered in basic statistics courses, it is important enough to go over again so that students may be better prepared for discussions regarding various risk measurements in portfolio management; 2) A distinction between use of geometric and arithmetic return data; 3) How risk is measured in investments, and what some of the measures of risk are used. In particular, it is recommended that a spreadsheet model be used to compute these various risk measurements. Differentiate between different types of risk; namely, total risk, systematic risk, and nonsystematic risk; 4. Demonstrate that the true betas tend to move toward 1.0 over time. With more advanced students, it is recommended that they use the Excel spreadsheet, (or some other statistical software, i.e., SAS or Minitab), to run the single-index regression model and verify these beta estimates. This case has a difficulty level appropriate for senior or first year MBA students. It is designed to be taught in a single class period (60 to 80 minutes). With more advanced students, the case can be assigned as a team project. The team presents their findings and conclusions to the class. If the case is used as a team presentation project, approximately 2 to 3 hours of student preparation time should be adequate for most students depending on their computational ability.*

**JEL:** G11; A29

**KEYWORDS:** Student-managed Fund, Portfolio Properties

## CASE INFORMATION

Jackson Pettyjohn has been the faculty advisor of the Student-Managed Fund (*SMF*) at Lowell State University since its inception. Jackson was a member of Jim Sharpe's doctoral dissertation committee as well as his faculty advisor while Jim was in the doctoral program at Lowell State. Jim enrolled in the *SMF* class while attending Lowell State. After Jim received his Ph.D. in finance from Lowell State and subsequently became a faculty member at Wettown University, the two became friends and maintained contact.

The *SMF* class at Lowell State has an advisory committee, consisting of senior finance faculty members and finance professionals who assist in providing guidance. An implicit decision was made to invest primarily in equities because there is more to learn about the selection of common stocks, whether mid-cap, large-cap, growth or value securities, than from recognizing an AAA corporate bond or a Treasury security.

Since his enrollment in the *SMF* class at Lowell State, Jim has been of the opinion that a student-managed fund class is an outstanding way to provide practical "hands-on" education for students who are interested in investments. Wettown University does not have such a class at this point in time. Thus, the next best thing would be to work up a case that would be beneficial to students in the investment class.

In addition, Jim is of the opinion that the case should make use of spreadsheet software in making calculations and estimations of return and risk factors. Investment analysis is by its very nature quantitative, and spreadsheets are recommended for analyzing most of these assignments. Students can learn a great deal by going through the process of constructing a spreadsheet, seeing how it is structured, looking at the formulas and functions, and thinking about the implications of the spreadsheet model's output. As an example, data included in all the exhibits of this case are obtained by using a spreadsheet model.

Exhibit 1: Descriptive Measures of the Return Series from September 1997 to April 2006

<i>Descriptive Measure</i>	<i>The SMF</i>	<i>The S&amp;P 500</i>
Arithmetic Mean	0.30%	0.59%
Mode	No Mode	No Mode
Count	104	104
Minimum	-12.24%	-14.46%
First Quartile	-2.31%	-1.89%
Median	0.70%	0.93%
Third Quartile	3.19%	3.80%
Maximum	10.22%	9.78%
Range	22.46%	24.24%
Variance	0.002250	0.002031
Standard Deviation	4.74%	4.51%
Geometric Mean	0.19%	0.49%

*This exhibit shows the descriptive measures of the monthly return series of Lowell State University's SMF and that of S&P 500 from September 1997 to April 2006. Note: For all the estimates expressed in percentages, two digits after the decimal point are taken. For example, the standard deviation of the SMF fund is displayed as 4.74%, but the more accurate estimate obtained from the Excel spreadsheet is 4.74301379856173%. For the ease of exposition, it is rounded off to 4.74%.*

For the outputs shown in Exhibit 2, the following regression equation was estimated.

$$r_{SMF,t} = \alpha_{SMF} + \beta_{SMF} \times r_{M,t} + \varepsilon_{SMF,t} \quad (1)$$

Equation (1) is called the single-index (market) model, where:

$r_{SMF,t}$  = return for the *SMF* over month  $t$ .

$\alpha_{SMF}$  = regression coefficient representing the intercept term for the *SMF*. It is the *SMF*'s return component that is independent of the market's return.

$\beta_{SMF}$  = regression coefficient representing the slope of the regression line. It measures the expected change in the *SMF*'s return given a change in the market's return.

$r_{M,t}$  = return on a selected market index (i.e., *S&P 500*) for month  $t$ .

$\varepsilon_{SMF,t}$  = error term of the regression for month  $t$ . It measures the deviation of the observed return from the return predicted by the regression and has an expected value of zero.

Ordinary Least Squares estimates were obtained. The results are presented in Exhibit 2.

Jim plans to include this case as a project in his investment class. In particular, Jim plans to cover the use of spreadsheets in working with various returns and risk measurements that are useful in portfolio management. Assume that you were a student in Jim's investment class at Wettown University, and he has given you the following assignments.



Exhibit 2: Selected Outputs from the Regression of the Single-index (Market) Model

<i>Regression Statistics</i>	
R-Square	89.90%
Adjusted R-Square	89.80%
The Standard Error of the	1.52%
The Coefficient of Correlation	0.9481
Observations	104

	<i>Coefficients</i>	<i>Standard</i>	<i>t Statistic</i>	<i>P-value</i>
Intercept	-0.0029	0.0015	-1.9180	0.0579
The Beta Estimate	0.9979	0.0331	30.1245	0.0000

This exhibit shows the regression results from the Ordinary Least Squares estimation using Equation (1). The monthly return series are those of Lowell State University's SMF and that of S&P 500 from September 1997 to April 2006, respectively.

### QUESTIONS

- Recall from your introductory business statistics course that three major properties that describe a batch of numerical data are (1) Central Tendency, (2) Dispersion, and (3) Shape. To describe the shape of a batch of data we need only compare the mean and the median. If these two measures are equal, we may generally consider the data to be symmetrical, i.e., *zero-skewed*. On the other hand, if the mean exceeds the median, the data may generally be described as *positive* or *right-skewed*. If the mean is exceeded by the median, those data can generally be called *negative* or *left-skewed*. With information presented in Exhibit 1, does either the *SMF* data or that of *S&P 500* appear to be zero-skewed? Justify your answers.
- Recall from your introductory business statistics course that when the distribution of a data set is skewed, the mean and standard deviation is not an adequate summary of the data. In this case, the five-number summary is a more complete summary of the data. Divide the original data into two sub-sets, one from September 1997 to December 2001 and another one from January 2002 to April 2006, respectively. Prepare a five-number summary for each of the two data sub-sets, and briefly describe your findings. Does either the *SMF* data or that of *S&P 500* appear to be zero-skewed in either sub-period?
- (a) Discuss the differences between the arithmetic mean and the geometric mean for each series. Relate your discussion to the difference in the standard deviations. (b) Compare the coefficient of variation of each series. By this relative measure of risk, does the data leave an impression concerning the relative risk of the *SMF* fund in comparison with the risk of *S&P 500*?
- The data needed for answering this question is provided in the student-version of the *Excel* file accompanied with this case. Use *Excel* with the data provided to compute the covariance estimate between the two return series from September 1997 to April 2006. (Hint: The covariance estimate should be 0.002026.) Discuss the relationship between the covariance and the correlation coefficient. Compute the corresponding estimate of the correlation coefficient. Is your answer the same as the one shown in Exhibit 2?
- Use the pertinent information in Exhibits 1 and 2. (a) What is the total risk estimate of the *SMF* fund? (b) What is its market (or systematic) risk? Use this measure of risk to discuss the riskiness of the *SMF* fund relative to that of the *S&P 500*. Is your answer different from that of Part (b) in Question 3? (c) What is its unique (or unsystematic) risk?
- (Optional) The beta value of the *SMF* is obtained from running the single-index market model, and it is available in Exhibit 2 along with other selected outputs of the regression. Run the single-index

market model in *Excel*, and the data needed for this regression is provided in the student-version of the *Excel* file accompanied with this case. Verify that the beta value shown in Exhibit 2 is the same as the slope estimate obtained from your regression model.

7. Refer to Exhibits 1 and 2. (a) Construct an equally weighted portfolio (that is, each of the two portfolios, the *SMF* fund and the *S&P 500*, is weighted by 50 percent), and compute the resultant portfolio's average return and its standard deviation. (b) Compute the *weighted-average* standard deviation, that is,  $0.50 \times$  the standard deviation of the *SMF* fund +  $0.50 \times$  the standard deviation of the *S&P 500*. (c) What is the difference between the portfolio's standard deviation from Part (a) and the *weighted-average* standard deviation from Part (b)? What explains this difference?
8. The following tables contain beta estimates of the *SMF* fund in the two sub-periods, respectively.

Exhibit 3: Output from the Single-index Regression Model: September 1997 to December 2001 Data

<b>Regression Statistics</b>				
R-Square		88.00%		
Adjusted R-Square		87.76%		
The Standard Error of the Estimate		1.94%		
The Coefficient of Correlation		0.9381		
Observations		52		
	<b>Coefficients</b>	<b>Standard Error</b>	<b>t Statistic</b>	<b>P-value</b>
Intercept	-0.0028	0.0027	-1.0272	0.3093
The Beta Estimate	1.0076	0.0526	19.1452	0.0000

This exhibit shows the regression results from the Ordinary Least Squares estimation using Equation (1). The monthly return series are those of Lowell State University's *SMF* and that of *S&P 500* from September 1997 to December 2001, respectively.

Exhibit 4: Output from the Single-index Regression Model: January 2002 to April 2006 Data

<b>Regression Statistics</b>				
R Square		93.95%		
Adjusted R Square		93.83%		
The Standard Error of the		0.95%		
The Coefficient of Correlation		0.9693		
Observations		52		
	<b>Coefficients</b>	<b>Standard Error</b>	<b>t Statistic</b>	<b>P-value</b>
Intercept	-0.0029	0.0013	-2.2165	0.0312
The Beta Estimate	0.9796	0.0352	27.8640	0.0000

This exhibit shows the regression results from the Ordinary Least Squares estimation using Equation (1). The monthly return series are those of Lowell State University's *SMF* and that of *S&P 500* from January 2002 to April 2006, respectively.

Compare these two beta estimates. What could explain the difference?

## APPENDIX 1

Note: The pertinent Excel files along with the data used in this case are available from the Institute for Business and Finance Research or the authors of the case.

Appendix 2: Data Used in the Analysis

Month	The SMF	The S&P	Month	The SMF	The S&P	Month	The SMF	The S&P
Sep-97	0.020500	0.054770	Sep-00	-0.076770	-0.052790	Sep-03	-0.001824	-0.010620
Oct-97	-0.009230	-0.033400	Oct-00	-0.001633	-0.004230	Oct-03	0.050170	0.056570
Nov-97	0.020840	0.046290	Nov-00	-0.088034	-0.078840	Nov-03	0.017139	0.008800
Dec-97	0.009890	0.017170	Dec-00	0.005365	0.004890	Dec-03	0.028311	0.052440
Jan-98	0.031650	0.011060	Jan-01	0.040820	0.035480	Jan-04	0.025052	0.018360
Feb-98	0.025220	0.072120	Feb-01	-0.121966	-0.091180	Feb-04	0.015466	0.013900
Mar-98	0.045260	0.051210	Mar-01	-0.088636	-0.063350	Mar-04	-0.024924	-0.015090
Apr-98	0.029030	0.010060	Apr-01	0.095197	0.077710	Apr-04	-0.012571	-0.015700
May-98	-0.032140	-0.017190	May-01	0.006465	0.006700	May-04	0.003768	0.013720
Jun-98	0.022222	0.040620	Jun-01	-0.030008	-0.024340	Jun-04	-0.002713	0.019440
Jul-98	-0.026033	-0.010650	Jul-01	-0.010210	-0.009840	Jul-04	-0.042004	-0.033100
Aug-98	-0.122445	-0.144580	Aug-01	-0.077836	-0.062600	Aug-04	0.003686	0.004040
Sep-98	0.041340	0.064060	Sep-01	-0.073001	-0.080750	Sep-04	0.002257	0.010830
Oct-98	0.082391	0.081340	Oct-01	0.022674	0.019070	Oct-04	0.009196	0.015280
Nov-98	0.043546	0.060610	Nov-01	0.087691	0.076710	Nov-04	0.047501	0.040460
Dec-98	0.055454	0.057620	Dec-01	0.014334	0.008760	Dec-04	0.037804	0.034030
Jan-99	0.005117	0.041820	Jan-02	-0.033532	-0.014590	Jan-05	-0.009034	-0.024370
Feb-99	-0.024592	-0.031080	Feb-02	-0.033717	-0.019280	Feb-05	0.013640	0.021040
Mar-99	0.038025	0.040010	Mar-02	0.032799	0.037610	Mar-05	-0.014130	-0.017710
Apr-99	0.034210	0.038730	Apr-02	-0.062621	-0.060630	Apr-05	-0.012823	-0.018970
May-99	-0.024231	-0.023610	May-02	-0.015330	-0.007370	May-05	0.028183	0.031820
Jun-99	0.049547	0.055500	Jun-02	-0.088511	-0.071240	Jun-05	0.000671	0.001420
Jul-99	-0.046383	-0.031220	Jul-02	-0.069693	-0.077950	Jul-05	0.025148	0.037190
Aug-99	-0.020796	-0.004950	Aug-02	0.020488	0.006570	Aug-05	-0.020460	-0.009120
Sep-99	-0.062593	-0.027410	Sep-02	-0.110535	-0.108680	Sep-05	-0.001709	0.008100
Oct-99	0.088335	0.063280	Oct-02	0.102168	0.088020	Oct-05	-0.019144	-0.016670
Nov-99	0.045984	0.020330	Nov-02	0.040080	0.058860	Nov-05	0.037343	0.037820
Dec-99	0.091666	0.058900	Dec-02	-0.053664	-0.058750	Dec-05	-0.000491	0.000340
Jan-00	-0.056397	-0.050240	Jan-03	-0.029881	-0.026200	Jan-06	0.007516	0.026480
Feb-00	0.027519	-0.018930	Feb-03	-0.020994	-0.015000	Feb-06	-0.000203	0.002710
Mar-00	0.100554	0.097830	Mar-03	0.023200	0.009710	Mar-06	0.011515	0.012450
Apr-00	-0.022784	-0.030090	Apr-03	0.080493	0.082370	Apr-06	0.010409	0.013430
May-00	-0.031698	-0.020520	May-03	0.045638	0.052690			
Jun-00	0.050456	0.024650	Jun-03	0.017090	0.012760			
Jul-00	-0.021080	-0.015630	Jul-03	0.013981	0.017630			
Aug-00	0.066648	0.062110	Aug-03	0.017495	0.019500			

# THE STUDENT MANAGED FUND: A CASE STUDY OF PORTFOLIO PROPERTIES

## TEACHING NOTES

Zhuoming (Joe) Peng, University of Arkansas - Fort Smith  
William P. Dukes, Texas Tech University

### CASE DESCRIPTION

*This case provides students with an in-depth look at various risk measurements in portfolio management. The primary issues examined in this case are: 1) Review pertinent concepts of describing and summarizing a bath of numerical data in the context of identifying portfolio properties. Although these concepts have been covered in basic statistics courses, it is important enough to go over again so that students may be better prepared for discussions regarding various risk measurements in portfolio management; 2) A distinction between use of geometric and arithmetic return data; 3) How risk is measured in investments, and what some of the measures of risk are used. In particular, it is recommended that a spreadsheet model be used to compute these various risk measurements. Differentiate between different types of risk; namely, total risk, systematic risk, and nonsystematic risk; 4. Demonstrate that the true betas tend to move toward 1.0 over time. With more advanced students, it is recommended that they use the Excel spreadsheet, (or some other statistical software, i.e., SAS or Minitab), to run the single-index regression model and verify these beta estimates. This case has a difficulty level appropriate for senior or first year MBA students. It is designed to be taught in a single class period (60 to 80 minutes). With more advanced students, the case can be assigned as a team project. The team presents their findings and conclusions to the class. If the case is used as a team presentation project, approximately 2 to 3 hours of student preparation time should be adequate for most students depending on their computational ability.*

### QUESTIONS

**Question 1:** Recall from your introductory business statistics course that three major properties that describe a batch of numerical data are (1) Central Tendency, (2) Dispersion, and (3) Shape. To describe the shape of a batch of data we need only compare the mean and the median. If these two measures are equal, we may generally consider the data to be symmetrical, i.e., *zero-skewed*. On the other hand, if the mean exceeds the median, the data may generally be described as *positive* or *right-skewed*. If the mean is exceeded by the median, those data can generally be called *negative* or *left-skewed*. With information presented in Exhibit 1, does either the *SMF* data or that of *S&P 500* appear to be zero-skewed? Justify your answers.

**Solution 1:** It is indicated by the pertinent information given in Exhibit 1 that the distribution of both return series is left-skewed. The reason is that the mean is smaller than the median for both series.

	The SMF From September 1997 to April 2006	The S&P 500 From September 1997 to April 2006
Mean	0.30%	0.59%
Median	0.70%	0.93%

**Question 2:** Recall from your introductory business statistics course that when the distribution of a data set is skewed, the mean and standard deviation is not an adequate summary of the data. In this case, the five-number summary is a more complete summary of the data. Divide the original data into two subsets, one from September 1997 to December 2001 and another one from January 2002 to April 2006,

respectively. Prepare a five-number summary for each of the two data sub-sets, and briefly describe your findings. Does either the *SMF* data or that of *S&P 500* appear to be zero-skewed in either sub-period?

**Solution 2:** The five-number summary along with the mean and the standard deviation estimates for each data sub-set is given below.

	The <i>SMF</i>	The <i>S&amp;P 500</i>
	From September 1997 to December 2001	From September 1997 to December 2001
Mean	0.004413	0.007154
Minimum	-0.122445	-0.144580
First Quartile	-0.027027	-0.025108
Median	0.012112	0.009410
Third Quartile	0.041892	0.052100
Maximum	0.100554	0.097830
<b>Standard Deviation</b>	0.055539	0.051708

Since the mean is smaller than the median, both series are left-skewed in the first sub-period.

	The <i>SMF</i>	The <i>S&amp;P 500</i>
	From January 2002 to April 2006	From January 2002 to April 2006
Mean	0.001687	0.004718
Minimum	-0.110535	-0.108680
First Quartile	-0.016284	-0.015243
Median	0.003727	0.009255
Third Quartile	0.023663	0.022400
Maximum	0.102168	0.088020
<b>Standard Deviation</b>	0.038144	0.037740

Since the mean is smaller than the median, both series are left-skewed in the second sub-period, too.

**Question 3:** (a) Discuss the differences between the arithmetic mean and the geometric mean for each series. Relate your discussion to the difference in the standard deviations. (b) Compare the coefficient of variation of each series. By this relative measure of risk, does the data leave an impression concerning the relative risk of the *SMF* fund in comparison with the risk of *S&P 500*?

	The <i>SMF</i>	The <i>S&amp;P 500</i>
Arithmetic Mean	0.30%	0.59%
Geometric Mean	0.19%	0.49%
Standard Deviation	4.74%	4.51%
<b>Coefficient of</b>	15.55	7.59

**Solution 3:** The values of the arithmetic means, the geometric means, and the standard deviations are obtained using the pertinent formulas and functions in the *Excel* spreadsheet model. However, the built-in function of a geometric mean in *Excel*, “=GEOMEAN(number1, number2, ...)”, cannot be performed directly on the holding period yield (*HPY*) series. It is routine to construct the corresponding holding period return (*HPR*) series (or sometimes called the *return relatives*) in *Excel* and compute the geometric mean from its definition or apply the geometric mean function to the *HPR* series. The geometric mean is equal to,

$$\text{The Geometric Mean} = (\text{return relative } 1 \times \text{return relative } 2 \times \dots \times \text{return relative } n)^{1/n} - 1.$$

The formula for computing the coefficient of variations is:

$$\text{The Coefficient of Variation} = \frac{\text{The Standard Deviation}}{\text{The Arithmetic Mean}}$$

- (a) If the rates of return vary over time, the geometric mean of the return series will always be lower than its arithmetic mean. The larger the standard deviation, the larger the difference. Only if the rates of return are the same in each period, will the geometric mean equal the arithmetic mean. Otherwise, the geometric mean should be smaller than the arithmetic mean.
- (b) The coefficient of the variation (*CV*) equals the ratio of the standard deviation over the arithmetic mean, and it measures the risk per unit of return. The *CV* of the *SMF* fund is much larger because its average return is lower while it has more volatility in its return series. Using this relative measure of risk, the returns of the *SMF* fund appear to be much more volatile than the returns of the S&P 500, the proxy for the market portfolio in the case.

**Question 4:** The data needed for answering this question is provided in the student-version of the *Excel* file accompanied with this case. Use *Excel* with the data provided to compute the covariance estimate between the two return series from September 1997 to April 2006. (Hint: The covariance estimate should be 0.002026.) Discuss the relationship between the covariance and the correlation coefficient. Compute the corresponding estimate of the correlation coefficient. Is your answer the same as the one shown in Exhibit 2?

**Solution 4:**

	The SMF	The S&P 500
The Standard Deviation	4.74%	4.51%
The Covariance Estimate	0.002026	
<b>The Correlation</b>	0.9481	

The standard deviation estimates are available from Exhibit 1 and the correlation estimate is obtained from Exhibit 2. The covariance estimate is obtained from the instructor-version of the *Excel* file. In class, using the monthly *HPYs* of the *SMF* and the S&P 500, students are shown step-by-step procedures in *Excel* of how to compute the covariance estimate from its definition. The definition of a covariance between two random variables *X* and *Y* is,

$$\text{The Covariance} = \sum \{ [X_i - E(X)] \times [Y_i - E(Y)] \}, \text{ where } i = 1, 2, \dots, n.$$

Alternatively, the covariance between two random variables can be computed as the correlation between the two random variables times the product of their standard deviations. The correlation coefficient rescales (or standardizes) the covariance to facilitate comparison with corresponding values for other pairs of random variables; correlation coefficients always lie between -1 and +1. The correlation estimate in Exhibit 2 is obtained from an *Excel* output. If students compute the correlation estimate from the covariance and the standard deviations listed in the case, the answer is 0.9477. Ignore the rounding error, and these two estimates are the same. In class, it is demonstrated that in the single-index regression model, the positive square root of the *R*<sup>2</sup>, the coefficient of determination of the regression, is the absolute value of the correlation estimate, and it takes the sign of the beta (slope) estimate. The *SMF* fund's returns are highly correlated with the returns of the market and it explains why its beta estimate is very close to one.

With more advanced students, they are asked to verify the covariance estimate using *Excel* with the data provided in the student-version of the file.

**Question 5:** Use the pertinent information in Exhibits 1 and 2. (a) What is the total risk estimate of the *SMF* fund? (b) What is its market (or systematic) risk? Use this measure of risk to discuss the riskiness of the *SMF* fund relative to that of the *S&P 500*. Is your answer different from that of Part (b) in Question 3? (c) What is its unique (or unsystematic) risk?

**Solution 5:**

	<i>The SMF</i>	<i>The S&amp;P 500</i>
The Variance Estimate	0.002250	0.002031
The Covariance Estimate	0.002026	
The Beta Estimate	0.9979	
The Total Risk Estimate	0.002250	
The Systematic Risk Estimate	0.002022	
<b>The Unsystematic Risk Estimate</b>	<b>0.000228</b>	

The variance estimates are available from Exhibit 1. The covariance estimate is obtained from the instructor-version of the *Excel* file.

$$\text{The beta estimate} = \frac{\text{The Covariance}_{(the\ SMF,\ The\ S\&P\ 500)}}{\text{The Variance of the Market}} \cong 0.9979.$$

Using the *Excel* spreadsheet, students are shown that the beta estimate obtained from the single-index regression is exactly the same as the one computed from the formula,

$$\frac{\text{The Covariance}_{(the\ SMF,\ The\ S\&P\ 500)}}{\text{The Variance of the Market}}$$

The variance estimate and the covariance estimate displayed in the case are rounded values; therefore, students are reminded that if one computes the beta value using these rounded values, i.e.,  $0.002026/0.002031 = 0.9975$  then his/her answer will not be the same as the one computed from the *Excel* spreadsheet which contains more accurate inputs.

- a) In class, the *Excel* spreadsheet is used to demonstrate computation of different types of risks.

The Total Risk =  $\sigma_{SMF}^2 = 0.002250$  (obtained from Exhibit 1). Alternatively, Total Risk = Total Systematic Risk + Total Unsystematic Risk.

$$\begin{aligned} \sigma_{SMF}^2 &= \beta_{SMF}^2 \times \sigma_{market}^2 + \sigma_{\epsilon}^2 \\ &= 0.002022 + 0.000228, \\ &= 0.002250 \end{aligned}$$

The *SMF's* total systematic risk is estimated to be 0.002022, as shown above, and its unsystematic risk,  $\sigma_{\epsilon}^2 = \sigma_{SMF}^2 - \beta_{SMF}^2 \times \sigma_{market}^2$ , is estimated at 0.000228.

- b) As shown in 5a) above, the total systematic risk of the SMF’s return is estimated to be 0.002022. Thus, it is quite close to the total risk estimate of the *S&P 500* in the amount of 0.002031. The difference is inconsequential. However, in 3b) the comparison relates to the coefficient of variation and now the comparison is with total systematic risk only.
- c) The total unsystematic risk, the variance of the error term, is estimated to be 0.000228. Use of the spreadsheet would provide more accurate data.

**Question 6:** (Optional) The beta value of the *SMF* is obtained from running the single-index market model, and it is available in Exhibit 2 along with other selected outputs of the regression. Run the single-index market model in *Excel*, and the data needed for this regression is provided in the student-version of the *Excel* file accompanied with this case. Verify that the beta value shown in Exhibit 2 is the same as the slope estimate obtained from your regression model.

**Solution 6:** With more advanced students, the class is shown how to run a simple regression in *Excel*. Then, the students are asked to run a regression using the data provide in the student-version of the *Excel* file accompanied with the case. In turn, they are asked to verify that the beta estimate given in Exhibit 2 is the same as the one from their own regression results.

**Question 7:** Refer to Exhibits 1 and 2. (a) Construct an equally weighted portfolio (that is, each of the two portfolios, the *SMF* fund and the *S&P 500*, is weighted by 50 percent), and compute the resultant portfolio’s average return and its standard deviation. (b) Compute the *weighted-average* standard deviation, that is,  $0.50 \times$  the standard deviation of the *SMF* fund +  $0.50 \times$  the standard deviation of the *S&P 500*. (c) What is the difference between the portfolio’s standard deviation from Part (a) and the *weighted-average* standard deviation from Part (b)? What explains this difference?

**Solution 7:**

	The SMF	The S&P 500
Average Return	0.30%	0.59%
Standard Deviation	4.74%	4.51%
The Covariance Estimate	0.002026	
The Correlation Estimate	0.9481	
The Weights	0.50	0.50
The Portfolio’s Expected Return	0.45%	
The Portfolio’s Standard Deviation	4.56%	
<b>The Weighted-average Standard Deviation of</b>	<b>4.63%</b>	

- a) The portfolio’s expected return is obtained as follows,
- b)

$$E(R_p) = 0.50 \times 0.30\% + 0.50 \times 0.59\% = 0.45\%$$

- c) The portfolio’s standard deviation is obtained as follows,

$$\sigma_p = \sqrt{0.50^2 \times (4.74\%)^2 + 0.50^2 \times (4.51\%)^2 + 2 \times 0.50 \times 0.50 \times 0.002026} = 4.56\%.$$

The *weighted-average* standard deviation of this equally weighted portfolio is obtained as follows,

$$\sigma_{\text{weighted-average}} = 0.50 \times 4.74\% + 0.50 \times 4.51\% = 4.63\%.$$



By forming a portfolio, the portfolio's expected return is a linear combination of individual asset's average (expected) returns. Through this assignment, it demonstrates that the portfolio mean return is seen to be simply the weighted average of returns on individual securities, where the weights are the percentage invested in those securities. However, the portfolio variance is not the weighted average of the variances of individual securities. Rather, the portfolio variance is the sum of the variances of the individual securities multiplied by the square of their weights plus a third term, which includes the covariance. The covariance is an extremely important concept because it is the appropriate measure of the contribution of a single asset to portfolio risk. The real importance of the covariance is the correlation coefficient component. If the correlation is positive, the risk is increased by the covariance term, but, if the correlation is negative, it will reduce the risk, with no change in the return.

**Question 8:** The following tables contain beta estimates of the *SMF* fund in the two sub-periods, respectively.

Exhibit 3: Output from the Single-index Regression Model: September 1997 to December 2001 Data

<i>Regression Statistics</i>	
R-Square	88.00%
Adjusted R-Square	87.76%
The Standard Error of the Estimate	1.94%
The Coefficient of Correlation	0.9381
Observations	52

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Statistic</i>	<i>P-value</i>
Intercept	-0.0028	0.0027	-1.0272	0.3093
The Beta Estimate	1.0076	0.0526	19.1452	0.0000

*This exhibit shows the regression results from the Ordinary Least Squares estimation using Equation (1). The monthly return series are those of Lowell State University's SMF and that of S&P 500 from September 1997 to December 2001, respectively.*

Exhibit 4: Output from the Single-index Regression Model: January 2002 to April 2006 Data

<i>Regression Statistics</i>	
R Square	93.95%
Adjusted R Square	93.83%
The Standard Error of the	0.95%
The Coefficient of Correlation	0.9693
Observations	52

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Statistic</i>	<i>P-value</i>
Intercept	-0.0029	0.0013	-2.2165	0.0312
The Beta Estimate	0.9796	0.0352	27.8640	0.0000

*This exhibit shows the regression results from the Ordinary Least Squares estimation using Equation (1). The monthly return series are those of Lowell State University's SMF and that of S&P 500 from January 2002 to April 2006, respectively.*

Compare these two beta estimates. What could explain the difference?

**Solution 8:** A statement was made pertaining to the issue of regression tendency. Blume (1975) showed that beta estimates in the single-index regression model tend to move toward the mean over time. The tendency for betas to regress toward its mean value implies that a security (or portfolio) with either an extremely high ( $\beta_i > 1$ ) or low ( $\beta_i < 1$ ) beta value during one estimation period will tend to have a less extreme beta value in the next estimation period. We use the two beta estimates of the *SMF* fund shown in this assignment to demonstrate this issue.

With more advanced students, a request is made to verify the beta estimates by running two separate single-index market model regressions with the data provided in the student-version of the *Excel* file.

## **ACKNOWLEDGEMENT**

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# ONE HUNDRED YEARS IN PRISON FOR \$126 MILLION FRAUD

Kathleen Dunne, Rider University  
Maria H. Sanchez, Rider University

## CASE DESCRIPTION

*This case examines the multimillion dollar Ponzi scheme perpetuated by Edward Okun. Okun was convicted in 2009 of 23 counts including wire fraud, money laundering, bulk cash smuggling and other offenses. In this case, students will learn about fraud, money laundering, federal currency reporting requirements, aspects of tax law, and ethics. This case is suitable for either undergraduate or graduate students. It can be used in an Introduction to Business, an Ethics, or a Fraud course. Students typically require 2-3 hours outside of class to complete the case. Approximately one hour of class time is needed to go over the case. This case can help students develop both written and verbal skills.*

**JEL:** M40, M42

**KEYWORDS:** Ponzi scheme, fraud, money laundering

## CASE INFORMATION

### Introduction

In December of 2005, then 54 year old Edward Okun is dancing at his lavish \$200,000 wedding. He is surrounded by his new 27 year old wife, many current and prospective clients, and his two dogs who are dressed in wedding attire! In the course of just one year he has divorced his former wife, acquired a multimillion dollar yacht, an estate in Miami, and numerous other expensive cars and aircraft.

Now fast forward to August 2009. Edward Okun is standing before a judge being sentenced to 100 years in prison for a \$126 million dollar fraud including conspiracy to commit mail and wire fraud, wire fraud, conspiracy to commit money laundering, money laundering, bulk cash smuggling and perjury. He is surrounded by victims of his Ponzi scheme including eight victims testifying as to the pain and suffering he has caused.

### Tax Law

How did this happen? Okun was the owner of several companies including Investment Properties of America (IPofA), The 1031 Tax Group (1031TG) and Okun Holdings, Inc. The 1031TG was named after Section 1031 of the IRS tax code. Normally when an individual sells a piece of property, that person is taxed on any gain from the sale (called capital gains). However, Section 1031 of the IRS code allows investors who sell real estate to defer their capital gains if they reinvest in similar investment property within 180 days. This means that they will not have to pay taxes on the gains until a later date. These transactions are called like-kind exchanges or 1031 exchanges. The investor has 45 days to find a replacement property and 180 days to complete the purchase. To qualify for the capital gains deferral, the cash proceeds from the sale (called exchange funds) must be deposited with a qualified intermediary (QI) until the like-kind exchange is completed. The QI acts like a safe harbor and keeps the money until the new property is purchased. Exchange agreements are signed and the intermediary holds the exchange funds in trust for their clients. The funds are to be used for 1031 exchanges only.

The problem is that there is no regulatory oversight of these financial intermediaries. There are no registration or certification requirements for qualified intermediaries even though their purpose is to safeguard investor funds. The investor is not really protected. This allowed Okun to withdraw millions of dollars from his QI companies to buy other QI companies in a massive Ponzi scheme to keep the scam going so that he could bankroll his lavish lifestyle, pay for expenses of his other companies and invest in commercial real estate. According to court documents, from August of 2005 to April of 2007, Okun and his associates misappropriated approximately \$126 million of client's funds. Okun would purchase QI companies and illegally withdraw the client funds. When he needed more cash to finance his lifestyle or to fund an exchange transaction to keep 1031TG solvent, he would simply buy another QI company. 1031TG was the parent company to all of the other QIs that Okun purchased. Okun orchestrated a Ponzi scheme in which new clients' money was used to pay back earlier clients' money and also used for Okun's personal life, including jewelry, jets, cars and houses.

### Scenario

The information in this section and subsequent sections was obtained from the indictment filed in the United States District Court for the Eastern District of Virginia as well as media coverage of the trial unless otherwise noted. It began at the end of August 2005 when Okun purchased a QI called Atlantic Exchange Company, Inc. (AEC). The exchange funds of the company were to be held in interest-bearing escrow accounts to be used to complete the exchange transactions. According to the indictment, soon after the purchase of AEC, Okun wired millions of dollars of AEC's client funds to his personal bank account, IPofA accounts, and another account partly to repay the money that he had borrowed to buy AEC. This was in direct violation of AEC's exchange agreements. AEC was supposed to hold the client funds in a safe harbor so that when clients were ready to purchase their next property, the funds would be available. These funds, however, were used to support Okun's opulent lifestyle, fund his divorce settlement of approximately \$6 million, pay exorbitant salaries to top executives, cover expenses of his companies, and purchase commercial real estate. The same scenario was repeated from November of 2005 to the end of 2006 with Okun purchasing five additional QI's and misusing the exchange funds in similar ways.

The scheme began to unravel in 2007 when 1031TG was unable to fund client exchanges when due. Okun and his conspirators continued to misappropriate client funds, making payment to earlier clients with funds from later clients. Finally, some clients began to threaten to contact the authorities. Okun then obtained a personal loan, using collateral originally purchased with misappropriated 1031TG funds, from a third party lender. The loan was forwarded from Okun's personal account to 1031TG's account and then to the clients. This was done with the intent to conceal the source of the funds. The 27 count indictment against Okun was filed in 2008. The counts on the indictment consisted of wire and mail fraud conspiracy, money laundering conspiracy, wire fraud, mail fraud, money laundering, bulk cash smuggling and false declaration (perjury).

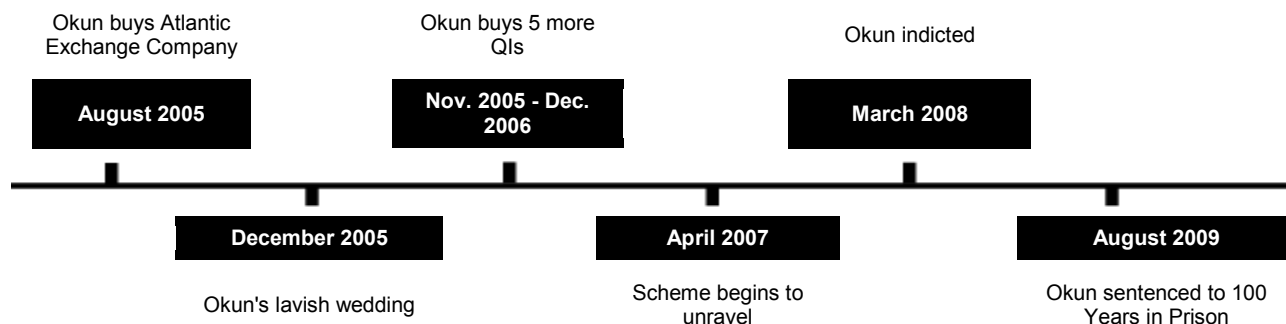
### Accomplices

Who were Okun's accomplices? A major player in the Ponzi scheme was Lara Coleman, Chief Operating Officer of IPofA. As COO, she was a participant in the misuse of client exchange funds. She was involved in the illegal transfer of client exchange funds into IPofA from the QI companies and the illegal transfers out. Robert Field II, a Certified Public Accountant and Chief Financial Officer for Okun Holdings, Inc entered the scene in August of 2006. Initially, all information regarding the misappropriations of 1031TG client funds were withheld from him. However, in October of 2006 an IPofA employee told Field about the misuse of client exchange funds. Field informed in-house counsel of 1031TG and hired outside counsel to review the transactions. Subsequently, both in-house and outside counsel resigned after multiple attempts at informing Okun, Coleman and Field that the use of the client

exchange funds was likely in violation of state and federal laws, that such conduct must cease, and that all misappropriated funds must be repaid immediately to the multiple QI entities owned by Okun. Next entered Richard Simring, an attorney, who advised Okun around November 2006 that he must rectify the situation at 1031TG so that funds would be available for exchange transactions as they came due. Simring warned Okun that he could go to jail if this was not done. Okun agreed to pay back most of the funds to 1031TG. However, in late November it became nearly impossible to fund the 1031 exchanges for clients because Okun had taken so much money from the QI companies. So, to get his hands on more cash, Okun purchased another QI, 1031 Advance, and fraudulently used those exchange funds. At the beginning of 2007, Simring was hired by Okun to be Chief Legal Officer for Okun Holdings, Inc.

Finally, by April 2007, they were running out of money again. The QIs were unable to come up with the cash when their clients purchased replacement properties. To cover this up, Coleman, Field, and Simring misappropriated client exchange funds for “lulling” payments to 1031TG clients. They took cash deposited by later clients to pay for the exchanges of earlier clients. The CEO of 1031TG then resigned and was replaced by Simring. Okun continued to misappropriate funds, assisted by Coleman and Simring, until they ran out of money and finally on May 13, 2007, 1031TG filed for Chapter 11 bankruptcy. Figure 1 below shows a timeline of the relevant events.

Figure 1: Timeline of Events



### The Trial

In his opening statement at the Okun trial, the prosecutor told the jury that Okun viewed the clients’ exchange accounts “as his own personal piggy bank” (Green, 2009a). An IRS agent testified that from 2005-2007, Okun spent over \$30 million on things including a divorce, jewelry, a \$171,000 wedding, and a yacht (Green, 2009b). At the three week trial Edward Okun did not testify and the defense did not offer evidence. Rather, Okun’s lawyers argued that Okun did not steal the money, he only “borrowed” it and intended to pay it back. The prosecutor countered with “These are not loans. They would be loans if the clients knew what was going on and agreed to it. They’re thefts.”(O’Dell, 2009)

Coleman, Field and Simring all cooperated with the prosecution and agreed to testify. Okun’s first wife testified that his fraudulent behavior may have started way back in the 1970’s when his sister and uncle sued him for improper business practices in Canada. Shortly after that he left Canada. A pivotal witness was Janet Dashiell, former owner of 1031 Advance Inc., one of Okun’s QI companies. She recounted how she deposited money in a separate secret bank account so that Okun did not have access to it. Dashiell did this after an email exchange with Okun where she stated that the company was short on cash and that perhaps Okun really didn’t need to purchase another airplane (Green, 2009b).

Okun was convicted of numerous counts of mail fraud, wire fraud and money laundering. The prosecution showed how funds were consistently transferred out of 1031TG and other QI companies into Okun's personal bank accounts.

Okun was also convicted of bulk cash smuggling. Okun instructed an IPofA employee to ship \$15,000 in cash to his yacht in the Bahamas. He specifically asked the employee to cash two checks. According to the indictment, Okun sent an email to the IPofA employee saying "[C]ould you please fed ex \$15,000 cash (large bills and pad the package with paper on both sides so it looks like a thick document, you may want to put it in several envelopes so they can't tell what it is) to me here in Nassau people don't like credit cards here. I would suggest cashing two checks one for 5,200 and one for 9,800 so you stay under the cash reporting with the IRS or better yet take someone else with you, you cash one and they cash the other..."

In the end, Okun was convicted of 23 counts including conspiracy to commit mail and wire fraud, wire fraud, conspiracy to commit money laundering, money laundering, bulk cash smuggling and perjury. He was sentenced to 100 years in prison and ordered to forfeit \$40 million. Coleman, after cooperating with prosecutors, pleaded guilty to conspiracy to commit mail and wire fraud and perjury. She was sentenced to 10 years in prison and ordered to pay full restitution. Field pleaded guilty to conspiracy to commit mail fraud and money laundering and was sentenced to five years in prison and ordered to pay full restitution. Simring pleaded guilty to conspiracy to commit mail fraud and money laundering and was sentenced to three years in prison.

### The Victims

The victims included a 56 year old Seattle woman who lost approximately \$500,000 of her retirement. Another woman, 59, lost \$335,000 after selling a house she had purchased with an inheritance from her sister. One family lost approximately \$500,000 from the sale of a strip mall that had been in the family for decades. A Denver based 1031 Exchange Company is responsible for 65 claims with many claiming to be owed more than \$1 million. The list goes on. In the end there were nearly 600 victims of the Okun's Ponzi scheme (Green, 2008).

One of the victims who lost \$2 million in a real estate deal spearheaded a civil lawsuit against Wachovia Bank. The lawsuit contended that Wachovia overlooked the fraud while profiting from the management of the 1031 Tax Group accounts. The lawsuit stated that the bank should have been aware of the money laundering and the illegal transfers of funds from IPofA's bank account to 1031TG bank accounts. Wells Fargo agreed to a settlement of \$45 million to be paid to plaintiffs as a result of work performed by Wachovia Corporation (acquired by Wells Fargo in 2008).

### **QUESTIONS**

1. Are qualified intermediaries legitimate businesses?
2. Okun tried to avoid federal currency reporting requirements by instructing his employee to cash two checks: one for \$5,200 and one for \$9,800, so as to stay under the \$10,000 cash reporting requirements and then ship the \$15,000 cash to his personal yacht in the Bahamas. Briefly describe the federal currency reporting requirements and briefly describe the purpose of these requirements.
3. What is money laundering?
4. What is a Ponzi scheme?
5. How does the Okun case compare to other cases in the news lately?
6. What is the government doing to combat financial fraud?
7. What are the ethical issues in this case?

# ONE HUNDRED YEARS IN PRISON FOR \$126 MILLION FRAUD

## TEACHING NOTES

Kathleen Dunne, Rider University  
Maria H. Sanchez, Rider University

## CASE DESCRIPTION

*This case examines the multimillion dollar Ponzi scheme perpetuated by Edward Okun. Okun was convicted in 2009 of 23 counts including wire fraud, money laundering, bulk cash smuggling and other offenses. In this case, students will learn about fraud, money laundering, federal currency reporting requirements, aspects of tax law, and ethics. This case is suitable for either undergraduate or graduate students. It can be used in an Introduction to Business, an Ethics, or a Fraud course. Students typically require 2-3 hours outside of class to complete the case. Approximately one hour of class time is needed to go over the case. This case can help students develop both written and verbal skills.*

## GENERAL COMMENTS

This case describes a real world fraud that went undetected by authorities for several years. By completing this case study, students can go beyond textbook learning and gain real insight into the ethical and legal issues associated with Ponzi schemes. Students will also learn about federal currency reporting requirements and certain aspects of the tax law. The case can help students develop both written and oral communication skills. This case is appropriate for an Ethics course, Introduction to Business course or a Fraud course. It can be used in an undergraduate or graduate level course. We typically assign the case as an individual project, allow one week for the students to complete the case questions, and spend one class period discussing the solutions on the day the case questions are due. It has been our experience that students find the case to be interesting, and lively classroom discussions often ensue. On average, each student's solutions take about 20 minutes to grade.

## QUESTIONS

**Question 1:** Are qualified intermediaries legitimate businesses?

**Solution 1:** Most qualified intermediaries are legitimate businesses that act as safe keepers of funds so that investors can defer capital gains taxes when purchasing a similar type of property. Section 1031 of the tax code allows investors to legally defer this gain. Investors can only defer the gain if the proceeds from the sale of the property go directly into a QI. The QI then is responsible for keeping the funds until another property is purchased by the investor. At that time, the QI transfers the funds directly to the closing agent for the sale. A QI should help the investor make sure that the transaction complies with Section 1031 of the tax code.

**Question 2:** Okun tried to avoid federal currency reporting requirements by instructing his employee to cash two checks: one for \$5,200 and one for \$9,800, so as to stay under the \$10,000 cash reporting requirements and then ship the \$15,000 cash to his personal yacht in the Bahamas. Briefly describe the federal currency reporting requirements and briefly describe the purpose of these requirements.

**Solution 2:** The Bank Secrecy Act was passed in 1970. To comply with this act, financial institutions that engage in a currency transaction in excess of \$10,000 must file a Currency Transaction Report (CTR) with the IRS. If Okun's employee had cashed one check for \$15,000, this would have necessitated a CTR

report from the bank. According to the IRS website, more than 15 million CTRs were filed in 2008. Financial institutions are also required to file a report when there is suspicious activity. If the bank knew or suspected that the employee was structuring transactions in order to avoid CTR reporting, then this would be considered suspicious activity and would trigger a report as well. The purpose is to detect and prevent money laundering, tax evasion, and other criminal activities. Reporting requirements are described in detail at [www.irs.gov](http://www.irs.gov).

**Question 3:** What is money laundering?

**Solution 3:** Money laundering means to conceal the source of funds. It is usually done so that the money then can be used without incurring any legal penalties. It is estimated that between \$300 billion and \$1 trillion is laundered each year (Crumbley et al., 2009).

**Question 4:** What is a Ponzi scheme?

**Solution 4:** The Securities and Exchange Commission describes a Ponzi scheme as “an investment fraud that involves the payment of purported returns to existing investors from funds contributed by new investors. Ponzi scheme organizers often solicit new investors by promising to invest funds in opportunities claimed to generate high returns with little or no risk. In many Ponzi schemes, the fraudsters focus on attracting new money to make promised payments to earlier-stage investors and to use for personal expenses, instead of engaging in any legitimate investment activity.”(from <http://www.sec.gov/answers/ponzi.htm>)

Ponzi schemes tend to unravel or collapse at some point because there are no new investors, so money runs out and the original investors cannot get their money.

**Question 5:** How does the Okun case compare to other cases in the news lately?

**Solution 5:** This question gives the instructor an excellent opportunity to discuss current stories that are in the news. Students will also likely bring up Charles Ponzi from the 1920's, for whom the Ponzi scheme was named. Charles Ponzi did not invent the Ponzi scheme, but his was the first to be well known in the United States.

The most famous Ponzi scheme in recent history was perpetuated by Bernie Madoff. Madoff's multi-billion dollar Ponzi scheme impacted thousands of investors, many of whom lost their life savings. The Madoff case is especially interesting because he was able to dupe not only individual investors, but also institutional investors and regulatory authorities for years. An important difference between the Madoff fraud and the Okun fraud is that with Madoff, the victims were *investing* their money and they knew that there was some level of risk. With Okun, clients were merely placing their funds in QIs for *safekeeping*, and it was assumed to be risk free.

**Question 6:** What is the government doing to combat financial fraud?

**Solution 6:** In November 2009, President Barak Obama signed an executive order which established a Financial Fraud Enforcement Task Force. The purpose of the task force is to investigate and prosecute financial crimes, recover ill-gotten gains, and to punish the perpetrators. The task force is comprised of members of the federal government and includes members from the Department of Justice, the FBI, the Department of the Treasury, the Department of Homeland Security, HUD, the IRS, the Secret Service, the SEC, and numerous other organizations.

According to the SEC website, in 2009 the SEC filed 60 enforcement actions involving Ponzi schemes or Ponzi-like payments.



**Question 7:** What are the ethical issues in this case?

**Solution 7:** Student answers to this question will vary and it is an excellent chance for lively classroom discussion. The number of victims in the Okun Ponzi scheme is estimated at 577. These victims placed their money in a qualified intermediary with the expectation that it would be there for them when they purchased their next property. Many victims lost their life savings. Okun's sentencing memorandum stated "Okun's criminal acts drove many individuals to economic collapse or near collapse, and caused especially significant noneconomic, emotional damage on many of his victims" (Green, 2009c). The sentencing judge said the "toll of human loss and suffering Mr. Okun's unbridled greed produced is enormous" (O'Dell, 2009b).

Another item to consider is that many of the victims who put their money in one of Okun's QIs were unable to purchase a replacement property because their money was gone. Capital gains taxes may be due if no replacement property was purchased (Vuong, 2009).

Victims may recover some of their money through bankruptcy court, but these victims have spent a lot of time and money on legal fees, they have suffered emotionally, and have had to delay retirement. And for what? So that Okun could buy another yacht, another jet, more jewelry, etc? It can be interesting to ask the students if they think it was worth the three years of living the high life in exchange for a 100 year prison sentence.

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# THE USE OF CASE STUDIES IN PREPARING POSTGRADUATE DISSERTATIONS ON SMALL AND MEDIUM SIZED FIRMS

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## ABSTRACT

*In recent years the case study methodology has been used much more in conducting research on firms. This increase is due to the needs and requirements, and to the perception that the results obtained by using such a methodology are of superior quality. The growing acceptance of case studies has been impelled by a wider knowledge and discussion of the criteria for assessing quality of case studies, and this has led to a better understanding of how the inclusion of case studies can be used to resolve certain problems connected to the study of organizations, in particular small and medium sized businesses. The present work proposes a design for conducting research suitable for writing a postgraduate dissertation on the subject of small and medium sized businesses. The methodology fulfills the conditions of quality required in a project conducted through the use of case studies. and that it is possible to complete within a limited period of time, thus improving the rate of students who graduate after completing their studies.*

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**KEYWORDS:** Case study, SMEs

## INTRODUCTION

In recent years, the case study methodology has been approved in disciplines where it used to be regarded as unsuitable for conducting scientific research. In subjects like the economy of firms, while not fully accepted as equivalent to quantitative research, there has been an increase in the number of projects using case studies. This has occurred particularly in the study of small and medium sized firms (SMEs). The increased popularity of case studies is due to the specific needs and requirements associated with approaching this particular object of study, but also to a better opinion of scientific results arrived at by following this methodology.

The increasing acceptance of case studies in research relating to businesses has been impelled by a better understanding of the criteria of quality that can be used in assessing a case research projects. The criteria for assessing research has reached a degree of considerable consensus and acceptance, as a result of the publication of papers referring to the methodological debate. The debate continues between researchers who consider the use of qualitative methods to be adequate, and those who claim that the only proper way to contribute to developing the discipline is through the use of quantitative methods (Bonache 1999, Bowen and Wiersema 1999, Cepeda 2004, Dyer and Wilkins 1991, Eisenhardt 1989, 1991, Fong 2003, 2005a, 2005b, 2006, Garcia and Peña 2004, Hamel 1992, Hamel et al. 1993, Kirk and Miller 1987, Martínez 2006, Perry 1998, 2001, Platt 1992, Rouse and Daellembach 1999, Stoeker 1991, Venkatraman and Grant 1986, Villareal 2007, Yin 1984, 1989, 1994).

In the course of this debate, one question that has attracted considerable attention is how case studies in scientific research should be conducted. And, which research projects are most suitable for solving the various problems associated with studying small and medium sized firms. This paper proposes the design of a research project that will be suitable for writing a postgraduate thesis on the subject of small and medium sized firms and meets two criteria. First it fulfills the criteria for quality in research conducted through the use of case studies, and second can be completed within the time limit established by a

postgraduate course for its presentation and defence. This research project is one of the varieties a case study can assume and its principal strength is that it makes research projects that must be conducted in conditions of limited time and resources and usually in the development of a postgraduate thesis viable.

The remainder of the paper is organized as follows: Section 2 briefly introduces the relevant literature. Section 3 discusses the case studies in research into small and medium sized companies. Section 4 provides some criteria for the evaluation of quality and case studies. Section 5 proposes the design of methodologies for case studies the postgraduate dissertations. Section 6 describes the form of the thesis conducted through case studies, and section 7 concludes the paper.

## **REVIEW OF LITERATURE**

Tellis (1997) notes, “the history of case study research is marked by periods of intense use and periods of disuse. The earliest use of this research form can be traced to Europe, predominantly to France. In the United States the case method was most closely associated with The University of Chicago Department of Sociology. From the early 1900's until 1935, The Chicago School was preeminent in the field and the source of a great deal of the literature”. After a long period of disrepute, in which their use was limited to exploratory studies (Platt 1993, Hamel et al 1993), currently this undergoing a boom. Since the seminal work of Yin (1984) there was extensive discussion related to how research should be conducted using case studies. This debate has been improved by the contributions of Stoecker (1991), Platt (1993), Eisenhardt (1989, 1991) Hamel (1992, 1993), Dyer and Wilkins (1991) among many others. The work of these authors includes both epistemological and practical issues associated with using this research method, and have allowed the elimination of prejudice against them.

Once the epistemological conflict related to the use of case study method in research was overcome, attention has focused on more practical aspects. The question is not yet if the case study allows academic research, but when it is appropriate to choose this methodological alternative. The answer to these questions is mostly found in the work of Yin (1984, 1989, 1994, 2003). Yin's answer to questions like: What is a case study? When you choose this strategy research? What are the criteria to be used to evaluate the quality of research conducted through this method? have influenced many authors both in English (Eisenhardt 1989, Stoecker 1991, Platt 1992, Remenyi, Money, Price and Bannister 2002 Chetty 1996, Tellis 1997 Perry 1998, Halinen, and Törnroos 2005. etc) and Spanish (Bonache 1999, Cepeda 2004, Fong 2003, 2005a, 2005b, 2006, Garcia and Peña 2004, Martínez 2006, Villareal 2007).

This work proposes a specific model for case studies suitable for conducting postgraduate dissertations and capable of fulfilling the criteria established by Yin. The aim is provide a methodological alternative that overcomes some of the difficulties associated with SME-related research, in contexts of insufficient statistical data. It also provides tools to train new researchers in the use of this method.

## **CASE STUDIES IN RESEARCH INTO SMALL AND MEDIUM SIZED COMPANIES**

If companies have one common feature, it is change. Companies must constantly change in response to modifications to the environment, consumer preferences, in technologies etc. In the case of small and medium sized businesses this situation is even more evident as these organizations are frequently created on the basis of innovations that allow taking advantage of specific market situations. Many of these opportunities are unexpected and the survival of these firms depends on their capacity to transform rapidly so they can keep up with the adjustments in their customers' preferences (Fong 2007).

As a consequence of this process of rapid transformation, which does not always last as long as expected, theories are created to explain their behavior and results for businesses easily lose their applicability. So, they must constantly be checked against reality and if necessary adapted, or replaced, in order to incorporate

the anomalies detected (Kuhn 2006). The search for new and better models to explain the firm requires methodologies that can generate the new explanations through contact with the study object. Given the limitations of quantitative approximations for building new theories, case studies are a particularly useful methodology for research on firms.

The usefulness of case studies is not limited to the creation of new theories. In fact, their usefulness in exploring and describing new or little known features of organizations is widely recognized, and are regularly used in business practice. In spite of this, in academic circles, nearly all the attention given to assessment of research using case studies is associated with determining its capacity for proving a hypothesis. In this area, case studies must compete with quantitative methodologies.

There is an urgent need for to provide methodological alternatives to case studies that deal with resource and capacities. This paper seeks to fulfill this need. These types of issues include variables that are incompatible with the logic of quantitative analysis (Fong 2005a). In some instances, it is accepted that the use of quantitative methodologies represents the best option for verifying theories empirically. In these instances, the decision to conduct research through case studies means additional risks and costs for the researcher who must confront the orthodoxy of the academy (Bonache 1999). It is certain that in research related to organizations there is frequently no alternative.

For this reason, in disciplines concerned with businesses a wide discussion has occurred with the aim of establishing suitable guidelines for conducting case studies, and identifying the right criteria for assessing the quality of studies undertaken. A deeper understanding has developed of when it is appropriate to follow this type of research technique and when it is better to choose a more conventional form, how the research project should be conducted and of how the results should be evaluated and interpreted, when these are not conclusive. In this sense Eugenio Moya (2000 p.190) says “And if it is true that following Popper and in the light of positivism we can claim that nature, that reality, never gives our theoretical proposals a full ‘yes’, it should be emphasized equally that it seldom gives us a flat ‘no’”.

### **CRITERIA FOR THE EVALUATION OF QUALITY AND CASE STUDIES**

In contemporary science, the value of a scientific theory is often determined by whether or not it can be proved correct or wrong. This criterion implies that the researcher assumes the risk of making a statement that might be demonstrably wrong. It further implies that the theory validity must be shown by deriving related hypotheses that can be proved true or false when applied to the real world.

A research project is scientific to the extent that its validity can be empirically proved. At the same time, a theory constructed following the appropriate method is plausible as long as it is not empirically demonstrated wrong, implying that more than one explanation of the same phenomenon can be considered scientific. The criterion of “refutability” implies both a recognition that perfect theories do not exist, and the need to constantly submit one’s theories to new tests in order to demonstrate the range of their applicability. These tests allow better comprehension of reality and also to generate profound debates, where the arbitrator, who establishes the quality of a research project, and the supremacy of one explanation over another, is the scientific community (Kuhn 2006, Kirk and Miller 1986).

Many advances in science have been made when ambiguities are detected in points of view that formerly appeared to be clear, or when it is shown that an alternative theory works better than the generally accepted theory. The truth, or what is provisionally accepted as true, is limited by the tolerance of empirical reality as it is by the consensus of the academic community. The scientific community evaluates the scientific character of a research project as a function of the validity of its explanations. In the natural sciences, the scientific character of the research is demonstrated by attending to two rules that guarantee the fulfillment of both criteria. The first is associated with the reliability of the study. In order to insure reliable, the

experience must be reported in a way to make it accessible to other researchers, so they may reproduce the experience and check the results. The second is associated with the validity of an experiment. To be valid the findings must be expressed in terms of the theory from which the contrasted hypotheses derive, using variables of significance to the theory that must be measured in a way that is justified.

In general terms, the reliability of a study is defined as the scope within which a procedure of measurement produces the same result no matter how or where it takes place. Thus the reliability of the study is the extent to which its findings are independent of accidental circumstances, while its validity is the range within which a test gives the correct answer.

The assessment of a research project depends on obtaining simultaneously as much reliability and validity as possible. Authors such as Platt (1993), Hamel (1992, 1993) and Stoeker (1991) point out that the criteria for determining how scientific a study is do not belong to any one methodology, and that case studies have a place among scientific methodologies. For Yin (1984), indeed, the various research methodologies represent alternative strategies depending on the advantages and disadvantages they offer for reaching study objectives.

After reviewing the criteria that are used to evaluate a research project, it is necessary to explain their characteristics in greater depth. Any scientific study should have validity, but there are various ways of qualifying as valid. This matters because the validity of a case should not be evaluated according to the same criteria as a quantitative study. In the latter, the criteria for validity are statistical, while in a case study they are logical. Ignoring this distinction may lead to underestimating the capacities of case studies for generating objective knowledge. In fact, one of the commonest prejudices held against case studies is the consideration that they provide a very small basis for scientific generalization (Yin 1994).

This criticism could be made of a theory developed on the basis of a single experiment. Where the only criteria for the validity of a study are statistical, it makes sense to wonder whether a general explanation can be derived from a single experiment. However, scientific discoveries are rarely based on a single experiment, and they are most commonly developed from a set of events that evaluate the same phenomenon under different conditions.

The same situation is produced in research using case studies, where each of the cases that go to make up the body of knowledge, represents something of an experiment, whose usefulness resides in the observation of variations generated by a change in the phenomenon conditions. It is a mistake to consider the collection of experiments or set of cases that go to make up a study equivalent to using a sample as the objective of both types of research is to broaden and generalize theories and not to enumerate frequencies (i.e. make statistical generalizations). The method of generalization used in case studies is analytical generalization where the results obtained in each case are used as a reference for comparison to other case studies. If two or more cases support the same theory, the empirical base of the theory may be considered correct and the results have been replicated.

The scientific value of all research depends upon a correct use of the chosen methodology, so the explanations have reliability and validity. Case studies are no exception to this rule, and as a methodology, research using case studies has developed various mechanisms and tests to guarantee reliability and validity are achieved. The incorporation of tests to guarantee research quality of case studies, as well as using them to submit hypotheses derived from already existing theories to empirical comparison, has led to the construction the contemporary study of cases.

This development marks a point of inflection for the methodology of case studies, as this methodology has recovered its position of relevance among possible strategies for conducting scientific research. The new

situation is evident in several fields, such as strategic management, where more frequently, reports of case studies are found in specialized publications (Villareal 2007).

Table 1 presents some of the principal tests conducted in contemporary case studies to guarantee that the results fulfill the requirements of scientific research:

Table 1: Tests for Validity in Case Studies

Test	Case Study Tactic	Stage of Research and Applicable Test
<p><b>Construct validity:</b> To establish the variables that should be studied and the correct operational procedures for the concepts chosen for the study</p> <p><b>Internal validity:</b> to establish causative relations under certain conditions and their variations in other conditions, in order to distinguish spurious relations</p> <p><b>External validity:</b> to establish the domain within which the results of the study may be generalized</p> <p><b>Reliability:</b> to demonstrate to what extent the operations of the study, such as the procedures for obtaining data, can be repeated with the same results for other researchers</p>	<ul style="list-style-type: none"> <li>• Use of multiple sources of evidence (triangulation)</li> <li>• Establish chain of evidence</li> <li>• Have key informants review draft case study report</li> <li>• Do Pattern-matching</li> <li>• Do explanation-building</li> <li>• Address rival explanations</li> <li>• Use logic models</li> <li>• Use theory in single-case-studies</li> <li>• Use of replication logic in multiple case studies</li> <li>• Use case study protocols</li> <li>• Develop case studies databases</li> </ul>	<p>Data collection</p> <p>Data collection</p> <p>Composition</p> <p>Data analysis</p> <p>Data analysis</p> <p>Data analysis</p> <p>Research design</p> <p>Data collection</p> <p>Data collection</p>

Table 1 shows tests for validity and reliability in case studies, as well as tactics for its implementation and the stage of research at which test applied  
Source: Yin (1993)

Among the tests noted three, which correspond to the stage of obtaining evidence, are particularly important and may be considered principles for obtaining evidence:

*Use Multiple sources of evidence:* one of the main strengths of case studies is that in research of this kind many sources of evidence may and should be used. No single source can form the basis for case study research. For the evidence to be considered objective, information from two or more sources must converge in the same set of facts. This also allows data obtained from sources that might be off the beaten track to be validated. Behind this principle is the triangulation of evidence, where it is sought to establish converging lines of research. Which is to say that every finding or conclusion of a case study rests on many sources that are corroborated with each other, thus obtaining greater validity and reliability. Triangulation also makes it possible to address the potential problem of the construction validity (study plan), as the distinct sources provide many measures of the same phenomenon.

*Crave a Case Study Databases:* this consists of recording and ordering the evidence collected. A clear distinction must be made between the evidence in the database and the research report as such. This separation is important, as the former is a great mass of information duly organized so it can be revised later, while the report is the result of an analysis of the base. The logic guiding the elaboration of the database is that it should be constructed in a way that will allow other researchers to use it to corroborate the evidence incorporated into the research report.

*Maintain a Chain of Evidence:* this is necessary in order to be able to link the hypotheses directing the study to the evidence supporting them and to the conclusions that may be reached. The chain of evidence allows the logic followed in the elaboration of the case study report to be reconstructed, which makes the study more reliable. Also it is possible by following this chain to reconstruct the context in which the evidence was obtained, as well as the criteria and techniques used in its analysis. Further, it makes it easier to interpret the results and to transfer them into the language in which the hypotheses were formulated.

## **THE DESIGN OF METHODOLOGIES FOR CASE STUDIES: POSTGRADUATE DISSERTATIONS**

The postgraduate (i.e. masters or M Phil) dissertation is a special case in academic research. Even though it lacks the scope and the depth of a PhD thesis, it is a mechanism through which the student is able to demonstrate he or she has a knowledge of the principal theories of the world of his discipline, as well as the capacity to do research and come up with significant results, following a method of conducting research that is accepted by the academic community. Normally it takes between 6 months and a year after the conclusion of the required courses to complete the study program.

Fulfilling these requirements leads the majority of students, with the approval of their thesis directors, to choose subjects of study for which there is a public access data. When analyzed following various strategies of quantitative analysis this allows the hypotheses deduced from the literature that are already in existence to be empirically verified.

Approval for thesis proposals using other than quantitative strategies is more difficult, because of prejudices there might be against case studies. In addition, it is thought that to write a thesis using a case study methodology would require a process of intense work in the field, where the researcher ought to invest a considerable amount of time. Time is necessary to create relations of trust with informants and to observe directly the phenomena being studied. In the case of a dissertation or thesis, adequate time may not be available.

The conflict lies in the fact that many aspects of the firm and several theories associated with it cannot be researched using quantitative techniques. Some aspects of the firm, which represent principal lines of discipline development need methodological approaches like that of case studies. Thus, the case study methodology may not always be the best option for doing a postgraduate thesis, but for some research projects, it may be the only one possible.

This is commonly the case with dissertations where small and medium sized companies are chosen as the subject of investigation. The general factors determining the choice of case studies in conducting firm level research combine with others such as lack of adequate data bases that limits other forms of research (Fong 2007). In the case of Mexico, in spite of the efforts made by a number of institutions, such as the National Institute of Statistics, Geography and Digital Information, INEGI (*Instituto Nacional de Estadística, Geografía e Informática*), to construct statistical information, the possibilities for analyzing small and medium sized firms from a quantitative point of view are still limited. This is complicated by the rapid transformations that occur in the sector, associated with cycles of creation-transformation-mortality, changes in surroundings, etc. These transformations make data bases lose their currency and relevancy rapidly.

In spite of difficulties associated with producing a thesis related to small and medium sized businesses, the interest is increasing. This is not surprising given the economic importance of this sector for Mexico. Currently 99.67% of establishments in the country belong to the micro, small and medium category (De la O, Ramírez, Ayala and Bonilla, 2007 p. 95). Further, the number of students choosing to conduct research into topics related to this object of study has increased, both in programs traditionally related to the study of the firm, and in others where interest in the firm has arisen from a perception of how important its performance is in areas like regional development, public policies, or migration movements.

With the objective of providing a viable option for a postgraduate thesis in the area of small and medium sized firms where the quantitative type of strategy proves inadequate, we present a case study methodology with which the student can demonstrate the skills that are expected of him or her and will



allow him or her to complete the research in the time available to do so. In general terms, this design features three elements that should be taken into account, as they define its nature:

The first is that this design forms part of the dominant tendency in understanding case studies today and it seeks to be compatible with what the tendency has established. From the seminal proposal of Yin (1984), a high level of consensus has been established to the effect that there are five aspects of designing a research plan which are decisive for the quality of a study conducted through the use of the methodology of case studies: 1) The phenomenon to be addressed in the study, 2) Its propositions or hypotheses, 3) Its units of analysis, 4) The logic linking the data to the propositions 5) The criteria for interpreting the findings.

These factors, which define the way in which the case studies methodology should be used, may also be useful for evaluating the quality of a report, as they set out which aspects in particular should be attended (Fong 2003, 2006, Villareal 2007, Yin (1994).

The second element in this kind of design represents a particular type of a general model of case studies. According to Yin (1984) it is a Type 4 design, that is, it is one with many units of analysis are used instead of adopting a holistic approach and is one of varied character (see Table 2). This design allows the student to centre on the specific aspects of the case that are relevant to contrasting hypotheses in the dissertation, and conducting more than one case study, makes it possible to replicate cases, which increases the potential for generalizing from the findings.

Table 2: Case Study Typologies

	Design for One Case	Design for Several Cases
Unit of single or holistic analysis	type 1	type 3
Unit of multiple analysis	type 2	type 4

*Table 2 presents typologies Case study, taking into consideration the number of cases that includes the study and whether the focus of each case is holistic or includes several units of analysis. The proposed model this work corresponds to type 4: A study involving multiple cases and explores a range of units in each. Source: Yin (1984)*

The third relevant element of this design is that it seeks to reduce the time spent on fieldwork to a minimum. To achieve this every moment dedicated to fieldwork must be fully exploited, which requires the research be prepared in minute detail, especially the empirical part.

The model proposed is based on developing the five case study components mentioned above and the construction of an explicit protocol, which in this case has the function of documenting aspects that will be evaluated in the dissertation. Doing so allows the different cases incorporated into the study to be comparable, and student training to deal with his or her field work in the best and most efficient way possible. As this proposal is for a particular study plan within the general model of case studies, it is worth specifying the particularities of each of its components:

*The phenomenon to be addressed in the study.* As the objective of the research is to write a thesis, the phenomenon addressed in the study should be susceptible to being handled from a deductive-hypothetical point of view, which means it can be framed in an already existing theory. This implies giving up many of the possibilities offered by the case study methodology, as the use of the case studies might lead to achieving other goals, such as exploring or describing the phenomenon addressed or even building a new theory up about it. But, these are not the usual objectives of a postgraduate thesis. Certainly, some courses accept a thesis describing the situation of a firm as a case study, for didactic purposes, or to solve a real *problem*. In these cases the theory is not explicitly expressed, but it is necessarily present in determining the aspects to be included in the description. In this sense even when the objective of the dissertation is not to prove a hypothesis, it is fundamental that the phenomenon studied be clearly framed in a theory.

Renouncing these potentialities has to do with the goal of writing a thesis and with the time and resources available for doing it. If there is only a limited amount of time for the study, the prior existence of a solid theory provides support and makes completing the task viable.

*The propositions or hypotheses of the dissertation.* Although in the general model of case studies, the function of the hypothesis is limited to pointing out areas where special attention should be paid, in a dissertation its function is to contribute to verification of a theory. This is achieved when the hypotheses are empirically contrasted, and whether they are accepted or rejected this exercise contributes to increasing the knowledge related to the object of study. In research into small and medium sized companies it is convenient for the general hypotheses derived from the theory or the theories used, to be identified and clearly explained. It is plausible that there might be two or more competing explanations of the object of study and it would therefore be advisable to have various sets of particular alternative hypotheses, with the aim of creating a margin of adjustment to the various situations that may present themselves in the course of the field work.

*The units of analysis of the research.* The intention behind renouncing holistic focuses is for the researcher to concentrate only on the aspects of the company that are of concern to the hypothesis being examined. This does not imply that an analysis of the context should be omitted, but it does focus the attention and allows the time dedicated to fieldwork to be reduced. It is recommendable that the least possible number of units of analysis be established.

*The logic linking the data to the hypothesis of the study.* One problem that postgraduate students face when they write their thesis is how to link the theory to reality. Many dissertations have an excellent review of the literature but poor empirical tests and show no clear relation between the evidence presented, the theoretical model used and the objectives of the work. In a quantitative kind of work this tends to be associated with the limitations related to the characteristics of the database, but in research through case studies, it needs to be anticipated and checked.

With this design the student can take advantage of the fact that, having the support of a theory, one can explain both in academic terms and in terms suitable for the field work which evidence is necessary for accepting or rejecting the hypotheses. The student can identify which sources such evidence may be obtained, how it should be triangulated to guarantee its objectivity, which are the scales of measurement, and so on. This leads to the formulation of a protocol, which not only shows the logic uniting the hypothesis to the data collected, but also forms the basis of the dissertation, which the research will result in.

*The criteria for interpreting the data obtained.* One of the most complicated aspects of research through the use of case studies is interpreting the data. The advantage of the research project design presented here is that as the study is framed in a theory that already exists and as the logic, uniting the evidence to be collected with the proposals of the study is made explicit, it is only possible to interpret the data in the light of the theory being examined.

## **THE FORM OF THE THESIS CONDUCTED THROUGH CASE STUDIES**

As pointed out by Perry (1998, p.797) “a thesis using the case study research methodology can be structured like a traditional theses”. In this section, then, the features of the research protocol that should be incorporated in the final document of the dissertation are presented. The following are the ways in which a study conducted through case studies makes it plain that it fulfills the requirements of objectivity associated with scientific research:

*A profile of case studies.* Even though the profile is prepared in order to inform the agents related to the investigation of the objectives of the project, of the relevant literature and of the findings expected from

the study, its incorporation in the dissertation also has other functions. The following stand out: to show that the student is familiar with the theories associated with his object of study, that he has been able to discern the state of the art of the subject and what the enigmas still to be resolved directing the field work, and that he is capable of making a contribution to their resolution. Furthermore, as the student is expected to use the instruments and methodologies correctly.

*Procedures to be carried out.* Both in the protocol and in the dissertation itself, an explicit account of the procedures to be followed as part of the research, is the key factor for determining the quality of the study. Fulfilling this requirement leads to the development of three groups of instruments that are required for conducting a case study.

The first group of instruments designed is to make it easier to obtain the necessary data, in the established form, from the various sources that it is considered appropriate to use and following suitable research techniques. These instruments may include questionnaires for in-depth and semi-structured interviews, records of direct observation, etc. It is also advisable to have alternative devices at hand enable appropriate responses respond to unforeseen situations in the field work.

The second group has to do with preparations to make the process of collecting evidence correct and efficient. It includes instruments whose object is to grant access to key organizations and informants, and to organize the activities that must be engaged in during the collection of evidence.

The third group of instruments has to do with guaranteeing that the study fulfils the three principles of data collection that make it easier for the criteria of scientific objectivity to be fulfilled. Table 3 presents an example of an instrument of this kind, where it may be seen how the steps taken to fulfills the conditions mentioned earlier are organized and made explicit. This instrument also makes it possible to insure that the instruments necessary for the collection of data are available and that the evidence is gathered in the correct sequence. As multiple units of analysis might well be called for, it encourages the best possible form of using the time of the informants by getting all the relevant information in a single interview. This instrument also defines the way in which the base of evidence of the case should be organized.

*Case study questions.* It is important to be clear that case study questions are not the questions asked of the informants, but those contained in the instruments referred to. They are for the researcher to answer in the light of the evidence collected and its analysis. In a thesis, the questions must give way to formulating hypotheses deduced from the theory that is taken initially as the best answer to the research questions. It is not so much a question of seeking the right answer as verifying that the answer is correct. So what is relevant in a thesis is to contrast the hypotheses of the study empirically. To the extent that their correctness is verified the theory is also validated.

As a question may have many answers, whereas a hypothesis should be accepted or rejected on the basis of well defined criteria, to answer a question may require the establishment and the verification of more than one hypothesis. Table 3 shows how a research question is transformed into a hypothesis.

The design of a research project presented here has been developed with the specific intention of making it easier to write a typical postgraduate dissertation, but there is no doubt that each and every one has its own particularities and these should be taken into account. For this reason I have considered it necessary to explain the methodological criteria used in producing this design, so that the model may be correctly adjusted to the characteristics of each particular thesis. Figure 1 presents the activities considered in this research plan in sequence.

Table 3 Design of the Fieldwork (Question 3)

Research Question	Hypothesis	Evidence / Criterion For Acceptance	Source	Triangulation Mechanism
3. What is the relation between the <i>advertising</i> produced by SMEs, and the reputation of the firm in the relevant milieu?	<p>3) The greater the amount of <i>advertising</i> put out by the company, the greater the amount of information on the company that is perceived in the relevant milieu (Barney, 1991; Basdeo, Smith, Grimm, Rondova and Derfus, 2006).</p> <p>4) <i>Advertising</i>, as an explicit mechanism for emitting information about the company, does influence in the perception (reputation) among the agents related to the firm (Basdeo, Smith, Grimm, Rondova and Derfus, 2006).</p> <p>5) <i>Advertising</i> allows a reputation to grow through the provision of information, about the company or about the product (Barney, 1991; Basdeo, Smith, Grimm, Rondova and Derfus, 2006).</p>	<p>Acceptable if there is a management strategy to advertise the company and the products / services it is known for or provides, and there is knowledge of the brand, product, service and its features among related agents.</p> <p>Indicators:  Existence of an explicit advertising strategy  Expenditure on advertising  Recognition of the brand  Appreciation of the brand  Recognition of the product  Appreciation of the product  Identification of the company's advertising</p>	<p>Company (Semi-structured interview with members of the management).  Market (Interviews with direct clients of the firm, chambers of commerce, competitors, secondary sources, etc., and with other key agents: suppliers, distributors, other collaborators, etc.).</p>	<p>Comparison of the perception of the importance of its advertising by the company, with the perception by the market of the advertising and the influence it has on the decision to buy the reputed product/ service.</p>

*Table 3 presents an example of an instrument that allows the study fulfils the three principles of data collection that make it easier for the criteria of scientific objectivity to be fulfilled.* Source: Macías López, Gisela (2007)

## CONCLUSIONS

This work proposes a research plan suitable for writing a postgraduate thesis in the area of small and medium sized firms, that will at the same time fulfill the criteria of quality established for research using case studies, and make it viable for the thesis to be completed in the given time. This proposal originates in the need to provide an alternative methodological design to those of a quantitative nature, which are traditional in the field of companies. Doing so gives an answer to the increasing demand for doing postgraduate theses on the subject of SMEs that could not be done using the traditional quantitative method.

The design presented here represents one of many variations that a case study may assume and its principal strength is that it makes viable research projects that need to be conducted with few resources and in a limited period of time as tends to be the case with writing a postgraduate thesis. It has been tried in practice with good results, and the model is flexible enough to be adjusted to the needs of each particular project. This gives it great potential for being used within as well as outside the field of small and medium sized business studies.

Amongst its weaknesses are that it has been designed for a particular situation, thereby giving up some of the principal strengths of case studies. Specifically, it limits the potential this methodology has for exploring and going deeper into aspects not considered in the original research plan.

Figure 1: Sequence of Activities to Be undertaken in a Postgraduate Research Project Using Case Studies

<p><b>THE PHENOMENON ADDRESSED IN THE STUDY</b></p>	<p style="text-align: center;"><b>ACTIONS TO BE TAKEN IN ANY KIND OF DISSERTATION</b></p> <ol style="list-style-type: none"> <li>1. Preliminary analysis of the question to be studied</li> <li>2. Identifying the theoretical models that apply to the question to be studied</li> <li>3. Definition of the object of study</li> <li>4. Choosing the appropriate strategy for making empirical contrasts</li> </ol> <hr/> <p style="text-align: center;"><b>CHOICE OF A STRATEGY FOR A CASE STUDY RESEARCH PROJECT: PREPARING THE PROTOCOL</b></p> <ol style="list-style-type: none"> <li>5. Choosing the most appropriate theory to frame the object of study</li> <li>6. Identifying the general hypotheses of the theory chosen</li> <li>7. Establishing the state of the art of the theory chosen</li> <li>8. Identifying the enigmas still to be resolved of the theory and the principal paths of development</li> <li>9. Identifying the general hypotheses of rival theories</li> <li>10. Establishing the state of the art of the rival theories</li> <li>11. Identifying enigmas still unresolved of rival theories and the principal paths of their development</li> <li>12. Joint analysis of the theories concerning the object of study to identify complementary and incompatible aspects</li> <li>13. Writing up the theoretical part of the thesis</li> </ol>
<p><b>HYPOTHESIS OF THE STUDY</b></p>	<p style="text-align: center;"><b>DESIGNING THE EMPIRICAL TEST OF THE THESIS</b></p> <ol style="list-style-type: none"> <li>14. Identifying and analyzing the context in which the empirical test will be made</li> <li>15. Elaboration of the research questions</li> <li>16. Deduction of specific hypotheses from the chosen theory</li> <li>17. Deduction of specific alternative hypotheses from rival theories</li> <li>18. Establishing the evidence and the criteria needed for verifying each of the hypotheses (including the alternatives), in particular the criteria for measuring each of the variables involved</li> </ol>
<p><b>THE UNITS OF ANALYSIS</b></p>	<ol style="list-style-type: none"> <li>19. Identifying units of analysis adequate for obtaining the relevant empirical evidence</li> <li>20. Revision of specific literature on the units of analysis</li> </ol>
<p><b>THE LOGIC LINKING DATA TO THE HYPOTHESES</b></p>	<ol style="list-style-type: none"> <li>21. Design of the instruments to: Guarantee that the principles for collecting evidence are followed, Obtain the necessary evidence and Organize and control the field work</li> <li>22. Gathering the evidence</li> <li>23. Organizing the evidence in data banks</li> <li>24. Analysis of the evidence</li> </ol>
<p><b>CRITERIA FOR INTERPRETING THE FINDINGS</b></p>	<ol style="list-style-type: none"> <li>25. Transcription of the evidence into terms used in the theory</li> <li>26. Acceptance or rejection of the hypotheses</li> <li>27. Elaboration of the conclusions and implications of the study</li> <li>28. Writing up the empirical part of the thesis</li> <li>29. Revision by key informants</li> </ol> <hr/> <p style="text-align: center;"><b>ACTIONS TO BE TAKEN IN ANY KIND OF DISSERTATION:</b></p> <ol style="list-style-type: none"> <li>30. Joint revision of the theoretical and empirical parts of the thesis</li> <li>31. Designing a strategy for presenting the findings</li> <li>32. Conclusion of the thesis</li> </ol>

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