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Funding decisions

Fatemeh Farhad*

M.S., Dep. of Industrial Engineering, Amirkabir University of Technology, Tehran, Iran

Maryam Farbod

M.S., Dep. of Industrial Engineering, Amirkabir University of Technology, Tehran, Iran

Shima Amini

M.S., Dep. of Industrial Engineering, Amirkabir University of Technology, Tehran, Iran

Abstract

Funding decision is one of the financial strategic decisions of a corporation. There are also two other financial strategic decisions that a corporation faces, the investment and the dividend decision. This paper describes briefly the investment and the dividend decision, although its main focus is on funding decision. In describing the funding decision the researchers will first explain the sources of funding in a corporation. Then, as funding decision is involved with determining the appropriate combination of the funding sources (debt, preferred stock, common stock, retained earnings), they will discuss about the debt equity ratio in different industries. After that they will describe the size and timing of corporate bond flotation and then they will present one model for corporate funding decision. Finally concentrating on the external sources of funding, they will discuss the funding decision in the perspective of determining optimal capital structure and will explain a mathematical programming model which can be used for determining the optimal capital structure.

Keywords: Financial strategic decision; Investment decision; Funding decision; Dividend decision; Optimal capital structure; Bond flotation; Dept to equity ratio

1. Introduction

The structure of financial strategy consists of three interrelated decisions: the *investment*, the *funding* and the *dividend decision* (Slater and Zwirlein, 1996). Investment is the allocation of capital to competing investment opportunities. The funding decision is concerned with determining the optimal capital structure for the corporation. The dividend decision determines the proportions of earning paid to shareholders, and the proportions retained and reinvested in the corporation. A firm should strive for an optimal combination of the three interrelated decisions in order to maximize shareholder value.

This paper focuses on funding decision and its financing sources with preparing a model for corporate funding decision, while the primary literature on investment and dividend decision is described briefly.

The financing decision must consider different factors such as flexibility, risk, income, inflation, control, and timing. Today's financing decisions will influence tomorrow's financing ones. If the business expects to raise capital in the future, it cannot maximize its use of debt today. We need to provide a cushion so we can have flexibility with future financing decisions. Furthermore, financing with the use of debt will increase the risk. There is a limit to how much debt we can use to finance our business. Too much debt can ultimately lead to bankruptcy. Besides, funding decision can influence earnings and thus affect return on equity. If we are concerned about returns to equity shareholders, then our financing decision will need to be adjusted. Income is also influenced by our ability to take advantage of tax deductions for interest on debt. If we have concerns about control over the organization, then we have to consider how financing will change control. Financing decisions are connected to either

* *Corresponding author. E-mail: f_farhad2003@yahoo.com*

ownership (equity) or creditors (debt). Financing decisions need to be timed to take advantage of the marketplace. What type of securities should be sold? When should they be sold? What length of maturity should be used for debt financing? Another factor to consider in the financing decision is inflation. Using debt financing during periods of high inflation, you will repay the debt with dollars that are worth less. As expectations of inflation increase, the rate of borrowing will increase since creditors must be compensated for a loss in value.

In this paper, the researchers have developed a model of funding decision based on the data on balance sheet of a corporation since all factors that are mentioned above can be pictured in balance sheet. Then, they conclude by offering an optimal capital structure and their thoughts for fruitful future research. In the next section and after a brief describe of investment decision, they begin by competing financing sources which can be raised by external or internal sources.

2. The investment decision

The investment decision at its most fundamental level determines whether the corporation will grow in size, be relatively stable, or possibly shrink.

The difference between the funding and investment decision can be illustrated with an example (Ferrera, 1998).

Consider that a firm has concluded that it should acquire certain factory equipment now, the determination of how the new equipment should be financed is funding decision, in the circumstances that firm can choose between conditional sales; outright purchase with borrowing the amount from bank (long-term or short-term debt); using the retained earnings; issue debt; or combination of these sources, while the decision of whether to acquire the factory new equipment, is investment decision. Most theorists conclude that these two decisions must be kept separate.

3. Funding decision

Funding decision means how to choose sources of funds from a set of financing alternatives, in order to meet the minimum cost of capital and risk and also gain the maximum return (Schall, et. al., 1992). These financing sources used by firms are:

- Debt;
- Preferred stock;
- Common stock;
- Retained earnings.

Debt, preferred stock, and common stock are alike in one essential feature. They are sources of money that are external to the firm and its operations, as opposed to the retained earning, which represent an internal source of funds. Provided that management can convince other people of desirability of investing in or loaning money to the firm, there is virtually no limit to the amount of money that can be raised from external sources. Retained earnings are internal to the firm, and the amount of money that the firm can raise by retaining earning is strictly limited by the profits of the firm and the amount paid in dividends to its owners.

Common stock and retained earnings share an important feature. They are both sources of shareholders' equity, which is to say that they represent money contributed by the firms' owners rather than its creditors or preferred stockholders. The owners of the firm receive income only after all obligations due to its creditors and preferred stockholders have been paid.

3.1. Debt financing

When a business firm raises money by borrowing, it must promise to repay the money borrowed (the principal) plus interest. These principal and interest payments are spelled out in the debt contract, which stipulates when and how much money must be paid by the firm. If the payments are not made on time and in the proper amount, the debt holders can take a variety of action to force payment, depending on the terms of the debt agreement. They may take some of the firms' assets, cause management to be fired, or even force the firm to sell all its assets and thereby force it out of business. They can also legally prevent any payments being made to shareholders (owners) or preferred stockholders before the debt holders have been paid. The debt holders have priority over the other security holders in receiving money from the firm. A second important feature of debt financing is that the amount of money to be paid to the debt holders is limited to what has been specified in the debt agreement. For example, if the firm owes a bank $2 million, which is to be paid in one year with interest of $200,000, the bank must be paid $2.2 million, but only this amount. Third, debt fi-

nancing differs from the other sources in that interest payments are tax-deductible because the effective cost of debt financing is less than the interest rate paid to the debt holders due to the tax deductibility of the interest. Thus, many different types of debt agreements are used by business firms, but these characteristics - priority over other security holders, tax deductibility of interest, and limits on amount - are most important.

If the probability of not receiving the amounts promised is very high, lenders may not be willing to lend money to the firm at all. Even when the probability is moderate, the money may only be lent at a high rate of interest. This is so because the maximum amount the lender receives is the principal plus the interest rate in the debt agreement. The lender may receive much less and must therefore be compensated for this risk by a high interest rate. This suggests that businesses making investments with a high degree of risk may find it difficult and expensive to raise money through debt financing.

3.2. Preferred stock financing

Preferred stock has some characteristics that are intermediate between debt and common stock. Preferred stock is similar to debt in that the payments to the preferred stockholders, preferred dividends are usually limited in amount to a fixed dividend rate per share. However, a few preferred stocks are participating, which means that if the firm has high earnings and is able to pay high dividends to the common stockholders, preferred dividend will be increased. Preferred stockholders must be paid before common stock dividends can be paid; but if no common stock dividends are to be paid, preferred dividends need not necessarily be paid. Unlike debt interest, failure to pay the preferred dividends does not expose the firm to the adverse consequences of failing to pay interest. Also preferred stock rarely has a maturity; the face (par) value need never be repaid by the firm. Interest and principal payments to debt holders have priority over preferred dividends, and preferred dividends are not tax-deductible for the corporation.

The preferred stockholders are protected by several features commonly found in preferred stock agreements. The dividends are usually cumulative, which means that any dividends not paid when due, remain as an obligation of the firm. No dividends to the common stockholders can be paid until all the preferred dividends which are owed to date have been paid. Failure to pay preferred dividends for a specified number of years often permits the preferred stockholders to elect some of the firm's directors and to gain some control over the firm's policies. Finally, if the firm is liquidated, preferred stockholders have priority over the firm's owners. The face value of the preferred stock must be paid to its holders before the common stockholders can receive any proceeds from the sale of the firm's assets.

3.3. Common stock financing

A firm can raise money by issuing common stock and selling the shares to investors, who become owners if they were not already stockholders of the firm. Let us assume here that a firm raising money by issuing common stock is selling the stock to new investors as opposed to its existing owners ("old" owners).

The rate of common stock divides the ownership of the firm into two parts: that part owned by the old owners and that part owned by the purchasers of new stock. Suppose that 20,000 shares are held by the old owners and an additional 5,000 shares are sold. There would now be 25,000 shares outstanding. The original owners who had 100 percent of the firm now have only 80 percent (20,000/25,000), and the new shareholders who bought 5,000 shares have 20 percent (5,000/25,000). If the firm now pays $100,000 in dividends the money must be distributed equally among the shares. In this example, the old shareholders would be entitled to 80 percent of $100,000 while the new shareholders entitled to 20 percent of $100,000.

The amount of money raised by issuing a given number of new shares depends on what the new shareholders believe their proportionate interest in the firm is worth. Suppose that the total value of the firm's stock after financing (therefore, including the new shares) and investment has taken place, expected to be $1 million. The new shareholders would then be willing to pay 20 percent of $1 million, or $200,000, to the firm for 5,000 shares. This amounts to $40 per share ($200,000/5,000). In practice, management decides how much money is needed ($200,000) estimates the price that new investors will be willing to pay for the shares ($40), and from this information determines the number of shares that must be issued (5,000).

The shareholders as owners have voting rights though which they elect the firm's directors, who determines corporate policy and affect the shareholders' earnings. The new shareholders therefore

acquire 20 percent of the voting power. In many cases the firms are reluctant to sell common stock because the new shareholders may not agree with the policies followed by the management elected by the old shareholders. This is especially true for small businesses where the old shareholders usually are the firm's management. For example, the president of a small company who is also its largest shareholders might lose control of the business if the company sold a large enough number of shares to other people. The new shareholders could then determine policy or even fire the president.

A major advantage of common stock financing over debt financing is the absence of any requirement to make payments to the shareholders. If the firm borrows money and then runs short of cash when a debt payment comes due, it may have to sell some of its assets to make the payment or even be forced out of business by the creditors. On the other hand, the firm does not have to pay dividends to its shareholders; and it never has to repay the money the new shareholders invested. The owners of common stock who wish to get back their original investment must either find someone to buy their stock or try to have the company liquidated. Common stock financing has only slight advantages over preferred stock financing in these respects since failure to pay a preferred dividend is not nearly, so serious as failure to pay interest, and the money obtained from sale of preferred stock need never be repaid.

3.4. Retained earnings

Retained earnings are the profits remaining in the firm after the dividends are paid. As we indicated earlier, the major differences between retained earnings and the other three financing sources are that retained earnings are limited in the amount available but do not require the bringing in of "outsiders" (lenders or stock holders). However, financing with retained earnings reduces the dividends that can be paid to the firm's current owners. This means that the availability of retained earnings depends not only on the earning of the firm, but also on the policies of the firm regarding dividends payments. We should only note that firms generally try to avoid reducing their level of dividends payments even in the face of temporary reductions in earnings. This policy makes the amount of retained earnings (profits less dividends) available in any given year highly variable with profits. Therefore, the financial manager cannot rely on the availability of this source to finance investment.

Although it reduces the current money available for dividends, using retained earnings increases the future amount of money available for dividends to the current owners. The reason for this is that the firm uses debt, it must pay the lenders interest in the future, thereby reducing the money available for future dividends; and if preferred stock is issued, preferred dividends must be paid in the future. If common stock financing is used, future dividends must be paid to the new shareholders as well as to the old ones. For example, if the new shareholders own 20 percent of the outstanding shares and the firm planned to pay $100,000 in dividends next year, the old shareholders would receive only 80 percent of $100,000 or $80,000. If retained earnings had been used instead of common stock financing, the original shareholders would have receive the entire $100,000 next year in return for receiving lower dividends now. Of course, the basic reason for raising money by any method is to undertake investment projects that are expected to provide high enough returns to benefit current shareholders regardless of the financing method used.

It is also important to realize that the firm does not have to rely exclusively on the earnings retained from the current year's profits. Most management forecast their investment needs several years into the future. Given this forecast, it is possible to begin to retained earnings and temporarily invest on financial assets prior to the planned investment in profitable opportunities.

Retained earnings substitute most directly as an alternative to the common stock, since both represent investment by owners (old or new) of the firm. However the use of common stock may present problems in maintaining control of the firm by the original share holders. For this reason, many small firms avoid common stock issues. Also, the firm must pay various fees and costs to issue stock which are avoided when retained earnings are used.

3.4.1. Retained earning and external sources of funding

Debt, preferred stock financing, and common stock financing force the financial manager to bargain with "outsiders". Lenders and investors must be convinced of the stability and profitability of the firm's present operations and of the desirability of new investment if they are to provide money at a reasonable cost to the firm and its present owners. The precise terms of these external financing sources will be determined by negotiations between

management and the people providing the money. In any case, the use of external financing reduces the future income available to the present owners. Financing investment by reducing cash and securities accumulated from the earnings of prior periods and by retaining cash generated from current operations does not present these difficulties. Instead the problem is to convince current shareholders (and perhaps current lenders) that the funds are best used for investment rather than for paying the dividends or repaying debt before it is due. Usually this is an easier task because current shareholders and debt holders have already made a commitment to the future of the firm. Indeed, the firm has no legal obligation to pay debt holders prior to the scheduled principal and interest payments. The shareholders present a different problem, however.

The following type of problem has arisen for a large number of firms. Suppose the shareholders have become accustomed to receiving on average, about 50 percent of the profits as dividends. Profits and dividends have been growing at an average rate of 5 percent per year for several years. Management is about to embark on a major capital expenditure program which will probably continue for several years. New products will be manufactured and production facilities will be expanded. Management anticipates that these will be profitable investments to make, although only the current opportunities have been evaluated in detail. In any case, some current decisions will commit the firm to investigating large amounts of money for two or three years. Based on forecasts of current and future cash flows, a continuation of the 50 percent payout of dividends would imply substantial external financing, at least part of which would have to be in the form of common stock. The use of debt to cover all additional requirements would, in management's judgment, be unwise, as the required amounts would subject the firm to excessive risk. The resulting capital structure would be outside the optimal range.

Given this circumstances, should management change the dividend policy of the firm to provide additional internal funds, plan to issue common stock as needed in the face of the uncertainties of future market conditions, try to borrow more money, or reduce the investments? Notice that each of the above alternatives implies a cost to the current shareholders.

The foregoing profitable investments are not in the best interest of the stock holders unless there is no way to finance them at a reasonable cost. It has been shown how the use of too much debt places the firm in a vulnerable position and will produce a lower value of the firm's stock. As many financial theorists and managers agree, usually the shareholders would be better off receiving lower dividends than having the firm issue common stock. This is so for several reasons:

- If the firm retains earnings instead of paying higher dividends and issuing stock, the price per share of stock should be higher since earning per share and future dividends per share will be higher if the new stock is not issued. The shareholders could therefore get cash benefits from the investment by selling some or their stock. They would receive capital gains on the stock rather than dividends, and a dollar of capital gains is worth more after personal taxes than is a dollar of dividends, since capital gains are taxed at a lower rate than dividends. This comment applies to the average wealthy investor at high tax rates, but it does not apply to the investors in lower personal tax brackets.
- There is a variety of costs (legal fees, commissions, etc.) associated with issuing common stock. These costs do vary with the size of the stock issue, the highest cost being associated with smallest issues.
- Temporarily investing retained earnings in marketable securities for the purposes of future investment increases both the safety of the firm and its financial flexibility. When the investment is to be made, the securities are liquidated and the proceeds used to finance the capital expenditure. On the other hand, if conditions change for the worse, sale of these securities brings cash quickly to meet debt payments, pay dividends, or pay expenses. Moreover, the existence of these funds does not preclude other financing, if desirable. Their absence forces management to seek external sources to finance investment.
- Sale of common stock may create control problems for the current owners of the firm.

Accordingly, we can see that there are sound reasons for preferring finance investment through funds generated from operations and accumulated as marketable securities.

Despite the usual advantages to financing with retained earnings, this method of financing is not

always possible or desirable. Shareholders may react very negatively to receiving lower dividends payments. It is one thing not to increase dividends as earning rises and another to reduce them from the prior levels. Shareholders may depend upon a given level of dividends, and reducing the dividends may force them to sell shares (and incur brokerage fees) to finance personal expenditures. The higher prices for the firm's stock due to the investment program may not be achieved immediately, and shareholders could be hurt under these conditions. Also, a reduction in dividends may actually cause temporary declines in the firm's stock. Investors may interpret the reduction of the dividend as evidence of weakness in the firm.

It may also be true that amount of money available from not paying dividends would not be sufficient to avoid issuing some stock if the investment program is to be maintained. Under these conditions, management is likely to be reluctant to risk even temporary declines in the stock price and may continue to pay dividends to support the price. Management will attempt to achieve a balance between the dividends paid and the increased number of shares needed to be sold. It should be clear that in effect some of the proceeds from the sale of common stock are being used to pay dividends any time a firm issued stock and also pays a dividend. This is not an uncommon event.

3.5. Some facts about industry debt ratios

Debt ratios[1] vary across industries. For example, the large, integrated oil companies have relied mostly on debt for external financing. Many of these companies have simultaneously retired equity through share repurchases. Exxon spent $29 billion on share repurchases from the mid-1980s to its merger with Mobil in 1999.

Other relatively heavy debt users include the utility, chemical, transportation, telecommunications, forest products and real estate development industries (Myers, 2001).

At the other extreme, the major pharmaceutical companies typically operate at negative debt ratios: their holdings of cash and marketable securities exceed their outstanding debt, so they are net lenders. Other net lenders include Ford Motor Co., which has roughly $25 billion of cash and marketable securities in 2000 vs. $10 billion of outstanding debt. Debt ratios are also low or negative for many prominent growth companies. At mid-year 2000, Microsoft had no long-term debt but held $24 billion in cash and marketable securities (Myers, 2001).

In general, industry debt ratios are low or negative when profitability and business risk are high. Intangible assets are also associated with low debt ratios. For example marketing and advertising intensive companies such as Procter & Gamble have traditionally operated at low debt ratios. Their profits flow mainly from intangible assets. Firm with valuable growth opportunities also tend to have low debt ratios (Myers, 2001).

3.6. Size and timing of corporate bond flotation

As mentioned, most theorists agree that a firm will have some debt in its capital structure, recognizing the tax advantage of debt financing. Suppose that investment opportunities offering positive net present values exceed the amount of available internal financing in a firm. Management may either impose a capital budget constraint or finance externally.

Also, assume that management chooses additional long-term debt from external financial sources which include debt, preferred stock, common stock or different combination of these securities. Here, we will delineate the question of the optimal size and timing of long-term debt issues.

There are economics of scale, both internal and external to the firm, in floating long-term debt. This suggests that total flotation costs[2] may be approximated by a fixed cost component and a variable cost component proportional to the size of issue. Externally, total underwriting costs are a decreasing percentage of the size of the flotation. Internally, economies of scale arise from the time corporate executive spend in arranging a flotation and from subconscious anxieties they may have of the investigatory inquiries that precede flotation.

Optimizing the size and timing of debt issue is a cost minimization problem that involves a trade off between fixed flotation costs and net interest costs. The problem of when to float a new bond issues is analogous to the manufacturing problem of deter-

[1] Ratios of debt to the some of debt and equity financing.

[2] Flotation costs of public issue of bonds consist of compensation to security dealer and other expenses. The latter are paid by corporation and include: revenue stamps, securities and exchange commission fees, tax and fees, trusts tees` fees, printing and engraving costs, legal fees, accounting expenses, officer and the other employee time consumed in the offering.

mining when to reorder inventory, and both cases require that the economic order quantity be calculated. The fixed costs associated with a flotation are analogous to the fixed cost of reordering inventory. The difference between the rate of interest the firms pay on its long-term debt and the rate of interest it receives from holding commercial paper is analogous to the holding cost associated with physical inventory (Lienberger and Rtenburg, 1972).

The firm's annual demand for external long-term debt is stochastic and because it has been forecast to change over time, is nonstationary. Stochastic, nonstationary problem is difficult to solve, so simple solutions can be found using either deterministic or stationary approximation. Following, the researchers examine the four possible assumptions on the firms demand for external long-term debt.

3.6.1. Stationary and deterministic demand

The firm is assumed to know its annual demand for additional capital, which will be the same each year (stationary demand). The difference between the capital raised and the capital required is kept in short-term liquid assets which are presumed to yield less than the cost of the long-term capital. This difference is the cost of carrying excess liquidity.

The continuous requirement for external capital eats into the inventory of excess liquidity. When the excess liquidity is consumed, a new flotation must be arranged. Small frequent flotations incur a low carrying cost but the fixed cost of each flotation sums rapidly. Infrequent large flotations incur large carrying costs but save on flotation costs. An optimum lies between these two extremes.

The Wilson economic lot size model can be applied to determine the optimal size of debt issues. We assume that firms pay interest on the average amount of its short-term borrowing. Let:

D Annual demand for external debt funds,

F Fixed cost of flotation,

i Difference between the firm's long-term borrowing rate and the rate of return on short-term commercial paper,

Π Difference between the firm's short-term and long-term borrowing rate,

S Optimal size of flotation,

T Time between two flotations.

Then, the optimal size of flotation is as follows [1]:

$$S^* = \sqrt{2FD\left(\frac{1}{i}+\frac{1}{\Pi}\right)} \tag{1}$$

$$T = \sqrt{2\frac{F}{D}\left(\frac{1}{i}+\frac{1}{\Pi}\right)} \tag{2}$$

And the firms should issue debt when the amount of short-term borrowing reaches:

$$\sqrt{\frac{2FD}{\Pi}\left(\frac{i}{i+\Pi}\right)} \tag{3}$$

For example, assume a situation when a corporation forecasts cash needs of 180000000$ a year for the foreseeable future (Bierman, 1964). It is currently pay 0.05 per year for long-term debt and can earn 0.04 on the funds by investing in short-term securities so the net cost of carrying the inventory of cash is 0.01.the fixed cost of floating a bond issue is100000$. Short-term borrowing rate is 0.065. The optimum amount of debt to be issued each time is:

$$S^* = \sqrt{2FD\left(\frac{1}{i}+\frac{1}{\Pi}\right)}$$

$$= \sqrt{2*18*10^7*10^5\left(\frac{1}{0.01}+\frac{1}{0.015}\right)}$$

$$= 61.96*10^6 \ \$$$

$$T^* = \frac{S}{D} = \frac{61.965*10^6}{10^7} = 6.196 \quad \text{Year}$$

3.6.2. Stochastic but stationary demand

Some firms can forecast a relatively stable probability distribution of demand for external funds into future (on the average they will require the same inflow each year). For these firms a stationary

[1] See Lienberger and Rtenburg (1972) for a detailed description of this formula.

model may reasonably characterize their demand for external funds.

The optimization of the size and timing of long-term debt involves a trade-off between fixed flotation costs and expected net interest cost. The firm's expected net interest cost may be dichotomizing as: (1) the cost of holding short-term securities (difference between long-term borrowing cost and short-term interest returns), and (2) the cost of short-term borrowing (shortage costs). The latter interest cost arises from the stochastic nature of the firm's demand for external funds. Further, there is a positive lead time[1] associated with arranging a debt flotation which includes the time required for preliminary consultations with the firm's investment banker, the time required for preparation of registration and the usual waiting period before the debt issue can be offered publicly.

The firm's level of short-term liquid assets may be depleted in the interim, forcing the firm to resort to short-term borrowing and/or to postpone capital outlays.

However, commercial bank are often reluctant to give short–term loan to finance, so the following analysis assumes that the costs of delay may be approximated using a single penalty rate. In the absence of short-term borrowing, this penalty rate would be equal to the difference between the certainty equivalent rate of return on the postponed capital projects and the long-term borrowing rate. The ensuing analysis uses a stochastic, continuous review, inventory model to determine the optimal size of a debt issue. We assume that the cost of borrowing is known, but demand for funds is stochastic. Let:

S The size of firm's flotations,

F The fixed cost associated with a flotation,

D The firm's expected annual demand for external funds,

i The difference between the firm's long-term borrowing rate and the rate of return on short-term commercial paper,

r Penalty rate associated with funds' shortage,

A The critical level of short-term liquid assets that triggers arranging a long-term debt flotation,

DL The firm's expected annual demand for external funds during the lead time associated with a debt issue,

QL The firm's annual demand for funds during the lead time,

PL(QL) The probability distribution of the firm's demand for external funds during the lead time.

Then the optimal sizing of debt issue can be calculated by:

$$S^{*}=\sqrt{\frac{2FD}{i}+DL+\frac{2Dr}{i}\sum_{QL>A}(QL-A)PL(QL)} \quad (4)$$

The optimal level liquid assets, at which the firm should arrange a debt issue, A*, is in selecting A*= A such that:

$$PL(A)=1-\frac{iS}{\frac{iDL}{2}+Dr} \quad (5)$$

The size of a debt issue and the trigger level of liquid assets are optimal if they simultaneously satisfy (4) and (5). A simple algorithmic solution procedure involves three steps:

- Let the initial trial value of the size of the flotation be $S=\sqrt{2FD\left(\frac{1}{i}\right)}$
- Use the current trial value for S to find in (5) a corresponding trial for A.
- Stop if the new trial value for A is the same as its previous value. If not, use (4) to calculate a new trial value of S and return to step 2.

Without specifying the form of the probability distribution PL (QL) of the firm's demand for external funds during the lead time, analyzing the optima solution is impossible.

Under the assumption that the probability distribution of the firm's demand for external debt funds can be approximated by a normal distribution, an increase (decrease) in either the expected average annual demand, the lead time, or the variance of the average annual demand would increase (decrease) both the optimal size of debt issue and the optimal

[1] Lead time is from the moment the decision was made to float an issue to the day on which the firm actually receives the money.

level of liquid assets. An increase (decrease) in the firm's cost of short-term borrowing would decrease (increase) the optimal size of debt issue and increase (decrease) the optimal level of liquid assets. A decrease (increase) in the fixed cost associated with flotation would decrease (increase) the optimal critical level of liquid assets and the optimal flotation size.

3.6.3. Nonstationary but deterministic demand

In some firms there is such a commitment to a long-range capital expenditure plan that the need for external funds can be forecast with relative certainty. Of curse, each year of the forecast will be different; usually, it would increase as the firm grows larger. A nonstationary deterministic model may provide a reasonable characterization of the external debt financing decisions faced by such firms.

It is easy to prove that in an optimal flow of funds, there will be a unique path from each annual demand to the source. Furthermore, as in inventory problems, it is sensible to group adjacent demand periods so we can use the procedure developed by Richtera *et al.* (1958) for inventory problems in order to deal with this problem. This approach is simple enough to do by hand if no computer is available. We can designate a starting and an ending period for a funding, without simultaneously having to specify when the funding will occur. Periods between the start and the funding will be satisfied by short-term loans and periods after funding until the ending period will be supplied by carried liquid assets. Within this starting and ending period, the optimal time to raise funds can be determined without affecting (or being affect by) time periods beyond this purview. Further, we can consider different rates on long-term and short-term borrowing for different periods. By calculating the cost of different arrangement for bond flotations, we can find the cheapest route.

For example, assume that we plan for n periods of time and we know the required external capital for each period. By considering 2^{n-1} orders and calculating the relative cost of floating debt to supply the demands, we can find the best solution.

3.6.4. Nonstationary and stochastic

A corporation may be able to estimate its future requirements for external capital and frequently its estimates may differ from year to year in a nonstationary fashion. However, less confidence is often place in more distant predictions, but we can assume that the firm's annual external capital requirements are predicted as probability distributions whose variances usually increase with time.

For these firms, simulations provide a good means to explore the timing and sizing of flotations, but two simplifications exist. First, if flotations must be in integer ten million dollars, the number of points to evaluate is vastly reduced. Second, the simulation can be preceded by hybrid stochastic nonstationary analysis so that a reasonable solution is known. The simulation is then to try integer flotations "in the region" of hybrid solution. The key purpose of the simulation would be to evaluate a repertoire of responses to stochastic possibilities.

We should mention that in the event that flotations recommended more frequently than once a year (considered important by financial community), we should replace the above continuous review models by appropriate periodic review inventory model.

3.7. A model of corporate funding decision

Several empirical studies to date have worked on the corporate funding patterns try to explain changes in various balance sheet items. All but Spies' (1974) study take the size of the external financing deficit as exogenous and seek to explain the composition of financing. Jaffee (1971) aggregates the financing sources into long-term and short-term categories, while Bosworth' studies (1971) have separate bond issues, stock issues, change in short-term debt and changes in liquid assets.

Spies takes only cash flow as given and formulates additional equations for dividend and changes in physical assets. Each of the studies assume that there are balance sheet target toward which firms slowly adjust but, none of them make systematic considering of optimal capital structure.

In this part, we present the integrated model of corporate funding patterns which developed by Taggart (1977). This model places the theory of Modigliani and Miller for optimal capital structure in the context of the overall funding decision. The decision to be explained can be pictured in the simplified balance sheet as Figure 1.

All the financial items have been placed on the right side of the balance sheet while real assets appear on the left.

NWA	Net Working Assets (= inventories, net trade credit and other assets)	**- LIQ**	Liquid Assets	**TC** Temporary Capital
		SDBT	Short-term Debt	
		LDBT	Long-term Debt	**PCB** Permanent Capital
NK	Net Capital Stock (= gross capital stock minus accumulated depreciation)	**E**	Equity (= cumulative gross stock issues minus cumulative stock retirement plus cumulative retained earnings)	
A	Net Assets	**A**		

Figure 1. Corporation balance sheet.

This scheme separates firms' real uses of funds from their possible funding sources. Liquid assets are placed on the right side, preceded by a negative sign, because it is considered as a source of funds. Total net assets, A, are then understood to be net of liquid assets. Change in the balance sheet items in any period are constrained by the sources and uses identity:

$$\Delta A = \Delta NWA + \Delta NK = \Delta SDBT + \Delta LDBT + \Delta E - \Delta LIQ \quad (6)$$

Each period's change in equity can be decomposed into gross stock issues, GSTK, stock retirements, SRET or retention of earnings, RE:

$$\Delta E = \Delta GSTK + RE - SRET \quad (7)$$

So the sources and uses identify can be rewritten as:

$$\Delta A - RE = \Delta SDBT + \Delta LDBT + \Delta GSTK - SRET - \Delta LIQ \quad (8)$$

That is, to the extent that firms' expenditures on plant and equipment and working exceed their cash flow (ΔA – RE will be taken as exogenous), they incur an external financing deficit which must be made up by changes in the five right-hand side items.

Although market values will be a determinant of the firm's actions, it is the book value that they control. If more funding is required, firms can increase the book value of their permanent capital, PCB (long-term debt plus equity), or they can increase their temporary capital, TC (short-term debt minus liquid assets). Change in permanent capital will be represented by the stock-adjustment equation[1] (Greenberg, 1964), where PCB* is the desired permanent capital, PCB_{-1} is the latest PCB in balance sheet and RT is the interest rate timing variable[2]:

$$\Delta PCB = \delta_1 (PCB^* - PCB_{-1} - RE) + \delta_2 RT + RE \quad (9)$$

Although there is not a rigorous theory of the optimal term structure of corporate liabilities, it is frequently suggested that firms hedge against changes in interest rates by financing permanent assets with long-term sources of funds. Under this policy, firms will wish to finance all their fixed capital, NK, and the permanent portion of their working assets, NWA_P, with long-term funds, so:

$$PCB^* = NK + NWA_P \quad (10)$$

That is movements in the target will affect permanent capital flows in (9), but interest rate timing considerations, RT, may exert an opposing influence. If firms expect long-term rates to decline, for example, it may be better to postpone raising long-term funds and borrow short in the interim.

[1] The stock-adjustment mechanism can be rationalized as an attempt to balance costs of adjustment against the costs of being out of equilibrium. In stock-adjustment model, the firm partially moves toward its desired position with the coefficient of adjustment allowed to vary by firm and year.

[2] This study follows previous studies in using the stock-adjustment model. The stock-adjustment mechanism can be rationalized as an attempt to balance costs of adjustment against the costs of being out of equilibrium. See Taggert, loc. Cit., for further discussion.

The current period's retained earnings, RE, are also included in (9) since the book value of equity rises as earnings are retained and the level of permanent capital is augmented.[1] Once adjustments in permanent capital are known, changes in temporary capital are determined as a residual. Because PCB* and TC* must sum to A, while ΔPCB and ΔTC must sum to ΔA, It follows that:

$$\Delta TC=\delta_1(TC^*-TC_{-1})+(1-\delta_1)(\Delta A-RE)-\delta_2 RT \quad (11)$$

According to (6), temporary capital adjusts to its target at the same speed as permanent capital.

Any part of external funding deficit which is not made up by changes in PCB, must be necessarily be made up by changes in temporary capital. Likewise, timing considerations must be the opposite of those for permanent capital.

The composition of PCB will be governed by the desired debt-equity ratio, which in turn depends on the market value of the firms' debt, LDM, and the market value of their equity, STOCK. The desired ratio will be defined by:

$$\left(\frac{LDM}{STOCK}\right)^* = b \quad (12)$$

where b is determined by the trade-off between tax savings and expected bankruptcy costs. This market value target must be translated into target for the book value of long-term debt, LDBT*. If $\bar{i}$ is the average contractual interest rate on long-term debt outstanding, and i is the current new issue rate on long-term debt, the market value of the debt is approximately:

$$LDM = \frac{LDBT\,\bar{i}}{i} \quad (13)$$

From (12) and (13), the target level of LDBT can be formulated as:

$$LDBT^*=bSTOCK\left(\frac{i}{\bar{i}}\right) \quad (14)$$

Adjustment in LDBT will now be governed by two targets. As a part of PCB, LDBT will be affected by the permanent capital target, but it will also be influenced by the desired split of PCB between long-term debt and equity. Interest rate timing considerations will affect long-term debt issues, and in addition short-term movements in the stock prices may affect the timing of bond issues. If the stock market is unusually depressed, bond issues may be temporarily substituted for stock issues, so a stock market variable, STOCKT, will be included. The adjustment equation for LDBT will now read:

$$\Delta LDBT = \alpha_1(LDBT^* - LDBT_{-1}) \quad (15)$$
$$+\alpha_2(PCB^* - PCB_{-1} - RE)+\alpha_3 STOCKT+\alpha_4 RT$$

Long-term debt issues will be simulated by a shortfall of actual LDBT from its target level, LDBT*, and also by a shortfall in permanent capital and these two effects can pull in opposite directions. If LDBT* increases faster than assets in place, bond issues will be restrained by the immediate need for permanent capital. Stock issues and retirements, the remaining components of PCB, will be governed by the same considerations:

$$\Delta GSTK = \beta_1(LDBT^* - LDBT_{-1}) + \beta_2(PCB^* - PCB_{-1} - RE) + \beta_3 STOCKT + \beta_4 RT \quad (16)$$

$$SRET = \eta_1(LDBT^* - LDBT_{-1}) + \eta_2(PCB^* - PCB_{-1} - RE) + \eta_4 RT \quad (17)$$

Together, (15), (16) and (17) allow for the substitution of debt for equity when the market value of the firms' stock goes up, but the extent of this substitution is restrained by the inflow of retained earnings and accumulation of permanent assets.

Changes in temporary capital can be decomposed into changes in liquid assets and changes in short-term debt. The equations for ΔLIQ and ΔSDBT will be similar in appearance to (11), but an additional target will be specified for the stock of liquid assets. Liquid assets are necessary to conduct transactions, and their target level should be positively related the level of sales. Interest rates should also enter, since these would determine the cost of maintaining any given level of liquid assets, so the liquid assets target will take the form:

$$LIQ^*=c_1 SALES+c_2 RATE \quad (18)$$

[1] It is assumed that dividend policy is determined independently of financing considerations.

where RATE represents an interest rate variable. Since the stock of liquid assets can be changed quickly and relatively cheaply, even if short-term borrowing must be undertaken to finance them, it will be hypothesized that there is no lag in adjustment to the liquid assets target, so changes in liquid assets will be simply be influenced by changes in LIQ*. There will still be partial adjustment to the temporary capital target, though, so the complete equation reads:

$$\Delta LIQ = \Delta LIQ^{*} + \gamma_2 (TC^{*} - TC_{-1}) + \gamma_3 (\Delta A - RE) + \gamma_4 RT \quad (19)$$

Once (14) is specified, the adjustment equation for short-term debt is determined by the condition that short-term debt minus liquid assets equals temporary capital:

$$\Delta SDBT = \Delta LIQ^{*} + \lambda_2 (TC^{*} - TC_{-1}) + \lambda_3 (\Delta A - RE) + \lambda_4 RT \quad (20)$$

The equations estimated are (10), (11), (12), (14) and (15). The data (balance sheet data) for estimating coefficients are taken from benchmark organizations or if not exist, the last years' data of the firm is used.

The remaining to be constructed are market values of long-term debt and equity, the stock market timing variable, STOCKT, and the interest rate timing variable, RT. The market value of long-term is constructed using the approximation given in Equation (8). The market value of equity is approximated by taking dividend payments and capitalizing them with a dividend yield series for standard stocks.

The market value of equity was also used in constructing the stock market timing variable. This consists of the average market value of equity over the last two quarters divided by the average market value over the last twelve quarters. Low values of this variable would be the indications that stock prices are unusually depressed, which in turn would stimulate a substitution of bond issues for stock issues. Hence the coefficient of STOCKT is expected to be negative in the bond issue equation and positive in the stock issue equation. The interest rate variable used in the target for liquid is a series on commercial loan rates from public bulletin. For estimating interest rate timing variable, RT, the variable WDRCP, a weighted average of the two most recent quarter` changes in the commercial paper rate , is used. Other estimations can be derived from balance sheet.

After gathering needed data, they are entered into statistical software like Matlab and the estimated coefficient for Equations (10), (11), (12), (14) and (15) will be presented. Further, Zellner (1962) has suggested a technique which exploits correlations between equations to achieve more efficient estimates. The obtained model helps managers to supply the demand for external financing by changes in the five right-hand side items of balance sheet.

3.8. Capital structure

The study of capital structure attempts to explain the mixture of securities and financing sources used by corporations to finance real investments. The most well known theories for capital structure or corporate financing are trade-off theory, pecking order and cash flow theory. In these models a firm's history plays an important role in determining its financial structure (Romano, et. al., 1997).

In trade-off models optimal capital structure are determined by trading off the benefits (tax deductibility of interest expenses, reduced agency costs of free cash flow) and costs (bankruptcy and distress costs) of debt financing and at the margin equate the two. So a decision maker running a firm evaluates the various costs and benefits of alternative leverage plans and interior solution obtained so that the marginal costs and benefits are balanced. Firms also can choose target ratios that reflect the benefits and costs of debt financing. This means firms that follow the trade-off theory sets a target debt-to-value and then gradually moves toward the target. Trade-off theory used for the hypothesis that bankruptcy and taxes are the key factors that determine leverage.

Pecking order models emphasis on the order of source financing. According to Myers (2001), a firm is said to follow a pecking order if it prefers internal to external financing and debt to equity if external financing is used. So it is financing deficit that drives debt issues.

Free cash flow theory says that dangerously high debt levels will increase value, despite the threat of financial distress, when a firm's operating cash flow significantly exceeds its profitable investment opportunities. This theory attempts to answer the questions:

- Where did the cash come from, and where did it go?
- How much of that cash is (or might be) available to investors (both equity holders and debt holders)?
- How much investment is required on an ongoing basis to maintain and grow these cash flows?

Each theory has its successes and failures in coming to grips with reality when checked by empirical works, but they can be understood a point of view mean that each provide a guide for development of models since different models based upon these theories or combination of them.

Following, we explain one of the well-known models of optimal capital structure based on trade-off theory, but before that it is appropriate to mention the factors that have influence over the capital structure of the firm.

According to Harris and Raviv (1989), the leverage increases with fixed assets, non debt tax shields, growth opportunities, and firm size and decreases with volatility, advertising expenditure, research and development expenditures, bankruptcy volatility, profitability and uniqueness of product.

Recently, Frank and Goyal (2004)[1] have done an empirical study on factors that are reliably important in capital structure decision which complete previous studies on this subject.

They identify a set of seven factors that account for more than 32% of variation in leverage[2], while remaining factors only added a further 4%. The seven main factors are as follows:

- Median industry leverage (+): firms in industry in which the median firm has high leverage tend to have high leverage.
- Market-to-book ratio (-): firms that have high m-t-b ratio tend to have less leverage.
- Collateral (+): firms that have more collateral tend to have more leverage.
- Profits (-): firms that have more profits tend to have less leverage.
- Dividend (-): firms that pay dividends tend to have less leverage than non-payers.
- Firm size (+): firms that are large tend to have high leverage.
- Inflation (+): when inflation is expected to be high firms tend to have high leverage.

Six of the seven factors have the sign predicted by trade-off theory. The sign on profit is consistent when leverage is allowed to drift most of time. The pecking order makes no predictions for the signs of most of reliable factors.

3.9. Optimal Capital Structure

In the existing literature, the question of optimal capital structure has been approached from two points of view. The first is the approach of financial theory, which has focused mainly on the question of whether an optimal capital structure does or does not exist. The second is the approach of operation research, which has focused mainly on obtaining actual solutions which yield recommended debt equity ratio and/or debt maturity distributions.

Looking first at the finance theory literature, the question of the debt equity ratio and debt maturity distribution has been treated mainly as separate problems. On the first topic, Modigliani and Miller (1958) prove that financing doesn't matter in perfect capital markets. Consider the simple market-value balance sheet in Table 1, the market values of the firm's debt and equity, D and E; add up to total firm value Modigliani and Miller (1958) proposed their irrelevance theory (M&M theory) in 1958[3], by stating that the determination of the debt/equity ratio (D/E) is a trivial decision since it cannot impact the value of the firm.

Their Proposition 1 also says that each firm's cost of capital is constant, regardless of the debt ratio. Since the cost of capital is a standard tool of practical finance, it is worth full to mention its formula here.

Let rD and rE be the cost of debt and the cost of equity - that is, the expected rate of return demanded by investors in the firm's debt and equity securities. The overall (weighted average) cost of capital depends on these costs and the market-value ratios of debt and equity to overall firm value.

[1] The sample consist of non-financial U.S. firms over the years 1950 – 2000.

[2] Leverage = total debt/market value of the firms assets
market value of the firms assets = total debt + market value of equity + preferred stock - deferred taxes and investment credits.

[3] Modigliani and Miller's proposition 1.

Weighted Average Cost of Capital =

$$rA = rD\ D / V + rE\ E / V \quad (21)$$

If we solve equation for the cost of equity then we will have:

$$rE = rA + (rA - rD)\ D / E \quad (22)$$

Equation (22) shows that the cost of equity, the expected rate of return demanded by equity investors, increase with the market value debt-equity ratio D/E. The rate of increase depends on the spread between the overall cost of capital rA and the cost of debt rD. This equation, Equation (22), is Modigliani and Miller's preposition 2 (1958). Debt has a prior claim on the firm's assets and earnings, so the cost of debt is always less than the cost of equity. Considering this fact, Equation (22) shows why "there is no magic in financial leverage." Any attempt to substitute "cheap" debt for "expensive" equity fails to reduce the overall cost of capital because it makes the remaining equity still more expensive, just enough more expensive to keep the overall cost of capital constant.

In 1963, considering the tax advantage of more debt, they proposed that leverage (debt-equity ratio) should be increased as far as possible. Afterwards number of writers moved to show that an optimal capital structure would exist where the undoubted tax advantage of more debt is balanced against the inherent risks of incurring substantial bankruptcy costs if the firm defaults on its debt obligations.

In 1977, this view on the nature of the optimal debt/equity ratio has been re-challenged by Modigliani and Miller (1958), who stated that the personal tax advantage of return on equity (net profit/equity) will offset the tax advantage of using additional leverage and thus they stated that" the debt/equity decision is irrelevant, even in a world of corporate taxes". In 1980, Deangelo and Masulis (1980) shown that this theorem does not hold if a) there exist corporate tax shelters which are not the result of debt ; or (b) if bankruptcy costs are non-trivial .

Now in the age of new finance it is accepted that an optimal debt/equity ratio does exists, and this ratio is a function of tax savings due to the deductibility of interest, and of expected costs associated with risks of bankruptcy, as the model presented in this section assumes.

With respect to an optimal maturity structure of debt, Stiglitz (1973) has demonstrated that, in a world of zero taxes and bankruptcy costs debt maturity is irrelevant.

Table 1. A market-value balance sheet.

Assets-in-place and growth opportunities	Debt	(D)
	Equity	(E)
	Firm value	(V)

However, Bosworth (1971) demonstrated the existence of an optimal structure in a world with taxes and bankruptcy costs. Thus a model incorporating an optimal maturity distribution, given the existence of tax and bankruptcy costs, can be shown to be theoretically valid.

In contrast to this theoretical discussion on existence, the operation research literature has never really questioned the existence of an optimal capital structure, and has concentrated instead on building models to find out where this optimum structure occurs.

Thus for example the paper by Litzenberger and Rutenberg (1972) obtains a maturity distribution for debt by application of an EOQ-type model which balances the transaction costs of issue against the interest cost of issuing debt in too large quantities.

3.9.1. A 2-period mathematical programming model for optimal capital structure

In this part we explain a programming model for maximization of the value of the firm in a 2-period context (T=0,1,2). The decision variables are the amounts and maturity distributions of debt outstanding in each period. The following assumptions are employed for developing this model:

- The bankruptcy costs are assumed to consume 100% of the firm's assets.
- Cost associated with the issuance of debt is assumed to be zero.
- All debt is issued at par.
- The firms investments are assumed to be known in advance, and all after tax earnings are assumed to be distributed as dividends.
- No allowance is made for personal taxes paid by shareholders.
- The risk less rate of interest in future time period is assumed to be forecasted by the company.

- The firm is assumed to be risk averse and to operate in a world where the Capital Asset Pricing Model is valid[1].

Assuming that in this two period world the firm make an initial investment of I0 , the firm must now decide how much debt to issue at t=0 and t=1 and the maturity type. For the sake of simplicity it is assumed that there are only two maturity classes, type 1 which is short-term or one-period debt, and type 2 which is long-term or two-period debt.

The firm is also assumed to liquidate itself at t=2, so the two-period model, long-term debt can only be issued at t=0. The cash flows accruing to stockholders at the end of the first period can be given as:

$$Y1s = \begin{cases} X1 - (1+r10)\,D10 - r20D20 \\ \quad -\tau(X1 - r10D10 - r20D20\text{-}DP1) \\ \quad -I1+D11 & \text{if } X1 >= \alpha 1 \\ 0 & \text{if } X1 < \alpha 1 \end{cases} \quad (23)$$

where,

Yjs The random cash flow available to stockholders at the end of period j,

Xj The random operating earnings (before interest and depreciation charges) during period j,

Rij The promised coupon rate of maturity type i issued at t = j.

Dij The face value of debt with maturity type i issued at t=j; because of the assumption that all debt is issued at face value, Dij is also the dollar amount borrowed,

T The corporate tax rate,

DPj The depreciation charge of period j,

Ij The cost of investment made in period j,

Aj The point of bankruptcy at t=j.

For period 1 the point of bankruptcy is given by:

$$X1 + D11 + S1 = (1+r10)\,D10 + r20D20 + \tau\,(X1 - r10D10 - r20D20\text{-}DP1) + I1$$

$$\alpha 1 = (I1 + D10 - D11 - S1 - \tau\,DP1\,) / (\,1-\tau) + r10\;D10 + r20D20 \quad (24)$$

It is noticeable that in Equation (23) there is no explicit expression for the proceeds from the sale of new equity. This is because Equation (23) is the total cash flow available to all stockholders, both new and old.

Thus, the sale of new equity, which is equivalent to old stockholders liquidating a portion of their interest in the firm, transfer cash from one set of stockholders (old) to another (new).

The reason of the presence of the term S1 in Equation (24) is that, if the firm faces a cash shortfall in any period, the stockholders can avoid a default by liquidating their existing holdings via the sale of new equity to satisfy the bondholders' claims. But the maximum shortfall which can be covered by this method is the total value of the stockholders' equity.

If X1>= α 1 , so the bankruptcy does not occur , then the firm will be able to pay existing bondholders in full, and new debt in the amount of D11 will be issued.

If X1< α 1, the firm will default on its loan obligations, and the bondholders will receive nothing. Thus, the cash flows to the bondholders at the end of the first period are:

$$Y1B = \begin{cases} (1+r10)\,D10 + r20D20 - D11 & \text{if } X1 >= \alpha 1 \\ 0 & \text{if } X1 < \alpha 1 \end{cases} \quad (25)$$

where, YjB is the random cash flow available to bondholders at the end of period j.

[1] The CAPM is based on four assumptions as follow(a) investors are risk averse and evaluate their investment portfolios solely in terms of expected return and standard deviation of return measured over the same single holding period , (b) capital markets are perfect in several sense : all assets are infinitely divisible ;here are no transaction costs, short selling restrictions or taxes; information is costless and available to every one; and all investors can borrow and lend at the risk-free interest rate, (c) investors all have access to the same investment opportunities, (d) investors all make the same estimates of individual assets expected returns, standard deviation of return and the correlation among asset returns (Ferrara, 1998).

At the end of the second period, by the assumption that the firm will liquidate itself, and distribute the proceeds to the stockholders, the cash flow available to stockholders, is:

$$Y2S = \begin{cases} X2 - (1+r20)\,D20 - (1+r11)D11 \\ \quad - \tau(X2 - r20D20 - r11D11 - DP2) \\ \quad - I2 + A2 & \text{if } X2 \geq \alpha 1 \\ 0 & \text{if } X2 < \alpha 1 \end{cases} \quad (26)$$

where A2 is the market value of the firm's assets in period 2. The cash flow to bondholders during period 2 is:

$$Y2B = \begin{cases} (1+r20)\,D20 + (1+r11) \\ \quad \times D11 & \text{if } X2 \geq \alpha 2 \\ 0 & \text{if } X2 < \alpha 2 \end{cases} \quad (27)$$

For period 2 the point of bankruptcy is given by:

$$X2 + A2 = (1 + r20)\,D20 + (1 + r11)\,D11 + \tau\,(X2 - r20D20 - r11D11 - DP2)$$

$$\alpha 2 = (D20 + D11 - A2 - \tau\,DP2)\,/\,(1 - \tau) + r20\,D20 + r11D11 \quad (28)$$

In the context of this model it can be shown that, maximizing the value of the firm's owner equity is equivalent to maximizing the total value of the firm[1]. This maximization is accomplished by choosing the appropriate values of the decision variables D10, D20 and D11.

Total cash flow available to both stockholders and bondholders in the first and second period are as follow:

$$Y1 = \begin{cases} (1-\tau)\,X1 + \tau\,(r10D10 + r20D20 + DP1) \\ -I1 & \text{if } X1 \geq \alpha 1 \\ 0 & \text{if } X1 < \alpha 1 \end{cases} \quad (29)$$

$$Y2 = \begin{cases} (1-\tau)\,X2 + \tau\,(r11D11 + r20D20 + DP2) \\ -I2 + A2 & \text{if } X1 \geq \alpha 2 \\ 0 & \text{if } X1 < \alpha 2 \end{cases} \quad (30)$$

The value of the firm, A0- the present value of total cash flow available to both stockholders and bondholders-, is as follow:

$$A0 = -I0 + \{[E(Y1|X1 \geq \alpha 1) - \lambda 1\ \mathrm{cov}\ \alpha 1(Y1,R1)]/(1+rf1)\} + P(X1 \geq \alpha 1) * \{[E(Y2|\,X2 \geq \alpha\,2) - \lambda 2\ \mathrm{cov}\ \alpha\,2\,(\,Y2,R2)] / (1+rf1)\,(1+rf2)\} \quad (31)$$

where

λj The market charge for risk which is given by $\lambda j = [E(Rj) - rfj] / \mathrm{var}(Rj)$,

Rj The random rate of return of the market portfolio at t=j,

Rfj The single period risk-free rate at t=j,

$\mathrm{cov}\alpha j$ The unconditional covariance operator for Yj given $Xj \geq \alpha\,j$.

It is noticeable that the CAPM framework has been employed in Equation (31) according to the:

$$CAPM \quad Es = rf + \beta\,(EM - rf) \quad (32)$$

where Es is the expected return on the asset and EM is the expected return on the market portfolio - the portfolio comprised of all available shares of each risky asset - and β is the sensitivity of the asset's return to the return on the market portfolio.

By employing the CAPM in this model we have:

$$EY = rf + \beta\,(ER - rf) \quad (33)$$

[1]Famma and Miller (1972) discussed the relationship between these two sometimes equivalent – and sometimes different. In this model whereas the information about future investment and dividend policies of the firm is known by the bondholders, the bonds are fairly priced in the market ;and, thus maximizing the value of the firm's owner equity is equivalent to maximizing the total value of the firm(which is equal to total value of its assets)

where EY is the expected return on the total cash flow and ER is the expected return on the cash flows from operations(market portfolio) (Perold, 2004).

The reason of the presence of the term λj cov α j(Yj,Rj) in Equation (31) is that according to the CAPM, the appropriate discount rate for valuing the expected future cash flows of a company is determined by the risk-free interest rate, the market risk premium[1] and the β versus the market of the company (Lienberger and Rtenburg, 1972). Therefore considering the definition we have mentioned earlier for λ:

$$\lambda j \; cov \; \alpha \, j(Yj,Rj) = [E(Rj)\text{-}rf1] \,/\, var(Rj) * \rho\sigma Yj\sigma Rj$$
$$= [E(Rj)\text{-}rfj] * \rho \, \sigma Yj \,/\, \sigma Rj$$

where ρ σYj/ σRj is β and [E(Rj)-rfj] is the market risk premium.

Assuming that X is normally distributed and substituting the related statistical formulas in Equation (31) , which is the objective function of the model, and also by employing the Equations (29) and (30), the optimal levels of D10, D20 and D11 can be derived, and thus the optimal value of the firm. It is noticeable that the problem can be reformulated as an N-period linear programming model, which can be solved for the optimal levels and maturities of debt.

4. Dividends decisions

The finance manager is also concerned with the decisions to pay or declare dividend. It assists the top management to decide the portion of profit to be declared as dividend. The yearly earning of a corporation can be paid out as dividends to stockholders or retained for internal purposes, e.g. financing new investment or retiring debt.

The level and regular growth of dividends represent a significant factor in determining the value of a company's shares. The level of dividends that a firm chooses to pay is influenced by a variety of factors such as taxes, investment opportunities and contractual restrictions.

[1] Risk premium is the expected return of an instrument in excess of the risk-free interest rate. In the CAPM, EM-rf (which is equivalent to ER-rf in this model) is the market risk premium.

5. Conclusion

The objective of three functions in structure of financial strategy is the same i.e. maximizing shareholders wealth, so these decisions are interrelated. A company having profitable investment opportunities generally prefers lower dividend pay out ratio; On the other hand having a good investment means profit of the company would be more and more then dividend can be paid to shareholders. Similarly, finance functions and investment functions are also highly correlated. Cost of capital plays a major role whether to accept or not an investment opportunity. Financing decisions also dependent on amount of to be retained in the profit.

The present study contributes to understanding of corporate financing patterns by including a market value debt-equity ration as a determinant of long-term debt capacity and by using an estimation technique which explicitly accounts for balance sheet interrelationships.

One can infer from the estimates that firms base their stock and bond issue decisions on the need for permanent capital and on their long-term debt capacity. Permanent capital increases each quarter to the extent that firms can retain earnings, while any shortfall may be made up through bond and stock issues.

Firms also watch their debt capacity, however, and if bond issues lead to excessive debt levels, stock issues will be stimulated as a countermeasure. Since the speeds of adjustments to the permanent capital targets are shown to be relatively slow, liquid assets and short-term debt play an important role in absorbing short-run fluctuations in the external financing deficit.

As mentioned, companies require optimum capital structure to meet financial objectives and seeing that fixed and working capital are effectively managed, e.g. sources and cost of funds, capital structure, and risk evaluation. Some of these funding requirements will come from internal sources, whilst some will need to come from external sources.

Considering funding decision as a decision which determines sources of financing in a corporation, this study started from explaining sources of financing.

Later on, concentrating on external sources of funding, we explained a model for financing decision and another model for determining optimal capital structure by using balance sheet of a corporation that individually consider all of factors such

as inflation, risk, income and flexibility . We also briefly explained investment and dividend decision which are considered as another two components of financial strategy decision.

We believe that this study is an important step in better understanding the types of financial strategy and sources of funding used by corporation in a theoretical model.

While drawing a valid conclusion about performance outcome of model was not an objective of this study, we believed that future research should address this issue more thoroughly. In particular, we believe that future research should consider a case study based on this model and the financial strategy-performance relationship. For example, is one of strategy more appropriate for conglomerates than for related diversifiers? Does financial strategy selection change as the rate of sales growth for corporation changes? Therefore answering to these questions need more time and attempt in future researches.

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