BUSINESS INVESTMENT THEORY AND PRACTICE IN THE UNITED STATES

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I. Introduction.

In an abstract sense, the objective of business investment theory, as will

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be discussed in this study, is to maximize the wealth of the person or group supplying the capital. Wealth-maximization has also been called "net present wealth maximization" and has been defined as "the difference between gross present wealth and the amount of capital investment required to achieve the benefits being discussed."(1) Gross present wealth consists of the sum of future earnings less economic depreciation, interest and taxes discounted by a factor which measures the uncertainty of the estimates. This is a more precise concept than profit maximization because it relates capital investments that occur in the present with uncertain profits that will occur in the future.(2)

It need hardly argued that this is a satisfactory goal from the investor's point of view. From the standpoint of society, it is also a desirable goal for it leads to maximizing the private sector's value of economic output available from a given level of input, measured at market prices. Where management and ownership are separated, there is some question about this objective being identical with management's point of view.(3) Since the owners in developing countries are frequently active as managers, it is easy for the two group to share common goals.

In many developing countries, there are extreme differences in the distribution of income. Those who have money to invest are probably already considered wealthy by their countrymen. How can encouraging them to maximize their wealth by seeking profits benefit the whole country?

Profits theoretically belong to the owners and are a reward for allowing their capital to be invested instead of consumed. The reward also must compensate for the risk of loss. In a developing country the wealthy have

(1) Ezra Solomon, *The Theory of Financial Management* (New York: Columbia Univ. Press, 1963), p. 20

(2) Sang Yong Suh "Economics of Corporate Finance Financial Objectives of the Firm" Memorial Articles for Prof. Lee Sang Whoon (1969) pp. 171-184

(3) Ezra Solomon, *The Theory of Financial Management*, p. 24

many alternative uses for their money: travel, larger houses, foreign cars, provide examples of consumption alternatives. If the opportunity for profits exists, they can be induced to invest in local business which will create employment and payments to other domestic companies for goods and services. If their businesses produce a product that is exportable, they will earn foreign exchange for their country.

Profits are eventually shared with the government through taxes, with the labor force through higher wages, and with suppliers through higher prices for their goods and services.(4) In some cases, owners can maximize profits by increasing the size of their markets through lowering prices and giving the consumer a better product. If profits are sufficient, they encourage owners to reinvest and expand their facilities, bringing another round of benefits.

However, developing countries seldom have the trained manpower or financial resources to engage in investment research on the same scale as developed countries. Student of finance in developing countries study traslations of texts written in the developed countries. as a consequence, financial managers trained in a developing contry are exposed to economic formulations of professers and other technicians from developed countries. This leads to a research question: Does the body of theory related to business investment decision-making for a developed country apply to developing countries?

Therefore, the objective of this study is to provide a theory and a framework within which managers could choose among alternative ways of employing capital. Working toward this goal, the following hypothesis was formulated: The business investment decision-making theory and practice of a developed country can be used to improve business investment

(4) Murray D. Bryce, *Industrial Development* (New York: McGraw Hill Book Company, Inc., 1960), p. 52

decisions in a developing country, although certain modifications may be necessary due to differences in the business and economic environments.

The general approach followed in supporting the hypothesis proceeds by analyzing the business investment theory and practices in developed country-the United States, and contrasting them with a specific developed country-Korea. The U.S. was selected because it has the largest body of literature on business investment theory and practice of any country in the world.

This study, therefore, is consisted of two parts: (I) the business investment theory and practice in the U. S. (II) a general investment theory for Korea. Due to the limited space, the first part of study only will be presented in this paper.

II. How Business Investment decisions should be made in the United States.

There are five general methods of evaluating business investment projects in the United States which are worth discussing because they are either widely used or widely advocated:

1. Payback
2. Accounting Rate of Return
3. Internal Rate of Return
4. Net present value method
5. The MAPI method

A. Methods of measuring profitability of investment proposals

1. Payback.

The first method, payback, involves calculating the period of time it takes a project to repay its original investment. For example, if a project had a cash cost of $ 400, and was expected to provide net cash flows of $ 100 per year in secceeding years, it would have a payback period of four years. Firms using the payback method rank their projects by the payback period, and give those with lower payback period.

Not all firms follow the same methods of calculating payback. Some use an average book investment instead of eash outlay for the investment figure. Instead of net positive cash flows, some firms use average income, before and after income taxes, before and after depreciation, with and without interest costs.(5) None of thses variations are correct because none achieve what payback is intended to do; i. e., measure the period of time it takes to repay the original cost of the investment.

This method is favored by many because of its simplicity, but there are two important disadvantages to the method. It does not take into account the fact that cash proceeds after the payback period for one alternative may be greater than for another. Therefore, if a project cost $ 400 and earned $ 100 for four years, it would have a lower payback period than a project which cost $ 400 and earnd $ 80 per year for ten years, although the latter would have greater total cash proceeds. Also, the first project would earn its cost only and nothing in excess of the cost.

Another disadvantages is that the payback method fails to account for differences in the timing of the cash proceeds received before the payback date. For example, the project that cost $ 400 and had cash proceeds of $ 80 per year for ten years could be compared with another project which cost $ 400, but earned $ 200 the first year, and $ 50 per year during the nest four years, and therefore, $ 80 per year for five years.

Both projects would have the same payback period, five years, the same total proceeds, $ 800, and the same life, ten years; but the project that earned $ 200 the first year would be preferable. This is true for the same reason one would rather have $ 100 today than a year from now: because one could loan or invest the $ 100 and earn on it during the intervening time period a concept called the "time value of money".

(5) Herbert Dougall, "Payback as an aid in capital budgeting," *The Controller*, XXIX(February, 1961), 67.

It would be possible to introduce the time value of money into the payback calculation through discounting the future positive cash flows by an interest factors. The payback period without interest may be formulated as follows:

C= cost of investment

R_t= positive cash flow received in year

Then the payback period is the that satisfies:

$C=R_1+R_2+R_t$

Let i= the interest factor

Then the payback period, considering the time value of money, and assuming that the positive cash flows occur at the end of the year, is the that saisfies:

$$C=\frac{R_1}{(1+i)}1+\frac{R_2}{(1+i)^2}\cdots\cdots\frac{R_t}{(1+i)^t}$$

It seems to be that this has not been done in practice, and would not solve the problem of evaluating positive cash flows after the payback period.

By redefining as the last term in an estimate of all future positive cash flows-not just those sufficient to repay the original cost of the investment-and considering the unknown, the formular can be solved for the interest rate which equates all future positive cash flows with the original cost of the investment. Expressed this way, it has been called the "true rate of return", the "yield", or the "internal rate of return".

The reciprocal of the payback period from the formulation $C=R_1+R_2 \ldots R_t$ has been suggested as an approximation of the rate of return.(6) This depends on assumptions that the annual cash receipts are uniform and that the life of the investment is fairly long. Proof of this proceeds as follows: Where R is equal in every year, the reciprocal of the payback is

(6) Myron j. Gordon, "The Payoff and the Rate of Profit," *Journal of Business*, XXVIII (October, 1955), 253.

$$\frac{1}{t}=\frac{R}{C}[C=tR].$$

The rate of return is:

$$C=\sum_{t=1}^{n}\frac{R}{(1+i)^t}$$

$$C=\frac{R}{i}-\frac{R}{i}\ \frac{1}{(1+i)^n}$$

and $$i=\frac{R}{C}-\frac{R}{C}\ \frac{1}{(1+i)^n}$$

The second term approaches zero as n approaches infinity, demonstrating that the reciprocal of the payback, the true rate of return, and the annual cash receipts divided by the cost of the investment are all approximately equal.

Conditions under which the reciprocal of the payback period would approach the rate of return are uniform annual cash receipts and a project life considerably beyond the payback period. This method could not be used to rank alternatives where the project lives were different, nor where the cash receipt patterns of the alternatives differed. The accuracy of the estimate is a function of the lenth of the project's life.

This can be seen by looking at interest tables:

$$C=\frac{R}{(1+i)}1+\frac{R}{(1+i)^2}\,2=\cdots+\frac{R_n}{(1+i)}n$$

$$\text{or } \$400=\frac{\$\,100}{(1+i)}1+\frac{\$\,100}{(1+i)}\cdots\cdots\frac{\$\,100}{(1+i)^n}$$

$$\text{Where } n=\infty,\ \$\,400=\frac{\$100}{.25}\ \text{from}\ C=\frac{R}{i}-\frac{R}{i}\ \frac{(1)^n}{(1+i)}$$

Substituting various values of n, one can observe how C approaches $400 From interest tables:

Value of n	Value of C (i=25%)	Interest Rate to Equal $400
5 Years	$ 268.93	8%
10 Years	375.05	21%

15 Years	385.98	24%
20 Years	395.39	25%(7)
25 Years	398.49	25%(7)
50 Years	399.99	25%(7)

In the payback example, where cost was $400 and annual proceeds $100 per year, if the project's life were fifteen years (eleven years beyond the payback period), then the reciprocal of the payback would give an estimate within 1% of the true rate of return.

2. Accounting Rate of Return.

Another method of evaluating the profitability of proposed projects involves a comparison of the profit from the project with the investment required, both determined on an accounting book basis. A simple example of this, using figures in the preceding payback example, can be constructed as follows: Cost of asset $400; annual cash flow $100; life of project 5 years; depreciable life of the asset equals the life of the project.

Cash flow before deperciation and income tax	$ 118.46
Depreciation	80.00
Taxable Income	38.46
Income tax	18.46
Profit After Taxes and Depreciation	20.00

Rate of Return (Accounting) $20÷400=5%

(Note: The cash flow in the payback example was calculated by deducting the income tax from the gross cash flow [$ 118.46 less $18.46]).

Since the profit after taxes and depreciation is an average annual figure, some companies divide this by the average net book investment, which in the preceding case would be $200.(8) The rate of return under this method would be 10% ($20÷200).

(7) Approaches 25%, but infinitesimally smaller than 25%.

(8) *Return on Capital as a Guide to Managerial Decisions; N. A. A. Research Report* 35 (National Association of Accountants, Dec. 1, 1959), p. 52

In a study of 44 firms using rate of return calculations, the National Association of accountants determined that companies differed in the amounts they included in investment base. Some included only those charges which would be capitalized. Others included investments incurrent assets if the project exceeded a certain amount. Practice also differed with respect to determining profits. Some companies included overhead charges; others did not. In choosing profits, some used an average of several years' profits, while others estimated profits in a "typical year."(9)

Even if rate of return were calculated in a manner analagous to what would be reported on the books; it would not necessarily give a comparison between what was expected from the project and what actually happened. If an average book investment and profit were used, any single year's results might not be near that average. If a specific year were used, it might be difficult to separate the effects of the project from other items on the books, particularly if overhead had been assigned to the project.

Rate of return methods have the same disadvantages as payback. They do not recognize the time value of money; earnings in the early years are given the same weight as earnings in later years. Unlike payback, they take into account the earnings over the life of the project earnings beyond the payback period.

One of the fallacies of rate of return methods in common use is deduction of depreciation. Since investment decisions are forward looking, only incremental cash flows subsequent to the investment are relevant.(10) Disregarding depreciation, the rate of return based on original investment would be the same as the reciprocal of payback in our example, $\frac{\$100}{\$400}$ =25%, and would be suitable for estimating the true rate of return. Hence, including depreciation is wrong.

(9) *Ibid.*, p. 53

(10) J. Fred Weston, *Managerial Finance*(New York: Holt, Rinehart, and Wnston, Inc., 1962) p. 127.

3. Internal Rate of Return.

If the positive cash flow of a project is viewed as returning the amount of the investment plus something in addition, then the cash flow pattern is similar to the purchase of a bond. Bond purchses are analagous to outlays for investments, and the future cash flows received are a return of principal plus interest. The basic formula for interest where is only one future payment is $S=P(1+i)^n$, where S is the sum, p the principal, i the interest rate, and n the number of compounding periods.

Given any three of the unkowns, the fourth can be found. If there is more than one payment, the formula can be expanded:

$$S_1+S_2\cdots S_n=P_1(1+i)^1+P_2(1+i)^2+\cdots P_n(1+i)^n$$

This can be written:

$$P_1+P_2\cdots+P_n=\frac{S_1}{(1+i)}+\frac{S_2}{(1+i)^2}\cdots+\frac{S_n}{(1+i)^n}$$

If the total of the payments received is considered equal to the cost of investment ($C=P_1+P_2\cdots+P_n$) and future positive cash flows R are considered equal to future sums ($R_1=S_1$), then the payback example can be stated in interest terms as follows:

$$C=\frac{R_1}{(1+i)^1}+\frac{R_2}{(1+i)^2}+\frac{R_3}{(1+i)^3}+\frac{R_4}{(1+i)^4}+\frac{R_5}{(1+i)^5}$$

Knowing that $C=\$400$ from the payback example, and that $R=\$100$, one can use interest tables to find i, which equals slightly less than 8% (an i of 8% gives $C=\$399.27$). In the payback example, all of the R's were equal, but it would not make any difference if they varied. One could find an interest rate which would satisfy the equation.

The first step in evaluating a project under the internal rate of return method consists in establishing the cost of the investment, the future cash flows, and the timing of each. Then, an interest rate is found which equates the positive cash flows with the negative cash flows. The cost of investment has been discussed as though it occurred in one period, but it

is possible to have the cost of the investment, the negative cash flows spread over several years developing a mine, for example. In this case, it would be necessary to apply an interest factor to the negative cash flows also.

In the payback example, the reciprocal of the payback period could be used as an estimate of the true rate of return, or yield of a project if positive cash flows were uniform and the life of the project was sufficiently long. Under the internal rate of return method, the yield is calculated directly instead of by estimation. Obviously, this is a better procedure than using the reciprocal of the payback; and since the IRR takes into account the timing and total amount of cash flows, it is better than payback and return on investment (ARR) for evaluating projects.

4. Net Present value method (NPV).

The net present value method (NPV) is similar to the IRR. The timing of future cash flows has to be estimated. However, instead of determining the yield from the flows, an interest rate is applied to the flows, and their present value is calculated at that interest rate. Using the payback example, the present value of the cost of the investment is $400. because it will be spent now. The present value of the future positive cash flows at 5% interest would be $432.95

Since the present value of future benefits is greater than the present value of the coat, one would accept the project if one wished to earn greater than 5% on investments. Like IRR, the NPV takes into account the timing and total of cash flows, giving an advantage over payback and rate of return on investment for evaluating projects.

5. The MAPI method.

The Machinery and Applied Products Institute (MAPI) has undertaken considerable research to determine a method for evaluating equipment replacement projects. The MAPI method is a result of this research.

The MAPI research tried to devise a reliable technique for assessing the

merits of individual investment proposals and for ranking them in an order of priority. In devising this technique, MAPI made certain simplications with the intention of making the formula easier to use.

The period of analysis was limited to one year, and the alternative to be considered was whether to replace a machine now with another machine or to delay the decision one year. MAPI defended this by saying:

What management usually needs to know is whether there is any period, however brief, for which it is advantageous to go on without the project. If there is such a period (and if a deferment of that duration is practical), it is immaterial that it would be disadvantageous to continue without the project over longer intervals of time.(11)

The rate of return relative to going on without the project for a year is calculated from five magnitudes:

1. The net investment cost of the project, installed cost less any investment released or avoided by it.
2. The next year operating advantage, the increase in operating results from the new project.
3. Next-year's capital consumption avoided, the loss of disposal value from holding for another year the assets that would be retired by the project, plus the next-year capital addition required in its absence.
4. Next-year's capital consumption incurred, the amout by which the remaining use value of the project at the end of the year is below its cost.
5. Next-year's income-tax adjustment, the net increase in income tax resulting from the project.

Calculation of No. 4 is the most difficult since it involves a reduction in the present value of future earnings, which requires a discount rate that rate a which earnings are capitalized. The MAPI method uses a dis-

(11) George Terborgh, ***Business Investment Policy*** (Washington: Machinery and Allied Products Institute, 1968), p. 58.

count rate of 8.25%, based on a capital structure which contains 25% debt at 3% interest, and a 10% after tax return on equity.

The MAPI method is similar to the net present value method with some qualifications. MAPI concentrates on the next year instead of the life of the project. Value beyond the next year are taken into account by using mathematical projections of the earnings of a depreciable asset. MAPI supplies tables based on three different patterns of earnings; increasing with time; decreasing with time; and constant. In the NPV method, these value have to be estimated year by year.

MAPI uses one cost of capital (8.25%) for all firms, while NPV requires that each firm estimate its own. However, if a firm wanted to, it could recalculate the MAPI tables with its own cost of capital. MAPI has tested other costs of capital and found that its tables were not very sensitive to variation in the cost of capital.(12)

The MAPI rate of return is calculated through dividing next year's benefit from the project by the net investment. This is used to rank projects. Management then accepts projects in the order or their ranking until available funds are exhausted. If a firm can obtain funds for less than the rate of return calculated for a project, it is advised to do so.

In summary, the MAPI method is a very special application of the discounted cash flow present value method.MAPI introduces short cuts by letting tables supply values that would otherwise have to be calculated. If one is willing to accept the MAPI assumptions, the method can be used as asubstitute for the net present value method for eAaluating equipment proposals. However, the method is more difficult to explain and comprehend, and this might be a handicap which would keep it from being widely used.

B. The Cost of Captital as a Cut-Off Rate.

In the discussion of discounted cash flow methods, an example project

(12) *Ibid.*, p. 234.

was used which cost $400 and had a yield slightly less than 8% with a present value of $432.95 at a 5% discount rate. What this $400 capital might cost the firm was not determined. In a world of complete certainy with perfect capital markets, the cost of capital would be identical to the interest rate.[13] How does one calculate a cost of capital in the world we have? Once the cost of capital is determined, how should it be used under the two different discounted cash flow methods?

If the yield of a project under IRR is greater than the cost of capital, the project should be accepted. If the present value of future benefits is greater than the present value of the costs when both are discounted at the cost of capital, then the project should be accepted. If the present value of future benefits is greater than the present value of the costs when both are discounted at the cost of capital, then the project should be accepted. The logic of these decision rules is apparent--a firm should make investment that return more than they cost, and a factor should be included for the

LONG ISLAND LIGHTING COMPANY
COST OF CAPITAL 1953

RAISED BY	A. AMOUNT PROVIDED	B. PERCENTAGE OF TOTAL	C. AFTER TAX COST	WEIGHTED AMT. B×C
Bonds	$24,857,500	45.91%	1.69%	77.59
Preferred Stock	9,755,000	18.02	5.38	96.95
Common Stock	10,641,257	19.65	7.40	145.41
INTERNAL FUNDS				
Earnings Retained	2,340,449	16.42	5.92[a]	97.21
Depreciation and Amortization	6,549,791			
	$ 54,143,997	100.00%		417.16
		Weighted average after tax cost		4.17%

[a](7.40) (.80)=5.92

(13) Ezra Solomon, *The Theory of Financial Management*, p. 28.

cost of capital.

1. The weighted average cost of capital.

The cost of capital includes cost of debt and equity financing. In a widely used finance text, the cost of capital is calculated as follows:(14)

Long Island Lighting was selected by the authors because in 1956 it raised funds from the public by using bonds, preferred stock, and common stock. The bonds were sold at less than per value, and their before tax effective interest cost was 3.53%. A corporate tax rate of 52% was used to give an after tax cost of 1.69%. The preferred stock paid a dividend of 5.25% on a price to the public of $ 100. The corporation received $ 98 per share after issuing costs, so the effective dividend rate was 5.38%.

Cost of common stock was based on current earnings per share, divided by the market price, less costs of floating a common stock issue. The cost of retained earnings was the same as the cost of a common stock issue, adjusted for the minimum federal income tax that shareholders would have to pay if the earnings were distributed in dividends. The cost of funds generated from depreciation was the same as for retained earnings, because there was no reason to invest these funds unless they earned at least as much as other retained earnings. Equity was divided between new common, retained earnings, and depreciation on the basis of recent years' retention of earnings.(15)

The weighted average cost of capital should not be calculated from a published balance sheet unless the firm feels that the capital structure on the balance sheet correctly presents the mix of capital sources which should be used by the firm. Balance sheets are representative of a firm's capital structure at a given date, but this structure is changing constantly as debt is repaid and earnings enter the equity section, or new debt

(14) Pearson Hunt, Charles M. Williams and Gordon, Donadson, *Basic Business Finance* (Homewood, Illinois: Richard D. Irwin, INC., 1961), p.626.

(15) *Ibid.*, p. 625.

is obtained.

The balance sheet capital structure by nature moves around the underlying capital structure. Instead of using the balance sheet, the ideal capital structure should be determined by management, taking into consideration the proper balance of income through leverage, risk, and control, given the nature of the business and the characteristics of its stockholders.(16)

Notice that in the Long Island Lighting example, the cost of bonds is the yield, not the coupon rate. The economic principle of opportunity cost dictates that the various parameters be found on a current basis.(17) For current decisions, current cost are relevant.

The logic behind using current yields on bonds and preferred stocks as the cost of capital they represent is apparent. Each represents a series of readily determinable cash outflows from the firm which can be compared to current market values to answer the question: What would be the cost if these were issued now? Unlike bonds and preferred stocks, the future cash outflow attributable to common stock is not readily determinable.

There are two schools of thought about the future cash outflow attributable to common stock. One says that it should be future dividends; the other says it should be future earnings. Those who choose earnings argue that all earnings are property of stockholders. This is what they are promised for their investment.

If management reinvests a portion of the earnings, it is as though these money were paid out to the stockholder and he purchased new equity with it an implied cash outflow and reinvestment. Since the stockholder must pay a personal income tax on dividend income, the cost of common should be anticipated earnings times one minus the marginal personal income tax rate divided by the current price. Marginal income tax rates differ by in-

(16) *Ibid.*,
(17) J. Fred Weston, *Managerial Finance*, p. 232.

dividuals, which means that some rate must be assumed. In Long Island Light, the minimum marginal income tax rate was used.

The other school of thought says that stockholders receive dividends. Reinvested earnings only increase future dividends. Thus, the cost of equity capital has been formulated as the current dividend yield plus the fraction of income retained after taxes times the rate of return on retentions;[18] or $K=\frac{Do}{Po}+br$, where K is the cost of capital, Do the current dividend, Po the current price, b the fraction of earnings retained, and r the return on investment from retained earnings.

Since $\frac{Do}{Po}+br$ represents the sum of earnings paid out in current dividends, plus return on retained earnings which will be paid in future dividends, the sum of the two terms is an earnings stream. If all earnings were paid out, the dividends and earnings stream would be identical. Therefore, the only difference between the two formulations is the *timing*. of when the cash outflows occur.

If all earnings were paid out in dividends, and the stockholders reinvested part of the payment in the firm to finance investment opportunities, then both formulations would be conceptually the same. Earnings intended for reinvestment are not paid out and then reinvested for the practical reasons that the stockholders would have to pay income tax on them, and there would be considerable administrative cost in paying out and then recalling the cash.

Management of the firm, acting in the best interest of the stockholders, should decide how much to pay in dividends and how much to retain for investment. If retention is considered an implied payout reinvestment, then there is no difference between the two viewpoints on either the timing or amounts accruing to the owner of a share of common stock; it is the an-

(18) M. J. Gordon and Eli Shapiro, "Capital Equipment Analysis: The Required Rate of Profit, "*Management Science*, III (October, 1956), pp. 102-110

nual earnings per share.

If current shareholders have a claim to the annual earnings per share, then any additional stock issues must not reduce these earnings per share. Hence, funds from new stock issues employed by the firm in investments must earn as much per share on the new stock as was earned per share before the issue. If not, the earnings of the stockholders will be diluted and management will not be acting in the best interests of the stockholders. Therefore, the cost of capital for common stock in Long Island Lighting is found by dividing current earnings per share by proceeds per share from the issue after flotation costs what the firm has to earn divided by the amount it has to invest.

2. Opportunity cost of capital.

In the Long Island Lighting example, the cost of retained earnings was presented as a function of market price and earnings per share, adjusted for cost of flotation and personal income tax. In retaining earnings, management makes a decision which increases the stockholder's investment in the firm. Looking at the decision from the standpoint of the shareholder, it can be decided if this is in his best interest or not.

At any point in time the stockholder has choice of selling his stock at the market price or retaining it and receiving benefits from the earnings per share accruing to the stock. Since, by retaining the stock, the shareholder gives up the sum he could receive for the sale, the opportunity cost of the decision to hold the stock can be measured by dividing the earnings per share by the market price. The after-tax opportunity cost would be based on earnings per share adjusted by the income tax the stockholder would have to pay of the earnings per share, caculated as if he received them.

Management of the firm should apply the stockholder's opportunity cost in deciding to retain earnings, and should invest earnings in proposals

promising returns higher than the stockholder's opportunity cost.[19] Therefore, the cost of retained earnings and depreciation in the Long Island Lighting example is probably wrong since it includes flotation costs which have nothing to do with the existing stockholder's position. The correct cost would be 5.44% instead of 5.92%··· the market price of $ 17 divided into the earnings per share of $ 1.15 gives a return of 6.8% times one minus the marginal tax rate (1−.2=.3) equals 5.44%.

Another argument justifying earnings per share divided by market price as the opportunity cost of capital from retained earnings looks at the problem the viewpoint of the firm instead of the stockholder.[20] The firm has external opportunities; it can invest in another enterprise within the same industry or in a separate industry.

In any reasonable market, external investments should be available which offer an earnings yield equal to and having the same degree of certainty or uncertainty as those offered by the company's existing assets.[21]

This yield is measured by earnings per share divided by market price, with no adjustment for personal income tax.

The opportunity cost concept based on external opportunities available to the firm is called the "lending" rate. The opportunity cost concept based on the stockholder's opportunities is called "borrowing" rate. Following the line of argument in the preceding paragraph, the borrowing rate is lower than the lending rate because of the personal income tax rate paid on dividends. Therefore, the best alternative opportunity foregone when undertaking an internal investment is measured by the lending rate, assuming there are external opportunities available, and correct cost of equity capital for retained earnings is the lending rate.[22] For Long Island

(19) Ezra Solomon, *op. cit.*, pp. 108-9.
(20) *Ibid.*
(21) *Ibid.*, p. 53.
(22) *Ibid.*

Lighting, this would be 6.8%

It was necessary to introduce the opportunity cost concept in anticipation of problems to be encountered in formulating the cost of capital in a developing country. These problems stem from absence of an effective stock market. In the preceding pages, market values have been important in determining the cost of new common shares and retained earnings. When discussing the cost of capital in a developing country in the latter part of this study, opportunity costs will be have to be developed when there is no market value for the stock.

3. Conclusions on cost of capital.

A cost of capital is necessary to determine whether a business investment project is acceptable or not. It is an integral part of the discounted cash flow methods for evaluating projects. Theoretical methods which do not depend on a cost of capital are inappropriate for developing countries.

United States theory is oriented toward finding cost of capital based on stock market values. Under the circumstances, the cost of capital may be considered an opportunity cost. Since developing countries do not have effective stock markets, their cost of capital will have to be defined as an opportunity cost that does not depend on market values.

C. Summary of United States Theory.

There are only two methods of evaluating investment proposals that take into consideration all the relevant factors and the timing of cash flows from projects: the internal rate of return method and net present value method.[23] Under either method, it is essential to use a cost of capital against which the project is compared.

Discounted cash flow methods (IRR and NPV) and the cost of capital provide a model of how investment decisions should be made. It is a model consistent with economic theory; indeed, those who have contributed most

(23) The both methods (IRR and NPV) are called as discounted cash flow method (DCF).

to the model have been economists. Yet it is a model which is not widely used in the United States.

If there is a valid reason why the theory cannot be applied to business investment decisions, then it would not be suitable for developing countries. If United States managers have found a practical method of evaluating business investments that is better than the theoretical method, then it should be considered for developing countries. The relation between theory and practice will be discussed in the next section.

III. How Business Investment Proposals Are Evaluated in the United States.

Three studies give an insight into how investment proposals are evaluated in large United States Corporations. One study, based on interviews with officials of forty-eight large corporations, showed that discounted cash flow methods, although theoretically superior, were used by only a few firms:[24]

Measure of Acceptability	NUMBER OF FIRMS USING:	
	As Primary Measure	As Supplementary Measure
Time-adjusted rate of return	5	9
MAPI formula	2	0
Simple rate of return	24	3
Payback	13	21
Subjective Judgement	4	44
Total	48	

The interviewer in this study chose to call discounted cash flow a time-adjusted rate of return method, but he acknowledged that they were the same.[25] Only 5 out of 48 large corporations used discounted cash flow

(24) Donald F. Istvan, *Capital Expenditure Decision; How They Are Made in Large Corporations,* Indiana Business Report No. 33 (Bloomington, Indiana: Bureau of Business Research, Graduate School of Business, Indiana University, 1961), p. 96.

(25) *Ibid.*, p. 64.

methods as a primary measure, and only 9 firms used it as a supplementary measure; less than one third used discounted cash flow method at all.

The Machinery and Allied Products Institute conducted a survey of 200 firms in 1948 and 1956. The percentage of firms acknowledging that they use certain methods of evaluating equipment investments was tabulated as follows:(26)

	1948	1956
Payback	42%	60%
Minimum-average-cost	8	24
MAPI	19	47
Discounted rate of return	1	2

Although this was a survey of firms cooperating with MAPI, hence the 47% in 1956 that used MAPI methods versus 2 out of 48 in the Istvan study, again the discounted cash flow methods--called discounted rate of return by MAPI--were not very popular.

Another study of 127 firms went into considerable detail on the types of rate of return calculations that could be used:(27)

Method	Number Using
Payback	66
Discounted cash flow	38
Return on total assets at original cost	59
Return on total assets at book value	0
Return on total asset at original cost less current liability	15
Return on total assets at replacement cost less current liability	1
Return on total assets at book value less current liability	0
Return on net worth	2
Other methods	6

(26) Material and allied Products Institute, *Equipment Replacement and Depreciation--A Survey of Policies and Practices,* (Washington: Machinery and Allied Products Institute, 1946).

(27) James H. Miller, "A Glimps at Practice in Calculating and Using Return on Investment," *N. A. A. Bulletin,* XLII (June, 1960), 20.

Of the 127 companies, 63 used only one method; 36 used two methods; 16 used three; and one used more than three. Therefore, the figures reported add to more than 127.

The three studies cited do not give a representative picture of United States business practice for several seasons. They were not random samples, and they were concentrated on large United States firms. Probably the proportion of firms using discounted cash flow methods in the aggregate was even less than the studies indicate.

There are two possible explanations why discounted cash flow methods are not more popular: They may not be understood by the majority of managers, or they may be understood and it will be only a question of time before they become more widely used.

Payback may appeal to managers because it is easy for them to calculate and they are not aware of its defects. As a model of how to evaluate investment proposals, discounted cash flow methods are superior to the more popular methods. The fact that firms do use some formulation, even though it is wrong, indicates the need for a model.

Payback and rate of return (accounting) may be used because they are older methods than DCF (discounted cash flow). The emphasis on the economics involved in an investment decision seems to date from Joel Dean's *Capital Budgeting* published in 1951. A review of literature published in the area indicates that the next big advance was Ezra Solomon's *The Management of Corporate Capital,* published in 1959. Even at that date there was some misunderstanding about DCF, such as whether yield or present value was better; the discovery that some cash flows gave multiple yields; and the fact that mutually exclusive projects with different lives might be ranked differently, depending on whether yield or present value was used. There are ways of solving all these problems, and the fact that they were problems in the first place indicates an

uncertainty about DCF methods.

In 1960, Bierman and Smidt's *The Capital Budgeting Decision* was published. This book attempted to bring the manager up to data on the theoretical work which had been taking place. As the authors stated:

The purpose of this book is to present for an audience, which may be completely unfamiliar with the technical literature on economic theory or capital budgeting, a clear conception of how to evaluate investment proposals.(28)

Since the empirical studies are from 1960 or earlier, Istvan's study was based on research conducted for his dissertation which was finished in 1959, the empirical information may be out of date. A need exists for a survey to determine the trend as well as the number of firms using specific methods. Judging from what has been published since 1960, one would expect to find the use of DCF increasing because it has receved a large amount of attention and support.(29)

(28) Harold Bierman, Jr., and seymour Smidt, *The Capital Budgeting Decision*,(New York: The Macmillan Company, 1960), pp. v-vi.

(29) A text by Eugene Grant, *Engineering Economy*, published in 1930, urged engineers to use present value methods, and one is hard pressed to explain why it took thirty years for the idea to become popular.

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