Shivajicollege.ac@gmail.com

Ch-3 Fixed Income Securities

Financial Instruments:- Vast assortments of bills, notes, bonds, annuities, future contracts, and mortgages are part of the well-developed markets for money. These market items are not real goods in the sense of having intrinsic value - but instead are traded only as piece of paper, or as entries in a computer database. These items, in general, are referred to as financial instruments.

If there is a well-developed market for an instrument, so that it can be traded freely and easily, then that instrument is termed as **Security**.

Fixed Income Securities:- Fixed income securities are financial instruments that are traded in well-developed markets and promise a fixed income to the holder over a span of time. They represent the ownership of a definite cash flow stream.

Money Market Instruments:-

The term **money market** refers to the market for short-term (1 year or less) loans by corporations

and financial intermediaries. It is a well-organized market designed for large amounts of money. Within this market Commercial Paper is the term used to describe unsecured loans (that is, loans without collateral) to corporations.

A banker's acceptance is a more involved money market instrument.

Bonds:- A bond is a fixed income investment in which an investor loans money to an entity which borrows the funds for a defined period of time at a variable or fixed interest rate. Bonds are used by companies, municipalities, states and sovereign governments to raise money and finance a variety of projects and activities.

Types of bonds:-

Municipal bonds:- They are issued by agencies of state and local governments. There are two main types: general obligation bonds, which are backed by a governing body such as State, and revenue bonds, which are backed either by the revenue to be generated by the project that will initially be funded by the bond issue or by the agency responsible for the project.

Corporate bonds:- They are issued by corporations for the purpose of raising capital for operations and new ventures.

Callable bonds:- A bond is callable if the issuer has the right to repurchase the bond at a specified price. Usually this call price falls with time, and often there is an initial call protection period wherein the bond cannot be called.

~~Sinking funds:~~

Mortgages:- A legal agreement by which a bank, building society, etc. lends money at interest in exchange for taking title of the ~~debtor~~ debtor's property, with the condition that the conveyance of title becomes void upon the payment of debt.

Balloon payment:-

Adjustable-rate Mortgages:- It adjust the effective interest rate periodically according to an interest rate index, and hence these mortgages do not really generate fixed income in the strict sense.

Annuities:- An annuity is a contract that pays the holder money periodically, according to a predetermined schedule or formula, over a period of time.

Perpetual annuities:- It pays a fixed sum periodically. e.g. It might pay $1,000 every Jan. 1 forever. (Consols in Great Britain)

Present value of perpetual annuity.

Suppose amount A is paid at the end of each period, starting at the end of the first period, and suppose the per-period interest rate is r. Then the present value is

$$P = \sum_{k=1}^{\infty} \frac{A}{(1+r)^k}$$

$$P = \sum_{k=1}^{\infty} \frac{A}{(1+r)^k} = \frac{A}{1+r} + \sum_{k=2}^{\infty} \frac{A}{(1+r)^k} = \frac{A}{1+r} + \frac{P}{1+r}$$

$$\Rightarrow \quad P = \frac{A}{r}$$

Perpetual-annuity formula:- The present value P of a perpetual annuity that pays an amount A every period, beginning one period from the present, is

$$P = \frac{A}{r}$$

where r is the one-period interest rate.

Ex:- Consider a perpetual annuity of $1,000 each year. At 10% interest its present value.

$$P = \frac{1,000}{0.10} = \$10,000$$

Finite-life Streams:-

Annuity formulas:- Consider an annuity that begins payment one period from the present, paying an amount A each period for a total of n periods. The present value, P, the one-period annuity A, the one-period interest rate r, and the number of periods n of the annuity are related by

$$P = \frac{A}{r}\left[1 - \frac{1}{(1+r)^n}\right]$$

or

$$A = \frac{r(1+r)^n P}{(1+r)^n - 1}$$

The process of substituting periodic payments for a current obligation is referred to as amortization.

Q: A debt of 25,000 is to be amortized over 7 years at 7% interest. What value of monthly payments will achieve this?

Soln:- Here, $P = 25,000$ $r = 7/12\% = 0.58\%$.

$n = 7 \times 12 = 84$

$$A = \frac{r(1+r)^n P}{(1+r)^n - 1}$$

$$= \frac{\frac{0.58}{100}(1+0.0058)^{84} \cdot 25000}{(1+0.0058)^{84} - 1}$$

$$= 377.32 \text{ monthly.}$$

Running Amortization

Consider the loan of $1,000. (discussed in example) which you repay over 5 years at 12% interest. Suppose you take out loan of Jan 1 and first payment is due Feb 1., then.

	Previous balance	Current Interest	Payment Recieved	New balance 1000
Jan 1				
Feb 1	1,000	10	22.20	987.80
March 1	987.80	9.88	22.20	975.48
April 1	975.48	9.75	22.20	963.03
May 1	963.03	9.63	22.20	950.46
June 1	950.46	9.50	22.20	937.76

Annual Worth :-

Suppose a project has an associated cash flow stream $(x_0, x_1, \ldots, x_n)$ over n years. A present

value analysis uses a constant ideal banks with interest rate r to transform this stream into an equivalent one of the form $(v, 0, 0, \ldots 0)$, where v is the net present value of the stream.

Now transform $(v, 0, 0, \ldots, 0)$ in $(0, A, A, \ldots, A)$

The value A is the annual worth (over n years) of the project.

Example:- We purchase a new machine for $100,000 (at time zero) is expected to generate additional revenues of $25,000 for the next 10 years starting at year 1. If the discount rate is 16%, is this profitable investment.

⇒ Here take $r = 16\%$, $P = 100,000$, $n = 10$, find A.

$$A = \frac{r(1+r)^n P}{(1+r)^n - 1}$$

$$= \frac{0.16(1.16)^{10} 100,000}{(1.16)^{10} - 1} = 20,690$$

Annual worth of the project is $= 25,000 - 20690$

$= \$ 4,310$

So, this is profitable.