**OPERATING LEVERAGE & CAPITAL RATIONING**

The following topics will be discussed in this lecture.

* Economic Break Even
* Degree of Operating Leverage
* Capital Rationing
* Hard Rationing
* Soft Rationing
* Single Period Rationing
* Multi period – linear programming with only two variables
* Limitation of Linear Programming / Criticism

**ECONOMIC BREAK EVEN:**

The difference between the accounting and economic break even is a cost factor known as opportunity cost of capital. In accounting break even we calculate the accounting earnings first and then deduct all the costs from earnings to reach at break even except the opportunity cost of capital that is invested in the project. According to Economic Value Added (EVA) concept, a firm creates value by earning returns of invested capital greater than its cost of capital. Basically, EVA is the economic profit a firm earns after all capital costs are deducted. More precisely stated, it is firm’s net operating profit after tax less the cost of capital charge for the capital employed.

A firm can create value for its investors either by investing in new assets or it can return cash to investors who will invest this money for themselves by trading in the stock market. A firm that earns more than the cost of capital is better off since it is providing investors with better returns than they can earn for themselves on stand alone basis.

Economic break even suggests that when you deduct other cost from accounting earnings you should also deduct the cost of capital employed. A project having a positive EVA adds value to firm and a negative EVA reduces the firm’s value.

**DEGREE OF OPERATING LEVERAGE**

A measurement of the degree to which a firm or project incurs a combination of fixed and variable costs.

1. A business that makes few sales, with each sale providing a very high gross margin, is said to be highly leveraged. A business that makes many sales, with each sale contributing a very slight margin, is said to be less leveraged. As the volume of sales in a business increases, each new sale contributes less to fixed costs and more to profitability.
2. A business that has a higher proportion of fixed costs and a lower proportion of variable costs is said to have used more operating leverage. Those businesses with lower fixed costs and higher variable

costs are said to employ less operating leverage.

The higher the degree of operating leverage the greater the potential danger from forecasting risk. That is, if a relatively small error is made in forecasting sales, it can be magnified into large errors in cash flow projections. The opposite is true for businesses that are less leveraged. A business that sells millions of products a year, with each contributing slightly to paying for fixed costs, is not as dependent on each individual sale.

For example, convenience stores are significantly less leveraged than high-end car dealerships.

**Capital Rationing**

Many companies specify an overall limit on the total budget for capital spending. There is no conceptual justification for such budget ceiling, because all projects that enhance long run profitability should be accepted.

The factors for putting limit:

* Net present values or IRR may strongly influence the overall budget amount
* Top management’s philosophy toward capital spending.
* Same managers are highly growth minded whereas others are not.
* The outlook for future investment opportunities that may not be feasible if extensive current commitments are undertake.
* The funds provided by the current operations less dividends.
* The feasibility of acquiring additional capital through borrowing or sale of additional stock. Lead-time and costs of financial market transactions can influence spending.
* Period of impending change in management personnel, when the status quo is maintained.
* Management attitudes toward not.

Capital Rationing occurs when a company has more amounts of capital budgeting projects with positive net present values than it has money to invest in them. Therefore, some projects that should be accepted are excluded because financial capital is limited.

This is known as artificial constraint because the management may dictate the amount to be invested for project purposes.

It is also the artificial constraints because the amount is not based on the product marginal analysis in which the return for each proposal is related to the cost of capital and projects with net present values are accepted.

A company may adopt a posture of capital rationing because it is fearful of too much growth or hesitant to use external sources of financing.

**Reasons for Capital Rationing:**

There are basically two types of reasons of capital rationing.

* **External Reasons**

These arise when a firm is unable to borrow from the outside. For example if the firm is under financial distress, tight credit conditions, firm has a new unproven product.

Borrowing limits are imposed by banks particularly in relation to smaller firms and individuals.

* **Internal Reasons**

Private owned company: Owners might decide that expansion is a trouble not worth taking. For example there may that management fear to lose their control in the company.

* Divisional Constraints: Upper management allocates a fixed amount for each division as part of the overall corporate strategy. This arises from a point of view of a department, cost centre or wholly owned subsidiary, the budgetary constraints determined by senior management or head office.
* Human Resource Limitations: Company does not have enough middle management to manage the new expansions
* Dilution: For example, there may be a reluctance to issue further equity by management fearful of losing control of the company.
* Debt Constraints: Earlier debt issues might prohibit the increase in the firm’s debt beyond a certain level, as stipulated in previous debt contracts. For example bondholders requiring in the bond contract, that they would accept a maximum Debt-to-Asset ratio = 40%.

Capital Rationing could be said to signal a managerial failure to convince suppliers of funds of the value of the available projects. Although there may be something in this argument, in practice it is not a well-informed judgment. Furthermore, even if there were no limits on the total amounts of available finance, in reality the price may vary with the size as well as the term of the loan.

 **HARD CAPITAL RATIONING:**

This arises when constraints are externally determined. This will not occur under perfect market.

* + If share prices are depressed or market is bearish, raising capital is very difficult.
	+ Restriction on lending by Banks.
	+ High interest rate
	+ High cost associated with issuance of share / debt instrument.

**SOFT CAPITAL RATIONING:**

This arises with internal, management-imposed limits on investment expenditure. The factors leading to soft rationing are as under:

* Management is reluctant to issue new share because of the fear of outsider taking control of company.
* Dilution of EPS
* Increased interest payments in case of debt financing.

Company’s will to maintain limited investment level that can be financed thru retained earnings.

**SINGLE AND MULTI PERIOD CAPITAL RATIONING**

Following topics will be discussed in this hand out:

* Single period capital rationing
* Multi-period capital rationing
* Linear programming

**ONE-PERIOD CAPITAL RATIONING:**

When limits are placed on the availability of finance for positive NPV projects for one year only and capital is freely available in all the rests of periods.

There are some additional assumptions in single period rationing which are very important to consider here:

1. If a firm does not undertake a project ‘now’ – the period of capital scarcity, the opportunity is lost. In other words, the project cannot be deferred until the capital is available.
2. The outcome of each project is known with certainty so that the choice between the projects is not affected by considerations of risk.
3. The projects are divisible – it means that we can undertake 50% of project A and 50% of project B. The basic approach will be to rank the projects in such a way that NPV can be maximized from the use of available finances.

Ranking the projects using NPV will be incorrect in this scenario because NPV basis will lead to select the ‘big’ projects, each of which has a high individual NPV but which have a lower NPV than a large number of smaller projects with lower individual NPVs. Therefore, ranking should be made in terms of Profitability Index.

There are some issues with the PI method as well and should be outlined. This approach would only be feasible if projects are divisible. If projects are not divisible, which is normally the case in reality; a decision should be made by considering the absolute NPV of all possible combinations of all positive projects within the constraint of limited capital.

This method is of little use when project have different cash flow patterns.

PI method ignores the absolute size of individual projects. A project with a high index might be very small and therefore only generate a small NPV.

**MULTI-PERIOD CAPITAL RATIONING:**

When capital is in limited availability in more than one period and selection of projects cannot be made by ranking projects according to PI, this situation is known as multi-period capital rationing.

Capital constraints are imposed in more than one period to restrict the acceptance of positive NPV projects. Other techniques like linear programming tools can be used.

In mathematics, **linear programming** (LP) problems are optimization problems in which the objective function and the constraints are all linear.

**Open problems**

* Does LP admit a polynomial algorithm in the real number (unit cost) model of computation?
* Does LP admit a strongly polynomial algorithm?
* Does LP admit a strongly polynomial algorithm to find a strictly complementary solution?
* Does LP admit a (strongly or weakly) polynomial pivot algorithm (may be a non-simplex pivot algorithm, e.g., a criss-cross or arrangement method)?
* Is the polynomial diameter conjecture true for polyhedral graphs?
* Does LP admit a (strongly or weakly) polynomial simplex pivot algorithm?
* Is the linear diameter (Hirsch) conjecture true for polyhedral graphs?

Here we will discuss the graphical approach to LP. This involves only two variables and if there are more than two variables then simplex method is used.

When we are confronted with TWO projects (only) we can use graphical method to select the one best fit project.

First step is to define the variables or project by assigning them symbols like x & y, a & b etc.

The second step is the key issue where we establish the constraints like availability of capital in period 1, 2 and so on. For example, if we have two projects x and y and project x need 30 million of investment and project y requires 25 million of investment and we have only 40 million available, then the constraint can be expressed as:

30x + 25y <= 40

Last step is to form an objective function. The objective function is to maximize the investment return. When we have translated the constraints and objective function in equation we plot these on a graph to work out the feasible solution.