INSTITUTE OF ACTUARIAL & QUANTITATIVE STUDIES

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Chapter: Unit 2 Chapter 1

Chapter Name: Bond

Today's Agenda

1. Characteristics of Investments
   1. Cash on deposit
   2. Money markets & it's key players
   3. Features of cash on deposit & money market instruments
   4. Attractions of cash on deposit & money market instruments
   5. Holding cash & money market instruments for liquidity
   6. Economic circumstances

2. Introduction to Bond market
   1. Fixed - interest (Conventional) bonds
   2. Characteristics of Fixed - interest (Conventional) bonds
   3. Characteristics of Fixed – interest (Corporate) bonds

3. Index – linked bonds
   1. Comparison of Fixed- interest & Index linked bonds
   2. Conclusion

1 Characteristics of Investments

Every investment product has certain key features associated with them, which enables the investor to understand which product suits his needs. The variability in these key features is what sets them apart from each other. An acronym can be used to understand the characteristics of an investment SYSTEM T

Security
Yield
Spread
Term
Expenses or **E**xchange rate
Marketability
Tax

1.1 Cash on Deposit

Cash on deposit is money held in a bank or any other financial institution that requires transfer of money from one party to another. The money deposited earns a rate of interest. The different types of cash on deposit are:

- Call Deposit – here the depositor has instant access to withdraw the capital deposited i.e. he has complete freedom of using his money at his discretion and can withdraw it at his will. Deposits can be held for as short as a term as overnight.
- Notice Deposit – here the depositor has to give a prior notice before withdrawing his cash, and hence has partial freedom in using his money.
- Term Deposit – here money once deposited cannot be withdrawn before the maturity of that deposited, thus leaving the depositor with no freedom in using his money before the fixed term ends. Minimum period for term deposits is a year, but they can be held for longer periods as well.

Which of the three types of deposits would earn the highest rate of interest and why ?

1.1 Cash on Deposit

- The rate of interest paid by the institution can be :
  - Fixed for the term of the deposit
  - Fixed for an initial period, and can be altered after the specified period
  - Variable from day to day
- Any changes to the rate of interest needs to be communicated to the depositor by the borrower prior to them being applied.
- A person who will prioritize security and surety when making an investment, can do so in a fixed term deposit having a fixed interest rate throughout the term where all the cashflows are certain and known in advance. On the other hand if the investor prioritizes liquidity and instant access to his money can use a call deposit but will have to accept variable interest rates and unknown amounts and timings of cashflow

1.2 Money Markets and its Key Players

Money markets usually deal with the trading of short term instruments having high liquidity such as commercial papers, treasury bills, overnight reserves etc. The term may be for a year or less.

1. Clearing Banks

Money markets are dominated by clearing banks, which act as intermediaries for participants to lend excess liquid funds and to borrow when they need short term funds. They assume the role of a tacit buyer and seller to reconcile orders between transacting parties. These loans and deposits are usually very short term, often overnight. They use interbank rates as benchmarks for short-term interest rates.

2. Central Banks

Central banks regulate the entire banking system and act as lenders of the last resort, providing liquidity to other banks when required and using money market operations to regulate short term interest rates. Operations involve the sale and purchase of treasury and other bills.

The central bank is at the receiving end of cash when market participants purchase treasury bills issued by them. This reduces the further circulation of cash in the markets as cash supply in the market is scarce. This is used to raise the interest rates. Similarly when they want to reduce the level of interest rates, they buyback treasury bills from the money market, thus supplying cash in the market. This happens because interest rates represent the cost of using money.

1.2 Money Markets and its Key Players

3. Other institutions

Other financial and non financial participants of the money market are commercial banks, government, corporations, government sponsored enterprises, discount houses, mutual funds, insurance companies etc for lending and borrowing short term funds

1.3 Features of Cash on Deposit and Money Market Instrument

Based on the SYSTEM T approach we now define the features of cash on deposit and other money market instruments.

1. Security

The risk that the borrower will default on his due diligence. In most of the cases, security is not a matter of major concern since money is only lent for a short term. However, the most secured form of money market instruments are those issued by the government of a country such as treasury bills. In case products sold by private institutions such as commercial banks, the level of security depends on their goodwill

2. Yield

The returns provided by these instruments are usually based on the short term interest rates established by the Central Bank. Some instruments provide a nominal return which is known at the time of investing, while other instruments known as bills, are sold at a discounted price and redeemed at face value.

Most of the money market instruments, provided a real rate of return which is linked to the inflation index, as any increase in inflation, will lead to an increase in short term interest rates. As an incentive for people to invest in money market instruments, short term interest rates are usually 2% to 3% higher than the inflation rate.

Higher the risk higher is the expected return. Since money market instruments are almost risk free, they provide lower expected returns than other instruments.

1.3 Features of Cash on Deposit and Money Market Instrument

3. Spread
The nominal values of cash on deposits and other money market instruments are fixed in cash terms, and since they are short term instruments the volatility is low.

4. Term
Money markets are characterized by short term instruments, with the maximum term being a year. Majority of the instruments are for a day or a week.

5. Expenses and Exchange Rate
Administration expenses when dealing in cash deposits and money market instruments are minimal.
These instruments are available in a number of currencies, which exposes them to exchange rate risk.
Movements in exchange rate compensate for differences in short term interest rates between countries over the term.
For example if the Euro six month interest rates are 5% pa and US six month interest rates are 4% pa, then investment in a six month dollar bond would make sense if there are chances of the dollar rising by ½ % against the Euro over the next six months
Predicting currency exchange rates is difficult, which poses the threat of the returns being lesser than expected.

1.3 Features of Cash on Deposit and Money Market Instrument

6. Marketability
Money market instruments are highly marketable except for call and term deposits. These instruments are unquoted and hence cannot be sold on the stock exchange. They are traded through an interbank money market.

7. Tax
Returns and capital gains from cash on deposit and other money market instruments are treated as income for tax purposes.

1.4 Attractions of Cash on Deposit and Money Market Instruments

Since cash on deposit and money market instruments, are short-term instruments, long term institutional investors, such as life insurance companies and pension, invest only a small proportion of their assets in them.

These instruments have a lower return than other investments, and do not solve the purpose of matching liabilities. The only incentive for them to invest in them is for:

- Liquidity to meet expected outgoes
- Temporarily if they feel, there is going to be a fall in the value of other available assets

1.5 Holding Cash and Money Market Instruments for Liquidity

1. Known short term commitments

Major short term liabilities such as rent, wages, brokerage etc which are known in advance can be met by short term money market instruments.

2. Uncertain outgo

When institutions are faced with uncertain liabilities, they need to hold a minimum level cash and other liquid assets to pay for them. For instance general insurance companies need to hold short term instruments, as it acts as a cushion against the risk of having to sell their assets at lower prices, when claims experience worsens in case of natural disasters.

3. Investment opportunities

Availability of liquid assets enables an investor to take advantage of attractive investment opportunities when they arrive, especially when they are available only for a limited duration. For example if an artificial intelligence company which promises tremendous growth is planning to go public, then the availability of liquid assets, will enable him to take part in its IPO.

1.5 Holding Cash and Money Market Instruments for Liquidity

4. Recent Cashflows
Institutional investors receive large cashflows on a frequent basis. However, it may not always be possible to invest these cashflows in assets as and when they come. These leaves the investor with a large cash balance, until all the cashflows are reinvested. Hence cash on deposits and money market instruments act like temporary investment avenues for the time being.

5. Preservation of Nominal Value of Capital and Risk Aversion
For a risk averse investor, who prefers holding large proportions of cash investments so that their nominal value remains intact, money market instruments are a safe option as they carry a very negligible risk factor

1.6 Economic Circumstances

Economic conditions that make cash temporarily attractive to long-term institutional investors or to other investors seeking to maximise returns include:

1. Rising interest rates

- An increase in interest rates will lead to a fall in fixed interest bond prices. Increasing interest rates lead to a fall in economic activity and thus company profits. This will reduce the market value of the equity stocks.
- If an investor makes timely predictions about the rise in interest rates, then he would prefer holding cash rather investing in fixed interest bonds or equity, so as to not suffer a capital loss. Also earning a high interest rates on savings in banks is attractive to investors.

2. Start of an Economic Recession

- When a country falls in a recession, the equity market faces a fall in its market value and a slower growth rate as companies tend to be less profitable.
- As a measure to control the recession, the government increases its borrowing by issuing a large supply of government fixed interest bonds, which in turn would lead to fall in bond prices overall.
- Every period of recession is followed by fall in short term interest rates and a rise in fixed interest stock prices.

1.6 Economic Circumstances

- Thus at the start of the recession, cash investments are more attractive to investors, unlike bonds and equities, as the interest earned on cash provides a sufficient level of income and is less susceptible to capital loss risk.

3. Depreciation of Domestic Currency

Any fall in the value of domestic currency, will make cash investments better because:

- Government of the country will increase the short term interest rate to prevent further depreciation of the currency. This makes cash investments attractive as they earn a higher rate of interest. Also as other assets are expected to fall in value people feel investing in cash is the most lucrative option.
- Investing in stronger foreign currencies abroad even though their interest rate is lower is attractive, as any depreciation in the value of the domestic currency, their value in overseas cash would increase.

2 Introduction to Bond Market

- A bond is an alternate term for fixed interest or index linked securities.
- Bonds can be issued by a number of authorized bodies such as the central government, agencies run by the government, supranational organisations or even private companies. Government issued bonds are generally in the domestic currencies, are the most secured form of bonds as the chances of a country's government defaulting on their due diligence are less and dominate a large part of the bond market in any country.
- Bonds can be categorized on the basis of:
  - The type of bonds whether they are fixed interest or index linked
  - On the issuer who may be the government, any local authority or corporate bodies
- The distinct type of bond markets are:
  - The markets in government bonds, which are listed in their country of origin
  - The markets in corporate bonds, listed in their country of origin
  - The market in overseas government and corporate bonds, listed in any country apart from their home country.

2.1 Fixed-Interest (Conventional) Bonds

1. Introduction

- Bonds are primarily a means of raising money for the issuing bodies.
- Bonds issued by the central government helps it to cover any shortfall of income to government expenditure. Government bonds hold a large proportion of market share.
- Corporates also issue bonds as an alternate source of funding to equities .
- The word nominal means, the amount of bond stock, and is the price stated on the bond certificate. For example if the bond certificate states a $100 nominal as the bond price, which has fixed interest payments of 5% pa, and is redeemable at par, then the purchase price of the bond is $94.56, the investor earns an income $5 pa, and receives a final payment of $100, upon maturity of the bond.

2. Gross Redemption Yield

It is the gross return that an investor would expect to earn when investing in a conventional bonds. It is assuming that the investor hold the bond till maturity, and the interest earned on the bonds, are again invested at the same rate. This rate is expected before allowing for taxation, expenses and default risk.

2.1 Fixed-Interest (Conventional) Bonds

The gross redemption yield on a 5 year zero coupon bond can be calculated using the following expression

Price = $100v^5 = \frac{100}{(1+i)^5}$

The gross redemption yield on a 5 year semi-annual coupon bond with an 8% coupon can be solved using

Price = $8a_5^2 + 100v^5$

The formulas exhibit an inverse relation between bond price and gross redemption yield, where an increase in price will lead to a fall in the gross redemption yield and vice versa

2.1 Fixed-Interest (Conventional) Bonds

3. Cashflows

- When an investor purchases a conventional bond, he is guaranteed to receive a regular level of fixed income every year till the bond matures, and a final lumpsum payment upon maturity.
- The fixed lumpsum payment is called the redemption value of the bond, and is paid on the redemption date and is normally the original nominal amount i.e. at par.
- The lumpsum payment receivable on maturity is calculated by multiplying the nominal amount held N by the redemption price R per unit nominal.
  - R is usually 100% if the bond is redeemed at par
  - R may be >100% if the bond is redeemable at a premium
  - R may be <100% if the bond is redeemable at a discount
- The investor has an initial negative cashflow at the time of purchasing the bond, a single known positive cashflow at the time of redemption and a series of smaller known cashflow on the interest payments date. Although amounts and timings of cashflows are known some uncertainty prevails due to credit risk.

2.2 Characteristics of Fixed-Interest (Conventional) Bonds

Once again using the **SYSTEM T** approach we set out the features of fixed interest bonds

1. Security

- Bonds issued by the government or its agencies, are almost risk-free as the chances of default by the government are almost negligible, thus ensuring complete security of income and capital.
- However bonds issued by corporates carry some risk element as it depends on the solvency and profitability of the company. If the company is loss making or has faced a poor financial year, then they may default on their income payments and their redemption payments.

2.2 Characteristics of Fixed-Interest (Conventional) Bonds

2. Yield

➢ Real vs Nominal

If an investor holds on to the conventional bond till its maturity, then the amount and timing of income and lumpsum payments are known in advance. Thus the expected returns on the bond are also known in advance. However the actual return achieved may be unknown if:

- Suppose an investor has invested in a 10 year bond, and is required to reinvest his coupon payments to match a liability that arises exactly when the bond matures. He might know his income and lumpsum payments in advance, but the terms at which the coupon payments are reinvested might not be known at the outset.
- If a sudden need arises for cash, and the investor is required to sell the bond before redemption, the sale price will not be known at the outset
- The real return earned from the bond is uncertain, because if the inflation rate turns out to be higher than expected, then the real return achieved from the bond will be lower than expected

2.2 Characteristics of Fixed-Interest (Conventional) Bonds

➢ Expected return relative to other assets

We know that lower the risk factor of an investment product, lower are the returns one earns from them. Since government bonds are almost risk free, the returns earned on them are lower than the returns one can earn from other investment products.

However conventional bonds perform better than other investment products if:

- Holding conventional bonds when redemption yields are falling. We know that bond prices rise with the fall in yields, so if the bonds are sold at that time, the investor can have a high capital gain.
- Similarly when gross redemption yields are high, bond prices are low, and if the investor purchases them at that time, they can lock in high nominal returns.

3. Spread

➢ Day to day changes in demand and supply cause market rates to vary. Market rates may change by a great value in case of long-dated bonds which are comparatively less liquid than short term bonds.

2.2 Characteristics of Fixed-Interest (Conventional) Bonds

➢ Repercussions of fall in price affect those:

- Investors who need to prove their solvency and financial strength for regulatory compulsions on the basis of the market value of their assets
- Investors who are at a disadvantage of having to sell at lower market prices, than what the bonds were purchased at when an urgent need for cash arises.

4. Term

Conventional Bonds can be classified as:

- Short term, if they are for 5 years or less
- Medium term, if they exist for 5 to 15 years
- Long dated if they exist for more than 15 years
- Undated or irredeemable if there is no specific date of maturity

2.2 Characteristics of Fixed-Interest (Conventional) Bonds

5. Expenses
Expenses incurred in the sale and purchase of conventional bonds are quite low as the margins between their selling and buying prices are narrower than corporate bonds.

Exchange rate - currency risk
The government may issue bonds in international bond markets as well. When an investor purchases a bond in a foreign currency, he is exposed to currency risk, especially if his liabilities are denominated in domestic currency. If the foreign currency depreciates against the domestic currency, then the value he will achieve from investing in the bond will be lower and may not match his liabilities fully.

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6. Marketability
Conventional bonds are highly marketable, and can be sold in large quantities with hardly any impact on the price.

7. Tax
Taxation on income and capital gains depends on the tax regime of the country. Government issued bonds are some times exempted from being taxed so as to incentives people to purchase them or they ma be taxed partially where only the income is taxed and any capital gains are tax free

2.3 Characteristics of Fixed-Interest (Corporate) Bonds

The basic features of conventional bonds are the same for instance their cashflow structure, expenses etc.

However they may differ from government bonds in terms of

- Security – while government issued bonds are almost risk free, corporate bonds carry a certain risk factor, as there are chances of he company defaulting. The level of risk posed by corporate bonds, depends on the company issuing the bond, the type of debt security and the term of the bond
- Marketability – lower the size of issue, lower is the marketability. Companies cannot compete with the government in terms of the size bonds issued and hence have a lower marketability.
- Liquidity – government bonds have some form of stability in their prices as their price does not fluctuate by a great margin, whereas corporate bonds are volatile with high price fluctuations and less predictability. This is why they are less liquid than government bonds
- Yield – gross redemption yield earned on corporate bonds is higher than that earned on government bonds, to compensate for the lower marketability, lower liquidity and greater risk factor. The yield margin can be lower if the bond issue size is large and the company issuing it has high credit ratings

2.3 Characteristics of Fixed-Interest (Corporate) Bonds

Yield margin is the excess of the yield provided by corporate bonds over government bonds. They vary with time and tend to be lower when good economic conditions prevail and the risk of defaulting is low.

- The level of security provided by the government varies between different government. For instance government issued bonds in the developed countries of the west offer greater security than that offered by the governments of less developed countries.
- There may be times when bonds issued by multinational companies are less risky than those issued by the government, as in the case of the European countries, like Italy and Greece which carry a significant risk of default.

3 Index-Linked Bonds

1. Introduction

- This is a security where the cash amount of the interest payments and the final capital repayment are linked to an index which reflects the effects of inflation, thus providing a real rate of return. The fundamental behind index-linked bonds is to protect the investor against inflation. In the case of fixed interest bonds, where the rate of return becomes lower as inflation rate rises, index-linked return rates, move in line with the inflation, thus protecting the value of returns.
- Index-linked bonds are a new innovation in the bond market, and have been introduced only in the last 25 years. Unlike conventional bonds, the size of issue of index-linked bonds is comparatively smaller and a result they are less marketable.
- Index-linked bonds are primarily issued by government bodies, with corporate bodies, issuing them rarely and having a small market share in it.

3 Index-Linked Bonds

2. Cashflows

- The cashflows starts with a known negative cashflow at the time of purchasing the bond. It is followed by a series of unknown positive cashflows on specified dates and a single larger lumpsum at the time of redemption. The absolute value of these cashflows are not known in advance, but since we know that they are linked to the inflation index, they are known in real terms.
- Practically, the cashflow arising at a particular date, will not be linked to the inflation index, prevailing at that time of the payment because of the time taken in calculating the index. This is known as indexation lag. At times the investor will wish to know the amount of cashflow in advance. For this purpose we link the payment to the index of an earlier period.
- As a result of lagging, index-linked bonds do not always safeguard from the effects of inflation. For instance in the last months before maturity, there is no protection for the number of months that are equal to the lag, thus exposing the real value of the investment to erosion, if inflation is higher than expected during the last period.

3 Index-Linked Bonds

3. Yields

- The redemption yield from index-linked bonds cannot be calculated as we do not know the future inflation rates, which are used to calculate the payments.
- Which is why the idea behind quoting yields on index-linked bonds, is to assume a fixed rate of future inflation, and calculating the real yields in excess of the assumed inflation rate. It is important to note that changes in price of index-linked bonds are a result of changes in the real yield rate and not the nominal rate.

State the information and assumptions required to calculate the value of index-linked bonds.

3.1 Comparison of Fixed-Interest and Index-Linked Bond

1. Relation between real and nominal yield

Nominal Yield = Risk-free real yield + expected future inflation + inflation risk premium

- Say a person who has to pay his liabilities in real terms, invests in conventional bonds, he would want an additional yield to protect him from the risk of the uncertain future inflation. This additional yield is represented by the inflation risk premium.
- The level of inflation risk premium is calculated by maintaining a balance between the number of investors requiring a fixed return and those requiring a real return
- Investors requiring real returns for having real liabilities would will want a higher fixed return from conventional bonds, to protect them from the risk of inflation being higher than expected and eroding the real return on conventional bonds.
- Investors requiring fixed returns for having fixed liabilities, will want higher returns from index-linked bonds, to compensate for the risk of inflation being lower than expected, and the required nominal return not being achieved.

3.1 Comparison of Fixed-Interest and Index-Linked Bond

2. The relative attractiveness of fixed-interest and index-linked bond
The attractiveness of these bonds depends on the needs of the investors. Some investors might find fixed-interest bonds more lucrative than index-linked bonds and some may the other way round. During particular economic circumstances, index-linked bonds may outperform fixed- interest bonds such as a high inflation period, and vice-versa during periods of recession.

3. Increases in values of fixed interest bonds
Conventional bond yields fall when investor's expectations of future inflation fall or if the size of inflation risk premium falls. However both these situations have hardly any effect on the real yields of the index-linked bonds, and thereby minimal effect on the price of index-linked prices. Thus, an investor whose expectation of future inflation is lower than the difference between nominal and real yields in the market, will find conventional bonds relatively more attractive than index-linked bonds. The converse will be true for an investor who is more pessimistic about the inflation than the market.

3.1 Comparison of Fixed-Interest and Index-Linked Bond

4. Increase in value of index-linked bonds

- Uncertainty looming around future inflation rates, pushes people to purchase products that safeguards them against the risk of inflation being higher than expected and returns being lower than expected.
- The best time to buy index-linked products is just before the market starts getting uncertain about the prospects of future inflation. As uncertainty increases, demand for index-linked products increases which in turn pushes their price up and reduces the real yield.
- Economic circumstances that cause uncertainty are:

- Booming economic growth
- Poor efforts taken by the government in reducing inflation
- Loose monetary policy
- Depreciation of the domestic currency

3.2 Conclusion

Practically it is very difficult to decide whether fixed interest or index-linked are better at satisfying the needs of the investor and which of the two provides better returns. A lot factors need to be considered such as the development of the various economic factors in the country, the skills of making effective economic judgement before the rest of the market, knowing ones needs and having an idea of future needs that may arise etc.

It is important to:

- Having a pragmatic approach and being open to several options
- Recognize the various economic factors, and understand which ones hold more significance
- Consider how the value of assets changes as economic factors change