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Strategic Financial Management

Strategic Financial Management, Financial Engineering, Financial Statement Analysis, Merger & Acquisition

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Acknowledgement

We gratefully acknowledge the support received from our colleagues in teaching the courses in finance in several institutions where our faculties for various discipline in finance have been sharpened. This has helped us to write this book with ease as this has a great degree of interdisciplinary approach even keeping within the frame work of finance.

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We would like to express our deep sense of gratitude to the publisher for his effort to publish the book in right time.

There are many people who have helped the book completion in small ways. We would like to thank them all for completing this work.

Authors

Though this book has been written with BPUT course work, many other institutions which offer this course work can also get the benefit of the this book.

We hope this book would solve the problem of the students to a greater extent and enrich their learning.

Authors

This time we started to work towards a book which could be dedicated for the use of the BPUT students Utkal University Students as well as other students those who are pursuing their career in finance and would help them to get desirous result from the course work. That apart, this book can work as guide to the teachers staying focused on the course.

This book is focused on Utkal University and BPUT course work except for the fact that it has a chapter of financial statement analysis which we thought is very essential in deciding the strategy for any firm in terms of Finance.

We have given the "well thought out course structure" of Utkal University and BPUT for this particular course work so that the students and teachers can refer to it as and when required. The chapters have questions for review and self assessment of the students. Besides, there are quizzes at the end of each chapter in multiple choice formats so that they can test their learning easily.

Each chapter has a case which can be analyzed in the class room or outside the class room by the students by forming groups. These cases are tested cases and had been used for class room discussion earlier too. Besides there are research based case and some other large case separately annexed as a chapter in the book.

Preface

It was not very long back that we took a particular course work of finance with colleges on the request of the Finance teachers and students of those colleges, which are affiliated to Utkal University and Biju Patnaik University of Technology (BPUT) as we are working for their other wings of PGDM, M.Com Programme, MFC, MBA (Financial Management). Few weeks after we had covered our course, we received a call from one of my students in that course asking us if we could suggest her book on Strategic Financial Management which was running parallel to our course. We advised her to go through the books that have been mentioned in the course curriculum. However, we came to know from her that the books that were prescribed as text did not cover the entire curriculum required by the university. We suggested her to read a few other books thinking that it would help in resolving the problem. Again we learnt that, the course was in the last semester of the MBA programme and time was a major constraint on them as they were busy with other activity such as placement and job focused activity. We then realized that, there is a need for a book which would give the students access to all that they are looking forward to for the course work and help them stay focused on the course work as well the forth coming exam.

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CHAPTER - I

STRATEGIC FINANCIAL MANAGEMENT

Introduction

Strategy building is very important for the short and long run existence of the business. A business generally builds two generic strategies which cater to the process need and that helps in building the financial strategies of the business. It is very difficult to segregate one from the other.

The process strategies focus on building the vision and the mission and aligning the business processes to them. The financial strategies on the other hand try to strengthen the business processes by enabling the mechanism of fund mobilization, utilization and creation of value. For example, when a vision statement says that you have to reach thirty crore rupees of sales revenue by the end of the next ten years, the financial strategy try to create a space by providing the appropriate long and short term budget, besides identifying growth areas where investment can be made and value can be created.

The concept of strategic management is focused on the fact that value creation is the central theme of all strategic decision – whither in short or in long run- and the business need to focus its energy in doing so.

The concepts that are explained in this chapter are elementary in nature but are essential to build up later discussion. The book has a chapter dedicated to present value of money and financial statement analysis at the end as appendix. The purpose of not keeping it as a part of the main book is to retain the focus of the book intact. However, these chapters can add as reference whenever a concept needs to be brushed up.

Through this chapter we will discuss the concepts of cash flow, the time value. Later with the same we will discuss the concept of absolute and relative valuation.

Cash Flow

Cash flow essentially is the cash that the investment generates and takes. Or in other words, cash flow is the payment made or received in an investment. Therefore the cash flow is divided into three vital components:

a. **Cash outflow and inflow**

   (Please read the annexed chapter on financial statement analysis for understanding the process of determination of cash flow)

The cash may flow in to the business or flow out of the business. The outflow is generally the cost of the investment or the project undertaken by the business. It is generally represented by putting a (-) sign in the

front of the amount which means that the money has flown out of business.

The cash inflows are the incomes from an investment on a project undertaken by the business. It generally occurs in several installments over the life of the project or the investment.

b. Timing of the cash flow

As mentioned earlier, the cash inflows occur in several installments. These installments are generally spread over a period of time. Say, for example, it may be monthly, annually etc. Similarly, the cash outflow may occur several times in the life of an investment or project. The first cash flow occurs at the beginning of the project and the subsequent ones may happen at various point of time reference, beginning from middle to end of the first life of the investment or project. The subsequent cash outflows are called reinvestment amounts.

c. Certainty of cash Inflows

The more certain we are about the cash inflow, the lesser is the risk in the business. For convenience sake, we generally assume in academic discussion, that the cash inflows are certain in nature

Time Value Implication

As discussed earlier, the present value concept emanates from the fact that the values of the cash flow originating at different points of time

will not be equal. This is because of the fact that the cash flow nearer to the origin of the investment are closer in term of purchasing power to the original money invested then the amount arising later in the period of investment. Hence the rate at which discounting happens is larger depending on how far the cash flows are from the origination point. We can therefore conclude from the above discussion that the rate of compounding has a direct bearing on the time value of money.

From the above discussion then it is clear that the sum of the present values derived after discounting the cost of lending may be more or less than the original amount interested. The difference sum i.e., the sum of the present value of the cash flow of the investment – the present value of the original sum invested should show the net amount derived from the investment. This amount is known as the **'Net Present Value'** of the investment.

The Relationship between value and present value of money

The value of investment (money) depends on the amount available to the business and the future series of cash inflow available from the investment. Apart from this, the value of the money which is being invested is dependent on the purchasing power of that money. This purchasing power of money is dependent on the time period through which the money is subjected to invest. The longer the duration the lower is the value of money. In other words, the values of investment tend to decrease as the period of investment increase.

The above principle is known as **deep discount**. If a sum of money invested today is say Rs. 1000 which will turn out to be Rs. 1, 00,000 at the end of 50 years, then the question arises as to what is return in such a case? The answer will be clear if we know what can Rs. 100,000 buy for the investor in the market? The question can be more precisely asked as – "Can Rs. 100,000 buy the same amount of goods and services which Rs. 1,000 can buy for the investor today (meaning the day of the investment)?' The answer could be more or less '**NO**' since the value of purchasing power of money will go down, which is compensated for by the interest rate and the volume of money. Hence, what we see here is a deep discounting available on the money of today though, apparently, the absolute value looks to be high.

This establishes a more important relationship between the value of investment and the present value of money. That the longer the investment is held, the lower will be the return. Therefore when investment decisions are to be taken, a balance has to be made between the period for which the investment is actually available and the period which is most desirable for the investment to be made.

Conceptualization valuation for a company

Let us now refocus our discussion on the company form of business. We all know that the company form of Business (which is same as taking about a modern day business as it is most widely represented and

is of general interest to all of us who are involved in the business of management) is funded by either equity (ownership shares) or Bonds

(borrowed fund which receives interest). Both these instruments (tool for raising money by the company) are tradable in the market (depending upon certain restriction some of them may not be traded. But that is not the point of discussion here)

If a company's value is to be determined then, then it should be judged by the value (price) that the equity share (stock) and the Bonds (Both per unit) will get in the market where they are traded. This is based on a simple logic that if all the equity holders (owners) and the entire bond holders (lenders) want to get the value of their investment they will have recourse to selling these instruments and realize their value of investment in the company.

So we can say that the value of the company outstanding in the market will be equal to the value of the equity share (stock) outstanding in the market and the value of the bonds outstanding in the market.

In terms of symbols we can depict it as;

$V = B + S$ ..... Eq. 1.

Where, V = Value of the Firm Outstanding

B = Value of the Bond outstanding

S = Value of the Equity stock outstanding

We will now focus our discussion on what is the relation between the earning, cost of investment and the value of a particular investment.

Suppose one is given the fact that a bond gives Rs. 1,000 at the end of a year and the rate at which it had compounded interest is 10%. What was the amount invested?

The answer would be simple,

Rs.1, 000 x 100/10 = Rs. 10,000

(The above process is known as capitalization of earning - given the rate of earning/cost of borrowing is know-in the theory of finance)

What is then the mathematical relation if symbols are put in the example?

Rs.1, 000 = I or the interest received

10% = Ki or the interest rate or otherwise the cost the borrower of the fund as to bear to give it to the owner of the fund.

Rs. 10,000 = B the value of the bond outstanding in the market

So, the equitation that comes out of this is;

$$\frac{I}{Ki} = B \text{ or } Bki = I \ldots\ldots\ldots \text{ Eq. 2}$$

Going by the same logic,

SKe = EAC

Where, S = value of the equity outstanding in-the market

Ke = cost of the equity capital

EAC = Earnings available to the equity shareholders or stock holders

Hence for the total firm

VKo = EBIT ..... Eq. 3

Where, V = Value of the firm, Ko = Cost of the fund (Equity cost plus bond cost or Ko = Ki + Ke) and EBIT, the total earning of the firm (tax being ignored, EBIT = I + EAC)

From equation 3 we get;

Ko = EBIT/V ..... Eq. 4

Or,
$$Ko = \frac{I + EAC}{B + S} \quad \text{..... Eq. 5}$$

But from Eq. 2 and 3 we get; I = BKi and EAC = SKe

Substituting the above in equation 5 we get;

$$Ko = \frac{BKi}{B+S} + \frac{SKe}{B+S} \quad \text{..... Eq. 6}$$

Restating equation 6 we get

$$Ko = \frac{B}{V} Ki + \frac{S}{V} + Ke \quad \text{..... Eq. 7}$$

The above equation is known as the weighted cost of the firm. This equation also states the relation that value of the form has with the earning and the cost of borrowing fund in terms of the equity and bond (ignoring other forms of borrowing).

What does the above proof states for us in term of strategy building for value in creating the value of the firm? It is very simple, higher the cost, lower will be the value and to develop a sustainable business model, cost has to be watched or earning has to increase in more than proportional form to the cost. This is still the biggest challenge to the business of today and more so to the finance managers who are managing funds. This means two things for us:

i. Minimize cost

ii. Maximize earning

The above two components will help the business to get its cherished goal of value maximization.

How the does the firm increase its value?

There are two schools of thought in this front too. The first school takes a look at the business as a portfolio of activity and advocates that the measurement of the cost be done in terms of standard deviation of the return. The second should propagate the idea of increasing the value of the business by either monitoring cost or by allowing a generic growth model.

The first school of through is broadly called as the investment management group and the second school of through is what this book is about: Strategic Financial Management which tries to seek help of assorted business application available for finance and decision makers to increase the value of the firm (business).

The strategy building is done essentially through three things

i. Building a cost identification and cost management process (such as activity based costing and target costing)

ii. Supporting business process and enabling inorganic growth of business to assimilate wealth and value through merger and acquisitions (using mergers and acquisitions as a major tool to increase value)

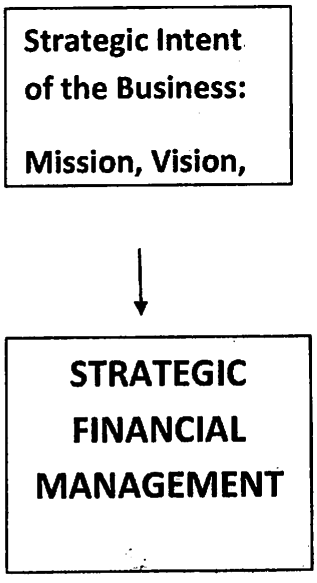
iii. Measuring the value of the firm by refocusing on the cost of equity and the value of the firm as in the case of Economic Value Added and Market Value Added.

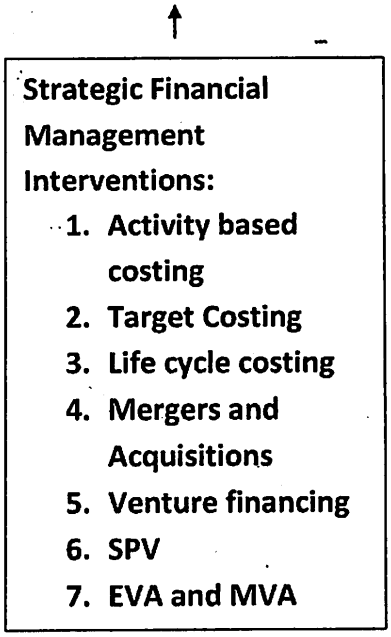
iv. Trying to make alternative and cost effective funding arrangement which will decrease the cost of the firm and increase the value of the firm such as venture capital and using special purpose vehicle to create value of unproductive or long locked in funds.

All the above that have been identified, certainly require the business to identify their market capability in terms of the span of market share and the stage of business cycle they are in. In a easier form, they need to identify, their strength weakness, opportunity and threat (SWOT) and the external forces which are acting upon then including the substitute for their product, new market players, available market and their position in it.

A schematic diagram for this is given below:

Figure 1.1 Schematic diagram for Strategic Financial Management





In the chapters that follow we will discuss these matters to observe how these tools are helpful for the growth of the firm in creation of the value of the business.

In doing so we will observe how each of the tool is used in the value creation of the business independently and collectively.

Summary

Strategy building is very important for the business as ensures its short and long run sustenance and continuity. In common strategies are builds around the capability and life of the business. When we talk of strategy of a business, one sure angle that needs to be discussed is the financial angle. This angle propagates the value maximization process both for the internal and external stake holders of the business. We need to remember here that, if a strategy does not lead to value maximization then it will not succeed as a policy however sound it might be. Therefore a successful strategy will evolve a platform for maximizing the value of the business. This is where the strategic financial management comes into focus. There are two schools of thought in this front. The first schools propagates the division of the business in terms of portfolios of activities and measures the returns and risks in this matter and help the business in growing and achieve value maximization. The second school propagates the fact that cost measurement, cost rationalization, organic and inorganic growth and sourcing proper funding mechanism help in the value maximization of the business and support the strategic intend of the business. This book uses the second method of logic and tries to build a strategy for value maximization in the business.

Question for Review

Write Short note on the following:

a. Value maximization

b. Deep discount

c. Capitalization

d. Compounding

Long Answer Questions

1. What is the main objective of business (corporate form of business) and how does strategy formation helps in it?
2. What is relation between the interest earned, the time of investment and the value of the investment? How does Time Value of money explain it?
3. Explain the logic of value maximization and cost minimization for a corporate form of business?
4. What are the various schools for strategizing value maximization of a business? Which one do you think is a better method and why?
5. How does the concept of time value of money help the business to take investment decision?

Quiz (Multiple choice questions)

1. Time value of money is a concept which .....

a. Gives the value of money across a time line

b. Shows how purchasing power of money increase or decrease in context of present time

c. Shows the use of money over a period of time

d. Both a and b above.

2. The cash flow is depended on which of the following?

   a. Certainty of cash flow, inflow and out flow and value

   b. Certainty of cash flow, inflow and outflow and time of cash flow

   c. Inflow and outflow, value of the cash flow and time of the cash flow

   d. Value of cash flow, time of cash flow and the direction of the cash flow

3. Value of the bond is determined by taking into consideration

a. The interest that we get out of the bond and the rate of interest

b. The cost of equity and the interest obtained from a bond

c. The cost of firm and the interest obtained from a bond

d. Both a and b

4. The scope of the strategic financial management is

   a. To decrease the cost of the firm

   b. To increase the value of the firm

   c. To moderate the value of the of the firm

   d. Both a and b

5. Which among this will increase the value of firm directly in short run for the business?

a. Cost rationalization and reduction

b. Inorganic growth

c. Merger and acquisitions

d. Value based strategy for business

(Answers for the above questions: 1. d 2.b 3.a 4.d 5.a.)

State true of false for the statements

1. The principle goal of business is to maximize the value of its stakeholder.

2. The product of cost and value is the earning.

3. Business only seeks profit in long run.

4. Whatever is the case, the business has to maximize the return of the investment.

5. The value of a business is directly proportionate with its cost.

(Answers: 1. True, 2. True, 3. False, 4. True, 5. False)

Fill in the blanks

1. _____ Minimization is one of the main objectives of the business.

2. If the value increases, then the _____ will increase.

3. Measuring value is a part of _____ building for a business.

4. Cost of capital is a integrated concept for _____ creation.

5. The ability of the form to create wealth in long run is decided by the firm's _____ term strategy.

(Answers: 1. Cost, 2. Return, 3. Strategy, 4. Value, 5. Long run

Case - 1.

Revitalization of a Bank

The Peoples bank has been one of the oldest banks in the country. As government bank, its function was limited to the growth of the economic development in the line of action of the central government. It was largely used for the treasury function of the government and to canalize the funds of the government to various developmental activities.

Until 1990's the bank had largely opened branches at various locations in the country to garner to the economic development of the country. Mobilization and utilization of the fund was the main line of the activity of the bank. The approach was conventional and it was largely human based with a huge work force catering to its various cadres of the service.

Post 1990, with the wind of privatization and liberalization and the changing wind, the central government became liberal in its approach to banks and banking business at large. Number of private banks were set up, with public private partnership (like the UTI Bank now Axis Bank) and few development banks like IDBI and ICICI also had set up banks. These banks were set up in a

model which became popular as retail bank – since they catered to financial services tailor made for the retail section under one roof.

The retail banks were the new generation bank. They used smart technology, process and people to attract the urban mass of the country which were in need of such a financial solution for them. These banks were a super success with the urban elite of the country.

However, many of these new generation banks in the retail mode felt that they were becoming limited to the urban areas and were not being able to tap the rural and up-country market of the country. As a result of these, they started to look at inorganic growth like merger and acquisition with several regional banks as good options to grow in the rural and up country market.

This made the situation a little difficult for the peoples bank as it in many respect could not match the aggression that was there with these new generation bank. Three main reasons were identified for this.

a. Sloppy approach for the employees and over staffing (with 45% and above employees over the age of 50 years)
b. Not being able to use latest technology making banking processes time consuming

c. Long paper work based approach which was making the customer specially in the urban areas shy away from the bank

The bank took some drastic steps towards this. It declared a golden handshake for the people who have served the organization for more than 20 years and would seek a voluntary retirement.
Peoples bank become proactive and started training its existing manpower towards modern processes of the management to drive home the point that the market has become very competitive and people have to earn their salary from now.

The third and the most important aspect which happened was that it became high end technology driven with the largest core banking solution of the country as well as the world.
With this, Peoples bank was a formidable challenge to bear with.

To add to the icing, the bank started to consolidate some of its subsidiary business and started to make the business lean and trim. A huge amount of cost shake out was possible in merely a decade.

Questions to answer

1. What do you think was holding back Peoples Bank in the development?

c. Long paper work based approach which was making the customer specially in the urban areas shy away from the bank

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Questions to answer

1. What do you think was holding back Peoples Bank in the development?

2. Do you think the changes that came up the way in the Peoples Bank were in the agreement to the strategic financial decisions that were discussed in the chapter earlier?
3. What are the other ways do you think Peoples Bank can improve their function and align with the new generation banks?

Annexure: 1.1

Conceptualizing Time Value of Money and its Use

Introduction

As discussed in the preceding section of the book, the role of corporate treasurer is to manage the inflow of cash and fund effectively ad utilize the same in a meaningful way in the business so that the value of business is increased.

It is matter of general knowledge that fund flows into the business at various points of time and flows out of business at various point of time too. The reason for such happening is due to the fact that the inflow of fund have various sources which have various time period of borrowing by the business and at the same time outflows are also decided by the various kind of projects and business need which have different time frame.

This is coupled with the fact that value of a unit of money is different in different time periods. This is because of the fact that money tend to buy

more or less, if we use one point of time as reference. This is further supported by the fact that 'money is what money buys'. For example one unit of money may buy 'n' number of commodity after one year. The same one unit of money may buy 'm' unit of the same commodity, where 'n' is smaller or larger than 'm'. In case, 'n' is smaller or larger than 'm', the unit of money has gained more value and if the reverse happens it has lost value of money. In this case we use purchasing power of money with time reference to understand value of money, and hence we call it 'time value of money'.

Due to such a reason as stated above the individual who uses the money may like to use the money today then keep it for getting more goods or services in a latter period of time. For example a individual who has Rs. 100 today will observe, whether by buying a good or service today he or she gets more benefit or by holding it for a period of time say one year. If he or she observes that at the end of one year the value (in terms of purchasing power) of money is more, than he or she may be willing to keep it and use the same at the end of one year. The increase or decrease may happen in two ways. First, it can purchase more goods or services at the same Rs. 100 or second, the units of money available with individual may go up, say Rs.110 at the end of one year of retention. Since, the dimension of holding the money in relation to time is strong; Time Value of money is sometimes called as the time Preference of Money.

The benefit or value which is talked about in the latter case in the above example when Rs. 100 at the end of one year becomes Rs. 110, is called interest or coupon in the treasury parlance.

The above discussion has revealed that in order to have logical and meaningful comparison between cash flows that occurs in different point of time it is necessary to convert the sums of money to a common point in time. There are two techniques for doing this:

A. Compounding techniques of Time Value of Money

B. Discounting Technique

A. Compounding Techniques of Time value of Money

Interest is compounded when the amount earned on an initial deposit (the principal at the beginning) becomes part of the principal at the end of the first compounding period. Table 2.1 gives a difference between compound interest and simple interest for a general understanding.

Table 2.1

Table containing comparison between compound and simple interest on a sum of Rs. 1000 as Initial Principal at the rate of 10 per cent for a period of 5 years

End of year	Compound interest in Rupees	Simple Interest in rupees
1.	1000 + (100 x 0.10) = 1100	1000 + (1000 x 0.10) = 1100
2.	1100 + (1100 x0.10) = 1210	1100 + (1000 x 0.10) = 1200
3.	1210 + (1210 x 0.10) =1331	1200 + (1000 x 0.10) =1300
4.	1331 + (1331 x 0.10) = 1464	1300 + (1000 x 0.10) = 1400
5.	1464 + (1464 x 0.10) = 1610	1400 + (1000 x 0.10) = 1500

From the table 2.1, we can come to two basic conclusions:

A. Under compounding method interest earns interest which is not the case in simple interest method.

B. That for business in general and treasury management in particular it is important to use compounding techniques and not simple interest

techniques. Therefore, the assumption for concepts of treasury management is always based on concepts of compounding.

Mathematical representation of compound interest

If P is the initial principal which earns at the end of a year I amount of interest then, A the amount at the end of the 1st year will be

$A_1 = P + P \times i$ ..... (2.1)

In subsequent year for n^{th} period of time the same equation can be re written as

$A_n = P (1 + i)^n$ ..... (2.2)

The equation 2.2 is the fundamental equation of compounding and essentially the corner stone for a wide range of application in treasury and financial management.

Using the Compound Interest table for Practical reasons

Calculation of compound interest for large sum of money be cumbersome even if on the face of it, it may look quite easy. To prove the point it may be quite cumbersome to deal with the example given blow.

If, we consider Mr. P who has Rs. 3,863,562 now want to know what is the total amount he will receive at the need of 23 years, it may be quite difficult to use a $(1+i)^n$ equation with the help of a hand held calculator.

Instead he can refer to the compound interest table as follows (as given in appendices 1)

i. Follow the table horizontally until he comes to 10%

ii. Go down upon the table for year 23 under the year column

iii. Observe what the interest is for one rupee compounded in 10% for 23 years.

iv. The resultant search will give 8.954

v. Mr. P has to multiply Rs. 3,863,562 with 8.954

vi. The result is Rs. 39594334.148 which the value Mr. P is looking for.

From the above example few lessons can be drawn.

a. if we had decreased the period of time of the interest accrual, the amount would have been low at the end. Hence, larger the period the greater is the amount received at a certain interest accrual level.

b. If the interest compounded would have been decreased the amount received at the end of the same period 9say 23 years would have been less) which means that if you need to receive more money at the end of an investable period at a lesser rate of interest of investment, it would mean longer period of investment.

Semi -annual and other compounding periods

In most of examples sighted earlier, we have used annual compounding period. This however, may not be the situation always, since, saving institution, particularly, compound interest semi-annually, quarterly and even monthly.

Semiannual compounding

In a semiannual compounding system, there are two compounding periods, within a year (through which investment occurs). This means that interest is actually paid every 6 months at a rate of one half of the annual (stated) rate of interest.

For example if Rs. 1000 is deposited in a bank saving which yield 6 percent interest compounded annually, for 2 years and if a person invest that amount, he or she will be paid 3 percent interest compounded over four period, each of six months duration.

Table 2.2 gives the amount the person will have from the time deposit after two years.

Table 2.2

Semi-annual compounding

(Amount in rupees)

	6monts	**1year**	**18 months**	**2 years**
a Beginning	1000	1030	1060.90	1092.73
b. Interest rate	0.03	0.03	0.03	0.03
c. Annuity of interest	30.00	30.90	31.83	32.78
d. Beginning principal	1000	1030	1060.90	1,092.73
e. End Principal	1030.00	1060.90	1092.73	11 25.51

Quarterly Compounding

Quarterly compounding means there are four compounding periods within the year or interest paid in four equal installments in a year. Table 2.3 below gives the interest acquired by the person who invests Rs.1000 at 6 percent annually for one year.

Table 2.3

Quarterly Compounding

(Amount in Rupees)

Period (In months)	Beginning	Interest	Amount	Beginning	Ending
3	1000	0.015	15	1,000	1,015
6	1015	0.015	15.225	1,015	1,030.235
9	1,030.225	0.015	15.453	1,030.225	1,045.678
12	1,045.678	0.015	15.685	1,045.678	1,061.263

Table 2.4

Comparison of annual, semi annual and quarterly compounding

		Compounding Period	
End of year	**Annual**	**Half yearly**	**Quarterly**
1	1060	1060.90	1,061.36
2	1123	1125.51	1,126.46

The effect of compounding more than one year can also be expressed in the form of a formula, as given in equation 2.3

$$P(1 + i / m)^{mn} = A \ldots\ldots \qquad (2.3)$$

Where,

M = time period for compounding for, semi- annual compounding m = 2, for quarterly compounding m =2, for quarterly compounding m = 4 and so on. All other notation remains as stated earlier for other equation earlier in the chapter.

Compounded Sum of annuity

An annuity may be defined as a stream of equal annual cash flow. Annuities involve calculation based upon the regular periodic contribution or receipt of fixed sum of money. An example will be in place to explain annuity.

If Mr. has Rs. 200 at the end of every year for 5 years, in his saving bank account which pays him 5 percent interest compounded annually and he wants to know what is the amount he would have at the end of fifth year? Then he can calculate the annuity by using appendix 1 as follows.

Table 2.5

Compounded sum of annuity (amount in rupees)

End of year	Amount	No. of years	Table value	Future value
1	2,000	4	1.216	2,432
2.	2,000	3	1.158	2,316
3.	2,000	2	1.103	2,206
4.	2,000	1	1.050	2,100
5	2,000	0	1.000	2,000

Or else, he can use appendix 2 and go down in the table up to 5 years under the column of 5% interest and find the rate of compound value of annuity i.e.; 5.526 and multiply Rs. 2000 with it. The resulting figure will be Rs.11.054. It may be noted here that the sum of the individual value of compounding i.e.; 1.276 + 1.158 + 1.103 + 1.050+1.000 = 5.527

Or symbolically,

Sum of annuity = CVIFA x A

Where,

A = Value of annuity or amount

CVIFA = Compounded value interest factor of annuity of one rupee.

Present value or discounting technique

The concept of present value is opposite of that of compounding value. Present value is the current value of future amount. Or in other words, to find out if the amount received in a future date invested at a certain rate of interest will be equal to the present value of the amount being put to stake.

It is akin to asking, if the future value of a one rupee will be more than one rupee in hand, if we use today's context?

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Let us examine the question by assuming that one rupee earn 10 percent interest and is invested for one year, if invested today (i.e. zero years)

The amount at the end of one year will be thus, Rs. 1.10. If we use unitary method, then we se that the value of Rs. 1.10 brought-down to zero year is actually

.909 = 1/1.10

This shows that present value of one rupee that will be received in the future will be less than the value of a rupee in hand today. This is because, as against compounding, where, the value of interest is added up, the corresponding interest is lost. This process is known as ***discounting.***

Thus, discounting means determining the present value of future streams of inflow of an invested amount.

Mathematical Formula

From equation 2.2 we know that the compounding equation is

$A = P (1+i)^n$

Therefore, the present value of one unit of money will be

$P = A/(1+i)^n$ ..... (2.4),

Where,

P = The present value for the future sum to be received or spent

A = The sum to be received or spent in the future

i = The interest rate

N = The period through which i is compounded

Thus we can say that the present value is the reciprocal of the compound value of one rupee through the same period of time reference.

Using the present value table for practical purpose

In order to simplify the difficult calculations of present value table as given in the appendix 3, the equation for using the table is

P = A (PVIF) ..... (2.5)

If Mr. P wants to find the present value of Rs. 3000 which is to be received 5 years from now at 10 % rate of interest, he has to look in the 10 percent column, go down up to 5 years and find the value as 0.621.

The present value = Rs. 3000 x 0.621 = Rs. 1863

Or is other words the amount which Mr. P receives by investing Rs.3000 after 5years if considered in today's value will be equal to Rs. 1863 only.

Some points about the present value are as given below:

a. The expression of the present value factor for n years at i percentage of interest, $1/(1+i)^n$ is reciprocal or inverse of compound interest factor for n years at i percent of interest, $(1+i)^n$. The amount compounded as

principal of Rs. 100 at 10 per cent annually is Rs. 110. The present value be Rs. (100/110) = Rs. 90.90.

b. The further the period from the investable period, the lower is the present value of the rupee. For example at 10 percent interest rate the PV for five consecutive years is

Time (in years)	1	2	3	4	5
At 10 % p.a	.909	.826	.751	.683	.621

c. Greater the discounting factor lower is the present value. At 20% p.a, the present value for 5 years is

Time (in years)	1	2	3	4	5
At 20% p.a.	.833	.694	.579	.482	.402

An eye observation between the 10% and 20% present values of one rupee proves the point.

Present value of Annuity

The present value of an annuity 'A' receivable at the end of every year for a period of n years at a rate of interest k is equal to

$$PV\ An = \frac{A}{(1+i)} + \frac{A}{(1+i)^2} + \frac{A}{(1+i)^3} + \ldots + \frac{A}{(1+i)^n} \quad \ldots\ldots 2.6$$

This reduces to

$$PV\ An = A \times [(1+i) - 1 / K (1+i)^n] \ldots\ldots \quad 2.7$$

The expression

$[(1+i)^n - 1 / K (1+i)^n]$ is called the present value of interest factor of Annuity. The value is equal to the sum of individual present value for investment of A amount at I rate of interest for nth number of year. The value can be determined by using appendix 4 at the end of the book.

Concept of TimeLine

Conceptually, time is taken to be liner in nature. Therefore, year 1 comes before year 2 and year 2 before year 3 and so on.

Hence, when we talk about time value of money, we take into consideration this concept of linier time, which starts at the zero (0) year,

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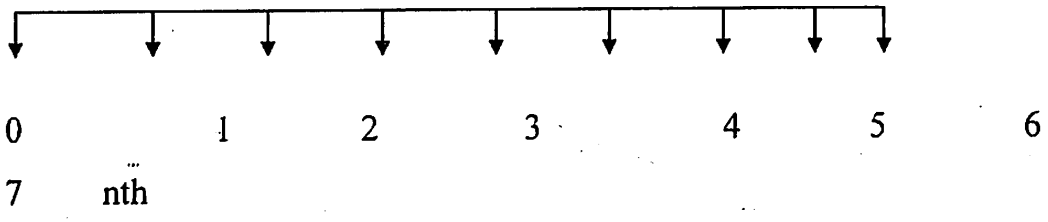
which is the year of outflow or investment and ends in n^{th} year, which is the terminal point of investment.

Hence, time line looks like the figure given below

Fig 2.1

Time line



The time line is used to conceptualize both compounding and present value methods of determining the value of money and fund.

Effective rate of Interest Vs Nominal Rate of Interest

Suppose we have Rs 10,000, which earns at the rate of 10 percent per annum compounded semi annually. Then the interest accrued will be

Beginning amount = Rs.10, 000

Interest for the 1^{st} 6 months = Rs. 500

(10,000 x .10/.2)

Sum at the end of six months= Rs.10,500

Interest for the 2nd 6 months = Rs. 525

(10,500 x 0.10/2)

Sum at the end of the year 11,025

Suppose the same amount would have compounded annually at the same rate than the sum of money at the end of the year would have been Rs. 10,000+ (10,000x10/100)= Rs.11,000

This brings us to the fact that if the rate of compounding is faster than the accrual is also higher. In this case it ids Rs. (11,025 -11,000) = Rs. 25

This difference is called effective rate of interest and is expressed as follows.

$r = (1 + i/m)^{m} - 1$ ..... (2.8)

Where,

r = Effective rate of interest

i = Nominal interest rate per annum

M = Number of times compounding is done during a year

Example

What is the effective rate of interest, if nominal rate of interest is 12 per cent and is quarterly compounded.

Effective rate of interest

$r = (1 + i/m)^{m} - 1$

Or, $r = (1 + 0.12/4)^4 - 1 = (1+0.03)^4 - 1 = 0.126$ 0r 12.6 p.a.

Concept of double discounting

If Rs. 100 receives 10% per annum then at the end of one year the value of investment will be Rs. 100 = 100x.10 = Rs. 110.

Using the concept of present value the value stands at Rs. (100/110) = Rs. 90.90

This basically means that Rs.100 has become Rs. 90.90. However, we know that the basic purpose of investment is to keep the value of investment constant at the least. Thus, the interest payable to the investment of Rs. 100 will be as follows (by back Calculation)

Present value of 100 brought to zero year =		Rs. 90.90
Add the value which keeps it at Rs. 100	=	Rs. 9.10

This is the basic value of Investment	=	Rs. 100.00
Add, to this the interest accrued	=	Rs. 10.00
Value of Rs. 100 invested @10%p.a at the end of one year.	=	Rs. 110.00

That shows that Rs. 100 actually receives two doses of interest to bring it to Rs. 110. We can generalize this as 2xi rate, we compounding is done flat (i.e., interest accrues at the end of the investable period without considering the fall in the value of the principal amount due to present value)

Conversely, the rule of thumb is (2xi)-1, for the situation of flat rate of interest.

Therefore, if a bike loan is 12 percent per annum flat then the actual interest to be paid is

(12 x2) -1 = 24 -1 = 23 percent per annum.

(The -1 is done to correct the count which is akin to the degree of freedom in statistics)

Capital recovery factor

One of the most important challenges faced by the treasury where lending is done, is to find out in what installments can capital be recovered.

This is obtained by multiplying present value of annuity in nth year at I rate of interest by amount, interest rate and number of year.

The equation stands as

$$A = PVAn \left[\frac{i+(1+i)n}{(1+1)n-1} \right] \quad \ldots\ldots \quad (2.9)$$

Where,

$\left[\frac{i+(1+i)n}{(1+i)n-1} \right]$ is known as the capital recovery factor.

We note that capital recovery factor is the inverse of present value of interest factor of annuity

Capital recovery factor helps in estimating;

a. amount paid annually to liquidate a loan over a specific period of time

b. Amount which can be withdrawn periodically for a certain length of time, if a given amount is invested today.

Example

If Mr. P takes a loan of Rs. 1, 00,000 to be paid in 5 equal annual installments, where the loan carries a interest rate of 14 per cent per annum, the amount of each installment can be calculated as below:

R x PVIFA (14%, 5) = Rs. 1, 00,000

Where R = Equal annual Installments

$$R = \frac{\text{Rs. 1, 00,000}}{\text{PVIFA (14\%,5)}} = \frac{\text{Rs. 1, 00,000}}{3.433}$$

R = Rs. 29, 129

The next problem is to see, what the amount of interest is and what is the principal amount that can be recovered from the equal annual installment (EAI)?

Table 2.6

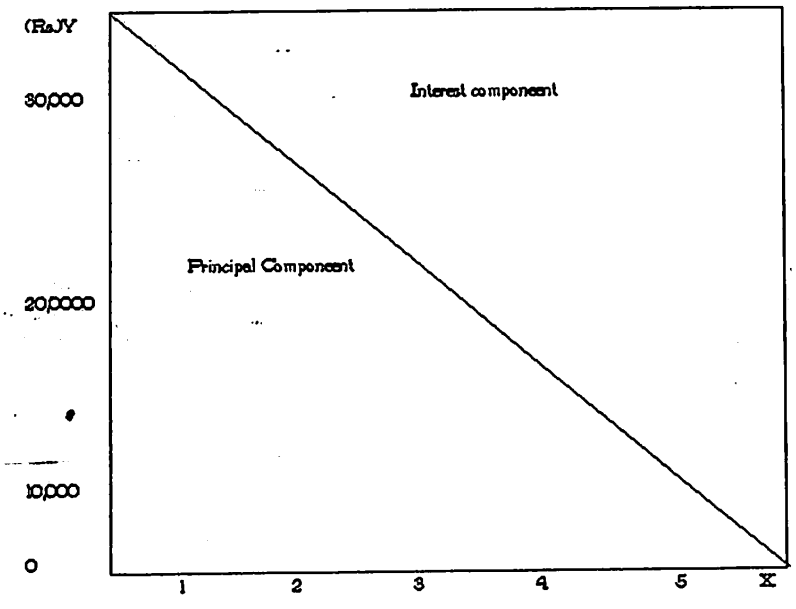
Table showing Calculation of equal annual Installment of loan recovery in form of interest and principal

Year	Equal annual Installments (EAI)	Interest Content in the EAI	Principal or capital content in the EAI	Loan outstanding after payment of each EAI
A	B	C	D = (B-C)	E
	Rs.	Rs.	Rs.	Rs.
0	0	0	0	1,00,000
1	29,129	14,000	15,129	84,871
2	29,129	11,882	17,247	67,624
3	29,129	9,463	19662	47,962
4	29,129	6,715	22,414	25,548
5	29,129	3,577	25,552	

Note: Value in column C is obtained by multiplying 14% (i) with the present years loan outstanding. For example 14% of Rs. 1, 00,000 = Rs. 14,000.

As can be seen that that interest component decreases per EAI and the principal component increases per EAI until the whole of the loan is recovered. Therefore, in any loan recovery, the initial years are dedicated to the recovery of interest amount and the later years to the recovery of the principals.

Fig 2.2: Relationship between Interest and principal recovery in Equal annual Installments



End Note 1

Formulae used in this chapter

Symbols Used

A = Amount

P = Principal amount invested

n = No. of year (of investment)

k = i = Interest rate or cost of capital

m = time period of compounding other then annual

PV = Present value

Compound Interest or Future value

$An = P (1 + i)^n$

The same formula can be re written by replacing I by k which represent the cost of capital and is more commonly used in financial terms.

$An = P (1 + K)^n$

Compounding more than once a year

$$A = P \left\{ \left(1 + \frac{k}{m}\right) \right\}^{mn}$$

m = Tim period for compounding for semi- annual compounding, i.e, m= 2, 3, 4 etc.

Present Value

$$P = \frac{A}{(1+i)^n} \quad \text{or} \quad \frac{A}{(1+k)^n}$$

Present Value of an Annuity

$$PV\ An = A \times [(1+i) - 1 / K (1+i)^n]$$

Compound Interest (or) Future Value

$$A_n = P (1+i)^n$$

The same formula can be re written by replacing "i" by "k" which represents the cost of capital and is now commonly used in financial

terms.

$$A_n = P(1+k)^n$$

Compounding more than once in a year

$$A_n = P(1+k/m)^{mn}$$

m = Time period for compounding for semi-annually compounding i.e. m = 1, 2, 3 .....

Present Value:

$$P = A/(1+i)^n \quad \text{Or} \quad A/(1+k)^n$$

Present value of an Annuity:

$$PVA_n = A\ [(1+k)^n - 1/k(1+k)^n$$

Effective Rate of Interest:

$$r = [1 + i/m]^m - 1$$

Capital Recovery Factor:

$$A = PVA_n \left[\; k (1+ k)^n / (1+k)^n - 1 \right]$$

Deriving the future value equation:

$$FVA_n = A (1 + k)^{n-1} + A (1+ K)^{n-2} + ... + A \longrightarrow (1)$$

Multiplying (1) by (1+k) on both sides will give

$$FVA_n (1+k) = A (1+K)n + A(1+ k)n-1 + ... A(1+K) \quad ---------(2)$$

Subtracting equation (1) from (2) we get

$$FVA_n k = A (1+k)n - A$$

$$FVA_n k = A [(1+k) n-1]$$

Or

$$FVA_n = A [(1+k)^n - 1 / k]$$

Symbols used:

A = Annualized return or cash outflow from investment after one period (n period) of investment

K = i = interest rate per period

n = number of years

FVA_n = Future value of regular

PVA_n = Present value of regular annuity.

If the annuity is not regular annuity but is an annuity due i.e annuity when cash flows occur at the beginning of the each period, then future value can be obtained as given below.

$$FVA_n = A (1 + k)^n + A (1+ k)^{(n-1)} + \ldots A(1 + k) \qquad (3)$$

Dividing equation (3) by (1+k) on both the sides, we get

$$FVA_n / (1+k) = A (1+k)^{(n-1)} + A (1+k)^{(n-2)} + \ldots\ldots + A \qquad (4)$$

Subtracting equation (4) from equation (3) we get

$$[1 - 1/(1+k)]\, FVA_n = A (1+k)^n - A$$

$$k/(1+k)\, FVA_n = A [(1+k)^n - 1]$$

$$FVA_n = A [(1+k)^n - 1/k] (1+k)$$

Therefore the future value of an annuity due can be expressed as the product of the future value of a regular annuity and the factor (1+k).