Discipline Specific Elective-B (1):
ECO-A-DSE-5-B (1)-TH-TU
Financial Economics

Unit 1

Syllabus

Investment Theory and Portfolio Analysis

•**Deterministic cash-flow streams**: Basic theory of interest; discounting and present value; internal rate of return; evaluation criteria; fixed-income securities; bond prices and yields; interest rate sensitivity and duration; immunisation; the term structure of interest rates; yield curves; spot rates and forward rates.

•**Single-period random cash flows:** Random asset returns; portfolios of assets; portfolio mean and variance; feasible combinations of mean and variance; mean-variance portfolio analysis: the Markowitz model and the two-fund theorem; risk-free assets and the one-fund theorem.

•**CAPM:** The capital market line; the capital asset pricing model; the beta of an asset and of a portfolio; security market line; use of the CAPM model in investment analysis and as a pricing formula.

In this chapter, we will deal with the highlighted portion of the syllabus.

1.1 Basic theory of interest

From our study of macroeconomics over the past four semesters, we have become acquainted with the basic interest rate theories, like the classical theory, Loanable Fund theory or the Keynesian liquidity preference theory. Though not really required for students of fifth semester Economics Honours, let us very briefly recapitulate the basic ideas behind those theories.

The classical theory of interest rate is associated with the names of economists like Ricardo, Marshall, Pigou, and Knight. This theory is also known as the real theory of interest rate because it leads to a determination of interest rate through the interaction of real factors like productivity and savings habit. Monetary factors, on the other hand, are not considered. The main features of the so-called 'classical' model can be summarized as follows:

Saving is an increasing function of rate of interest, which may be written as S (r), and investment is a declining function of rate of interest, which may be written as I (r). The equilibrium in the capital market (where investment represents the demand for, and savings represent the supply of capital) is given by:

$$I(r) = S(r) \quad \text{...............} \quad (1)$$

So we have one upward sloping curve (savings) and one downward sloping curve (investment). The rate of interest is the variable that affects both. The point of intersection between the two curves gives us, on the one hand, the equilibrium interest rate; and on the other hand, the equilibrium quantity of planned savings and planned investment (The relevant diagram is not drawn here: we are very familiar with it).

One criticism that has been levelled against the classical theory is that it does not offer any answer as to what the equilibrium interest rate would be. For, aggregate savings is a function of national income, while aggregate investment affects national income. Therefore, in a sense, the position of the upward sloping savings curve is not something unique (it is, only if income is held constant), and shifts in the investment curve can affect its position as well. So, the theory is 'indeterminate'.

The Loanable Fund theory is an extension of the classical theory (attributed to economists like Wicksell and Robertson) with some monetary component added to the classical theory. It focuses on the fact that savings need not be the only means of funding investment expenditure: bank credit is an equally important source. As banks can create credit, they can affect the flow of investment expenditure in the economy. (In fact, we know very well that the credit policies of Central Banks around the world focus on controlling bank credit with a view to influencing economic activities via the investment channel). So in this theory, we rewrite equation (1) as:

$$PS + \Delta B = PI \text{.........} \quad (2)$$

Where P is the aggregate price level and ΔB is the change in bank credit. Note that multiplying S and I with P gives us nominal savings and nominal investment respectively, and as ΔB is stated in nominal terms, both sides of (2) are stated in nominal terms. Also, it should be noted that the PI and PS being flow variables, we cannot have B – or stock of bank credit – on the LHS of the equation. So we take ΔB, which is a flow variable (change in bank credit in the relevant time period).

If change in bank credit leads to an equivalent change in money supply, (2) can be rewritten as:

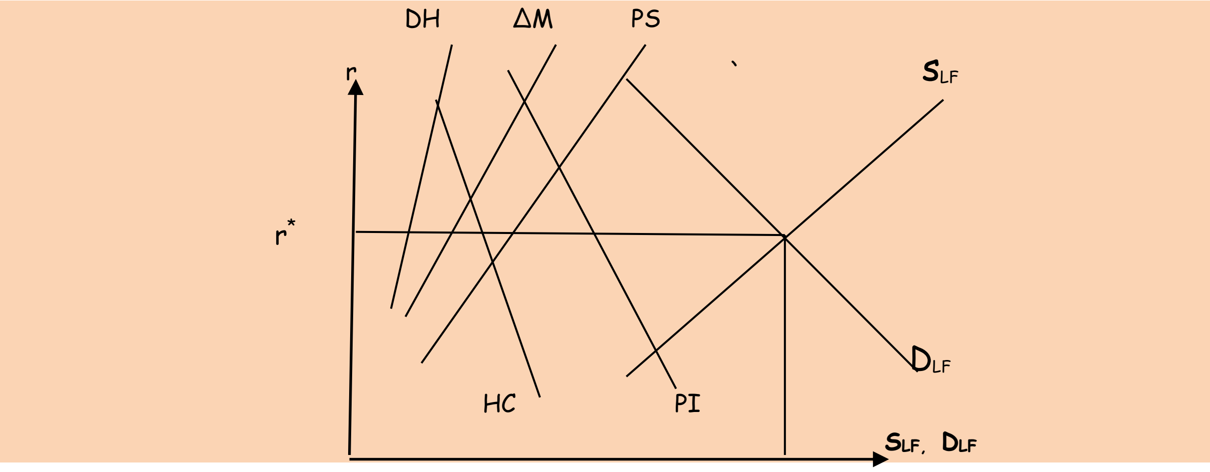
$$PS + \Delta M = PI \text{.........} \quad (3)$$

The preceding description clearly holds for closed economies. In open economies, net capital inflows must be added to change in credit on the LHS to give a correct description of the equilibrium condition.

Often, dishoarded cash can offer an additional fund of investment expenditure. Similarly, hoarded cash (from additional M created) can reduce the room for investment expenditure. Taking all these into account, we can finally write,

$$\boxed{PS + \Delta M + DH = PI + HC} \text{.........} \quad (4)$$

Where DH is freshly dishoarded cash and HC is freshly hoarded cash. Therefore, we no longer have just a savings curve and an investment curve, but a curve for total supply for LOANABLE funds and a curve for total demand for LOANABLE funds. These curves are a horizontal summation of the relevant underlying curves.



Liquidity Preference Theory of Keynes

This part can be skipped because students have studied extensively at the 2^{nd}, 3^{rd} and 4^{th} semesters. In any case, section 1.1 is just an introductory section and is not very important with regard to the rest of the syllabus except in one or two cases.

1.2 Discounting and present value

To have a grasp over these ideas, let us first elaborate on the concept of **'time value'** of money. To start with, we ask a simple question. Why is one rupee **today** worth **more** to us than one rupee **a year from now**? The time value of money focuses on this basic idea – we are happier with one rupee **now** than with one rupee sometime **in future**. Thus, it is as if **time adds value to a rupee**, and to compensate for one rupee today, we would like to have some amount more than one rupee tomorrow.

The simplest way to explain this is to note that we could have invested the rupee somewhere and earned a return on it, say, in the form of interest (there are, of course, other ways to earn a return than just interest, like, say, dividend).

The next question is: why should there be an interest on a rupee borrowed today, so that one has to return a higher nominal amount than what he or she borrowed. This is because of

(i) **Time preference of people**, in the sense that consumption today is deemed more valuable than consumption tomorrow. Thus, people want compensation in lieu of consumption sacrificed today, because, they will not be satisfied if they get exactly the same level of consumption tomorrow. With a view to getting a higher level of consumption tomorrow, interest compensation is required.

(ii) **Possibility of inflation:** It is quite common for prices to rise, and hence, the same amount of nominal money will have a lower purchasing power tomorrow (as compared to today). So, in order to maintain even the same level of consumption, a higher amount is required tomorrow than what is lent out today.

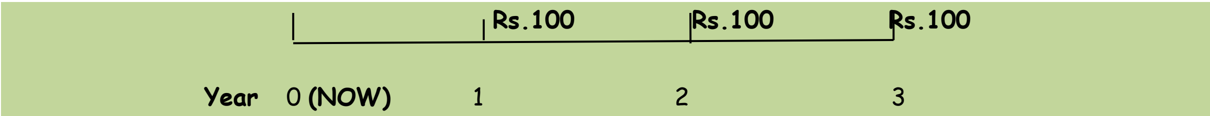
(iii) **Protection against uncertainty:** As there may be an element of uncertainty – large or small – as to whether the full amount lent today will be returned back in time tomorrow, the lender would demand compensation as a risk premium.

Therefore, if we imagine that we are in the future (say, one year from now) holding a hundred-rupee note, and view the problem backward, we may ask: what is the amount we are willing to pay today for that hundred-rupee note one year from now? Surely, the answer will be ***'some amount less than a hundred rupees.'*** So, we must **reduce** the value of that hundred-rupee note to make it valid in today's context. This reduction factor is the **discount rate**.

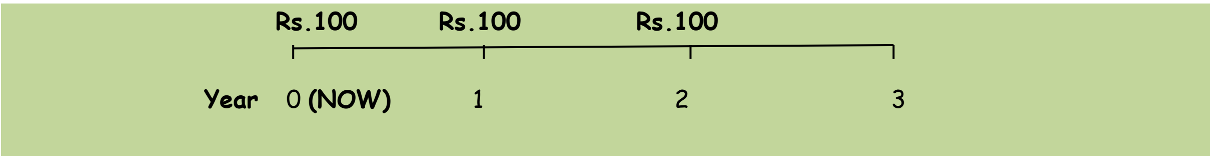
How do we find the discount rate? If the rate of return from an investment is certain (say, the interest rate on a Government bond), then that can be used as the discount rate. The current interest rate and the discount rate are the same in that case. However, if returns are uncertain, the expected rate of return on investments with similar risk has to be used as the discount rate.

However, in this case, we have not taken into account the time preference of the person concerned. If person X values today's consumption more than person Y (as compared to tomorrow's consumption), he will apply a higher discount rate than person Y, that is, will reduce tomorrow's receipt by a greater factor.

Before we go into the issue of present value (PV), let us consider a cash flow timeline. A cash flow - as the name suggests – is the expected (or certain) amount of cash we shall receive or pay over a time interval in one or more instalments. For example, let us assume that person X expects to receive Rs. 100 each in three instalments – one year from now, two years from now and three years from now. In that case, we may draw a time line as follows:



The Rs. 100 received at the end of the 1st year (or the beginning of the second year) is more 'valuable' than the Rs. 100 received at the end of the 2nd year (or the beginning of the third year). That, in turn, is more 'valuable' than Rs. 100 received at the end of the 3rd year (or the beginning of the fourth year).



Compare the first timeline with the above cash flow. Here, X receives Rs. 100 each in three instalments, but this time cash flows occur at the beginning of the 1st year (NOW), beginning of the 2nd year and beginning of the 3rd year. Which stream is more 'valuable' to X? Clearly, the second one, as the receipts occur one year earlier than in the first case.

Let us now examine the methods to convert cash flows of the future into cash flows of today. This process is called discounting, and the future cash flows, once converted into cash flows of today, yield a present value (PV). The formula of calculating PV can be expressed as follows:

If C is the cash flow at the end of some future year t and r is the discount rate,

$$PV = C/(1 + r)^t \quad \text{............} \ (5)$$

If C_1, C_2, ..., C_t are the expected cash flows at the end of 1 year, 2 year, ..., t years from now, then:

$$PV = \frac{C}{1+r} + \{C/(1+r)^2\} + \ldots\ldots + \{C/(1+r)^t\} \ \ldots\ldots\ldots \ (6)$$

This simple formula can help us take important decisions as explained in the example given below.

Suppose person A wants to purchase a two-wheeler. There are two options. One is to make cash payment of Rs. one Lakh now and the other one is to make instalment payments of Rs. 30000 at the end of each of the next five years. Suppose that the discount rate to be used is 12%. Which option should A take?

Using equation (6) above, we see that the PV of the instalment option is as follows:

$$PV = \{\text{Rs. } 30000/(1+0.12)\} + \{\text{Rs. } 30000/(1+0.12)^2\} + \ldots\ldots + \{\text{Rs. } 30000/(1+0.12)^5\}$$
$$= \text{Rs. } 1{,}08{,}140$$

Comparing it with the cash payment to be made today, we see that person A should prefer the 'pay the full amount now' option.