AN ANALYSIS OF THE RISK CHARACTERISTICS IN PRIVATE INDUSTRIES: A NEW METHODOLOGICAL APPROACH

JEON, DOYLE*

I. Introduction

Recent contributions in the field of financial management have made the subject broader and more analytical. Today academic as well as professional discussions on the problem of committing and raising capital funds on behalf of an individual enterprise contain a much larger component of theory than they did in the past.

Modern financial analysis technique, therefore, attempts to analyze many different aspects of the firm's activity. However, our analysis is particularly interested in several important variables as determinant factors; the rate of return earned by the firm, the firm's retention rate, the dividend payout rate, the rate of growth expected by investors, and the rate of discount that investors apply in assigning a present value to the firm's future returns.

In order to determine the functional relationship of these variables and to estimate their variables, we typically utilize the three basic characteristics of risks in relation to the cost of capital for any kind of firm.

Thus far, the scope of the subject of business finance has been analyzed in terms of different points of view from which the business finance field has been approached.

In this study, the concept of profit and wealth maximization, risk characteristics and cost of capital structures relating to oil companies will be discussed.

For the purpose of this study, Texaco Oil Company and Phillips Petroleum Company have been taken into consideration.

II. Profit Maximization vs Wealth Maximization of the Firm

As a part of the general subject of economics, the goal of financial decision-making has generally been expressed in terms of what is maximized. In

* MBA, Ph. D., Research Director, Korea Rural Economics Institute, Seoul, Korea.

terms of price theory, the goal of the firm is stated to be profit maximization, and in other literature, particularly in the theory of capital, the firm's goal is specified as maximizing wealth.

There are several arguments available in this content. First, the problem of uncertainty is one of the arguments. Since the future can not be expressed in terms of objective probability distributions of alternative possible returns, it is argued that it is not possible to maximize what can not be known. In the face of true uncertainty, there is not any objective probability distribution than can be maximized. The second argument is that most decisions involve a trade-off between expected return and risk.

Characteristically, the opportunities promising the probability of higher expected yields are associated with greater risk. To recognize such a trade-off, wealth maximization is brought into the analysis. If greater expected returns are associated with higher risk, a higher capitalization rate would be applied to opportunities that involved greater risk.

The combinations of expected returns with risk variations and related capitalization rates can be fully expressed in the concept of wealth and utility maximization, but not in the concept of profit maximaization. The third argument is also related to the uncertainty factor. The decision-maker may have so little confidence in the estimates of future returns that may be achieved that he may go for attempting to maximize. Since whatever information or judgements he may have are subject to wide variations, he may prefer to "rest his case" when he has achieved some level that meets his needs, aspirations or goals.

The satisfying goal is appropriate for a behavioral theory of the firm and is perfectly manageable. It is not necessary to make mutually exclusive choices between wealth maximization and wealth satisfying. Satisfying is primarily a short-run search strategy and relates to the cost of search. The fourth argument to profit or wealth maximization is that it is too narrow or centered. The complaint is that such a maximization criterion fails to take into consideration the roles and interests of government, labor unions and other participants in the enterprise process.

According to Solomon,[1] maximization of profit in the sense of maximzing wealth "accrual" to stockholders is clearly an unreal motive. How the wealth of the firm is shared among the participants can be subject to considerable argument. On the other hand, profit maximization in the sense of using resources to yield economic values higher than the joint values of inputs required is a useful goal. The distribution of profitability achieved by outputs greater than inputs values involves another set of considerations. Thus a proper goal of financial management is wealth maximization. He concludes that maximization of wealth provides a useful and meaningful objective as a basic guideline by which financial management deci-

[1] Solomon: *The Theory of Financial Management*, p. 17.

sions will be evaluated.

We have discussed, so far the basic concept of wealth maximization and profit maximization and their implications.

Wealth maximization is associated with maximizing net present value which would suggest undertaking any additional investment as long as a rate of return greater than the cost of capital is secured, while profit maximization with a stream of future benefits would recommend any additional investment as long as the rate of return exceeds the cost of debt financing.

III. Risk Characteristics

In dealing with risk and uncertainty, we can assume that some future outcomes can be assigned a definite probability distribution. For sales of a new product, no specific probability distribution can be assigned with absolute confidence. For any probability distribution, subjective or otherwise the mean of the distribution will be spoken of as the expected value. The level of risk associated with an expected value is normally assumed to be a positive function of the variance of its distribution, or some other measure of dispersion. However, the important factors, it should be emphasized, are the expectation actually held by investors. These expectations may vary because the information available to different investors varies in amount or quality or because the investors evaluate the same information differently, arriving at different subjective probabilities for various possible outcomes. Besides these differences, investor's actions may differ because they have different attitudes toward risk or because they may expect other investors to behave "irrationally."

However, it is assumed that investors are averse to risk that the expected equilibrium rate of return of the stock of a risky firm, and that the expected return of any stock will be higher than the market rate of interest on a riskless investment.

1. Economic Risk

In general, economic risk may be defined as the sensitivity of the firm's sales to economic fluctuations. Theoretically, the economic risk characteristics are determined by the income elasticity of the demand for goods, and the income elasticity of demand is influenced by the durability and the degree of necessity of goods, general level of economic activity, market position and management capability, and social and political systems, etc.

In measuring economic risk, we have to take account of the average growth rate of operating revenue over time periods and the standard deviations, which explain the range of stability or unstability, for instance if $\sigma_{y/x} > 1$. If there is relatively instability in terms of operating revenue, we have to compute the percentage change in operating revenue over the

period.

However, in this study, to measure economic risks of the two chosen firms, the regression analysis result was used.

GROWTH OF OPERATING REVENUE

	g	$S_{y/x}$
Texaco Oil Co.	9.895	1.04614
Phillips Oil Co.	8.578	1.05858

Texaco Oil Company shows a little higher growth rate as compared to Phillips Oil Company and the growth rate has a lower standard deviation. Therefore, we would conclude that the operating revenue of Texaco Oil Co. is more stable than that of Phillips' as far as economic risk is concerned. However, we don't known the degree of stability or unstability as an absolute measurement(degree of unstability $= b \times S_{y/x}(g)$).

2. Business Risk

Business risk is the risk inherent in the physical operations of the firm; it arises simply from the instability to insure absolutely stable sales, costs and profits. Frims can not be entirely protected from the vicissitudes of the market. Business risk exists independently of the means by which the firm is financed. To be more explicit, the business risk is defined as the sensitivity of operating income to the fluctuation of sales. It can be measured in terms of the degree of operating leverage. However, the earnings coverage ratio is also associated with business risk in the sense of earnings stability of earning coverage depends on the stability of $EBIT(1 - t)$, the level of $I(1-t)$ and pd (paid dividend).

Since the variable costs are not known in this case study for the chosen firms, we can not compute the actual value of the degree of operating leverage. Instead we have to look at the carnings coverage ratio for the firms from the regression analysis results.

The earnings coverage ratio $= EBIT(1-t)/I(1-t) + pd$, can be found in terms of fixed finance expense coverage in ratio analysis.

	ave.	c.v.	$S_{y/x}$	risk range
Texaco Oil Co.	30.4	0.453	16.1	$-11.9 \sim 72.7$
Phillips Oil Co.	9.4	0.554	5.2	$-7.8 \sim 26.6$

Note: 3σ was taken into consideration.

As shown in the above table, Texaco is more risky than Phillips as far as earnings coverage is concerned. This implies relatively greater risk and Phillips' as far as business risk is concerned.

One of the major reasons for this could be a larger proportion of fixed cost in terms of operating costs involved in Texaco Oil Company's operation. Another possible reasons would be Texaco's foreign investment in exploiting oil-wells which resulted in a huge fixed cost investment.

3. Financial Risk

Financial risk is added to business risk when a firm, instead of meeting all capital requirements with equity funds, borrows a portion of its needs. Borrowing increases risk in two ways. First, borrowing means that the company must meet fixed interest charges and principal repayment schedules or face bankruptcy. Second to the extent that borrowing is used, the fluctuations in annual cash flow available for payment of dividends or for reinvestment will be greater as a proportion of the stockholder's investment. If a company is entirely financed with all equity financing, the firm and its owners expect certain average sales, cash flows for capital requirement, etc. However, the owners are interested in the fluctuations of the net cash flow that will be avilable for dividends and reinvestments—a measure of risk inherent in this fluctuation would be the standard deviation of the net annual cash flows divided by the value of the stockholder's equity investment in the firm. How the shareholders could elect to have the firm pay larger dividends and borrow to meet capital requirements? Since the interest cost on the borrowed funds is most likey less than the overall return the firm is expected to earn on its capital, the expected return on the owner's remaining equity value would rise. On the other hand, the ratio of standard deviation over expected earnings would also rise, since increasing the use of debt financing may increase the net income to common equity but it would also make the income stream more unstable. The stockholders are, in short, faced with a trade-off between risk and return. This trade-off process is the central problem of financing and investment decision making.

This implication will be discussed bringing in two distinguished arguments:

1) *J. M. Gordon's Version*

Assume that a company retains a constant proportion of earnings(b) in the present and future period, and that investment in any period adds a constant increament to earnings in every subsequent period. Let r, the rate of return to new investment, be this investment to income divided by incremental investment. This r is also assumed to be constant and it is also assumed that the following model describes that new equity financing through earnings retention will be matched by new debt financing sufficient to maintain the present debt-to-common equity ratio. Then,

$$D_t = (1-b)Y_t \quad \text{and}$$

$$Y_{t+1} = Y_t + rY_tb = Y_t(1 + rb)$$

,where Y_t = retained earnings

At every point in the future, bY_t is the proportion of earnings reinvested and rbY_t is the incremental earnings to this investment.
This implies a constant growth rate, tb, for earnings, so that

$$Y_t = Y_0(1 + rb)^t = Y_0e^{rbt}$$

If the value of this firm in year 0 is the present value of all future dividends, discounted at a constant rate k, then

$$V_0 = \int_0^\infty D_te^{-kt}dt. \quad \text{Thus}$$

$$V_0 = \int_0^\infty (1 - b)Y_0{}^{rbt}e^{-kt}dt$$

If V_0 is known,

$$K = \frac{(1 - b)Y_0}{V_0} + br = d + br$$

where d = current divident yield.

This model's particular merit is that it gives a measure of stock prices in terms of current values of r, b, and Y_t. These current values could be obtained from readily available data. However, Gordon assumes that not only are shares valued at the discounted present value of expercted future dividends but also the payout ratio are constant for all future period. Thus if all current earnings are reinvested, the model would assume $b = 1$ for all future periods.

However, it would not be necessary for $b = 1$.

However, Gordon's assumption of a constant ratio of return, r, is unrealistic. The relationship usally assumes that r declines with the volume of investment since the most profitable investments are presumably undertaken first. The idea of a constant r would be more profitable if we looked at it from the point of view of the stock holders who may not have any clear idea of how r varies with investment and, therefore, might regard this variable as a long run average rate of return, discard from the returns of individual investment projects. In any sense, a declining rate of return r may not occur in a dynamic economic environment.

However, the financial manager frequently has the opportunity to invest in individual projects if earning's a rate $r > k$, and we should not be surprised in practice to find some companies which can earn an average rate $r > k$ on new projects. Therefore, Gordon's model is actually unrealistic and is of little use for financial decision-making.

2) *Modigliani-Miller's Version*

In order to introduce the debt to the analysis, we must distinguish between net operating earnings and net earnings, the amount available to owners

after interest charges on borrowed funds have been paid. In the all equity case, net operating earnings and net earnings are equal. Anyhow, we assume that corporate income taxes do not exist for the time being.

The quality of the expected stream of net operating earning depends on complex factors which we can refer to as business risk. These factors include general expectations with respect to overall economic and political trends, specific expectations about the particular regions and markets within which the company acquires resources and sells its products and the speed and flexibility with which the company can lower its total operating costs when total revenues decline. However, all these factors interact and their combined effects determine the level of uncertainty or quality which is attached to anticipations about the future flow of net operating earnings. However, the use of debt exposes equity holders to a potential loss of their total equity in the firm's assets in the event that net operating earnings are not sufficient to cover the fixed charges to creditors.

Generally, the use of borrowed funds affects both the quantity and quality of anticipated net earnings. One effect of investing borrowed funds referred to as trading on the equity or leverage, is that owners get to keep all investment returns in excess of the fixed rate at which funds are borrowed.

If the rate of return on total borrowed investment is higher than the rate of interest, the rate of return on the equity component of investment will be higher than the rate of return on total investment.

However, in an uncertain world, the presence of a prior fixed charges reduces the certainty of residual net earnings below the certainty of operating earnings. For simplicity, only two kinds of capitals—pure equity and pure debt—are assumed in this study. We also presumed expected earnings flow contains no growth trends and all existing and proposed investment is homogeneous with respect to quality of yield. The total market value of the firm is equal to the total market value of bonds plus the total market value of stock.

If we ignore the effect of income taxes for the time being, we can have the following conclusions;

1. k_i is simply the effective yield on the firm's bonds, it is the rate at which the market capitalizes the return that the firm offers.
2. k_0 reflects the basic business risk, economic risk and opportunity cost. It reflects the quality of the stream of operating earnings.
3. k_e is the rate at which the anticipated residual flow to owners is assayed in an all equity situation $k_e = k_0$. With some debt in financing structure, the residual flow is subject not only to business risk but to the additional financial risk caused by borrowing.

The rate k_0 can be stated such that k_0 is the weighted average of the cost of equity capital, k_e, and the cost of debt financing, k_i, with stock and bond components of total market value used as weights.

The equity capitalization rate, k_e can be expressed in terms of k_0 plus an adjustment for financial risk. The adjustment for financial risk is equal to the debt-equity ratio times the disperision between k_0 and l_i.

However, we have discussed the relationship between risk characteristics and its application to the cost of capital structure. This relation of risk to cost of capital can not be separable as far as financial management is concerned.

Now what we are interested in is to measure this financial risk characteristics and its application to the cost of capital structure.

The degree of financial leverage reflects financial risk in terms of numeric figures.

The risk figures for the two chosen companies are given as follows. It is computed in such a way that DFL NOI(1-t)/NI,

	Texaco	Phillips
NOI(1-t)	971.430	198,640
NI	916,617	132.316
DEL	1.06	1.50

where DFL = Degree of Financial Leverage.

As shown in the above table, Phillips Oil Company reflects a comparatively higher degree of financial leverage which denotes a more risk situation as compared to Texaco Oil Company as far as financial risk is concerned.

IV. Cost of Capital Structures

The cost of capital structure in relation to risk factors has been discussed in the previous section under the financial risk subsection in terms of the Modigliani-Miller's version.

Under this section, this relationship between risks and cost of capital will be briefly reviewed and discussed as to how this theoretical argument applies to practical cases.

The cost of capital, k_0, is directly related to the minimum required rate of return to the level of business risk involved in financing and investment decision-making. We are trying to ignore some of the complexities of the real world in measuring the cost of capital. Under a realistic situation, it could be wrong to apply a single overall cost of capital. Therefore, we need to adjust for the differences in risk characteristics between the returns offered by the individual investment proposals and the various risks reflected in k_0.

K_e denotes the combined effect of business risk and financial risk contained in the expected equity yield on existing assets. By allowing each new

proposal a different proportion of debt financing varying from zero to a high proportion of debt, it is possible to adjust the overall level of business and financial risk involved in any given proposal so that the net yield it offers can be compared directly against the overall risk reflected in k_e.

We have, so far, discussed the realtionship between the cost of capital and risk, from various point of view, however, there still remains an unsolved problem which needs a powerful proof in the field of financial risk.

It would be, however, an interesting matter to apply these various implications of theoretical issues to practical cases. For the purpose of this objective, costs of capital will be computed as follows:

COST OF CAPITAL

	Average Mkt. Price	Book Value	Market Price	Divident Interest	Yield BT	Yield AT	Weight	Cost of Capital
Texaco Oil Company								
Current liabilities		810,189	810,189				0.066	
Note payable (Current)		366,373	501,373	35,614	0.071	0.045	0.044	0.0028
Note payable (Non-Curr.)		135,000						
Debenture bond, %, '83	71.75	150,000	107,625	5,445	0.072	0.045	0.009	0.0004
Debenture bond, %,'97	85.375	200,000	170,760	11,500	0.07	0.044	0.018	0.0006
Debenture bond, 7.75%, 2001	102.562	200,000	205,120	15,500	0.05	0.047	0.021	0.0008
Common equity (272241) davidend $ 1.60	34.42	6,211,409	9,373,258	435,585		0.109	0.089 1.000	0.8818 0.8864
Phillips Petroleum Company								
Current liabilities		375,873	375,838				0.110	
Notes pay. (Current)		17,327	547,451	62,602	0.09	0.064	0.160	0.007
Notes pay. (Current)		530,124						
Debenture bond, 5.5%,'83	92.50	13,838	12,800	7,040	0.0636	0.045	0.004	0.0002
Debenture bond, 6%, 1981	104.00	20,808	21,640	12,984	0.0546	0.039	0.006	0.0002
Debenture bond, %, 2001	100.53	200,000	200,106	15,200	0.0762	0.054	0.06	0.003
Common equity (74741) dividend $1,30	30.5	1,351,361	2,279,600	821,633		0.124	0.660 1,000	0.09504 0.10954

From the above tables, the following table has been summarized:

Cost of Capital

	Texaco	Phillips
$K_i(1-t)$	0.045(0.071)	0.064(0.09)
K_0	0.89 (——)	0.109(——)
K_e	0.109(——)	0.124(——)

Note: ( ) denotes before tax figure, and tax rate for Texaco is 36.2% and for Phillips 28.5% repectively.

As shown in the above table, Texaco Oil Company reflects more stable than Phillips Oil Company in terms of K_0, K_i, and K_e. Through the study some significant results were found as follows: As far as economic and financial risk characteristics are concerned, Texaco Oil Company reflects more stablity than Phillips Oil Company, however, as for the business risk, Texaco Oil Company reflects more unstablity than Phillips Oil Company. In the specific case study, the business risks for the two companies resulted in the irrelevancy of the cost of capital, however, economic risks reflected were more closely related to the costs of capital structures.

V. Summary and Conclusion

The main objective of this study was to ananlyze the risk characteristics with repect to the cost of capital in the financial decision-making process in private industrial firms. The scope of this study was limited to financing. Therefore, there are some issues uncovered because any financing theory would not be complete in the sense of precision. Very often, the assumptions for financing-decision making model building are away from reality. Unless we can hardly expect the reasonings for being precise.

Under these kinds of limitations, hoping that these limitations may not affect the analysis, however, the application of basic issue to practical cases was attempted. Through this study, most of the cases contained in actual situations fell into the theory covered in this study. However, the matter of business risk associated in this case study could not be proved satisfactorily in all cases. As discussed in this study, Texaco Oil Company was relatively stable and less risky in operation. The proof of this statement implies DFL, K_i, K_0, and K_e regardless of earnings coverage ratio. This kind of study will develop as accounting knowledge increases. As a matter of fact, it would be useful and meaningful to learn this analytical methodology and apply it to practical cases of a private industrial firm's financial analysis.

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